FARMING AND RURAL SYSTEMS RESAERCH AND EXTENSION

European Farming and Society in Search of a New Social Contract – Learning to Manage Change

(Pre)Proceedings of the 6th European IFSA Symposium

Coordinated by

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With the collaboration of

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PREFACE

The countryside is no longer seen as a space of food and fibre production. It is understood as multifunctional. Policies have changed considerably over the last decade, and new changes are being discussed at the moment under the EU framework. The global context, markets and trade are part of the debate, as are equity, sustainability, and social inclusion and participation concerns. Urban representation about the rural areas and “nature” have changed, and such changes have influenced the emergence of the so-called new social demands. Economic diversification of rural areas, particularly through tourism promotion and valorisation of quality agricultural and agri-food products have become a focus of attention.

But many questions and concerns remain, for instance about the benefits and risks of these diversification strategies. In the academic, professional, and policy-making communities, it has become clear that European farming and society in general (policy-makers, consumers, environmental groups, and citizens) are searching for a new social contract. Farming systems researchers are active participants in this effort, through research activities and multiple events that they organise or in which they participate. The 6th IFSA European Symposium is a major opportunity to contribute to this on-going and crucial discussion.

The five topics proposed for reflection in the Workshops of this Symposium emerged from these general concerns: food quality and safety; sustainability of small farming; natural resource management and landscape construction; knowing and learning to manage change; and developing new tools to support sustainable agriculture and rural development. As before, we have an outstanding occasion to present and share research results and to advance ideas on future research projects and initiatives.

After the first announcement and call, 95 paper proposals were received by the organisation. These proposals were forwarded to the Workshop Coordinators, who worked actively with a large team of reviewers. Each paper was evaluated and commented by at least two reviewers. The result was that a total of 76 papers were selected to be presented and published in this volume. In addition, 20 posters were also submitted and included in the final part of this publication. These papers and posters represent a considerable scientific work done by more than 100 authors from 22 countries, mostly Europeans.

We are thankful to all Workshop Coordinators and reviewers who volunteered their time for this scholarly activity. We are also thankful to all others who contributed to this Symposium and the publication of this volume, underlining the role of the Steering and Organising Committees and Secretarial staff. We wish that the (Pre)Proceedings of the 6th IFSA European Symposium, along with the Symposium debates, in the Plenary, Workshops and parallel sessions, will stimulate the reflection among researchers, extensionists, farmers and all other actors involved in the construction of new approaches, methods and projects eventually leading to a renewed social contract between European agriculture and society.

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SYMPOSIUM ORGANIZATION AND PROGRAMME

The IFSA European Symposia

The European Group of the International Farming Systems Association (IFSA, ex AFSRE) carries out European Symposia every two years. After five successful symposia in Edinburgh, Granada, Hohenheim, Volos and Florence, the Group decided to carry out the 6th symposium in Vila Real, Portugal. This European Symposium addresses all Europeans, irrespective of their area of research and work, as well as Non-Europeans working in Europe. Participants and authors represent a wide range of European States (EU member States, Central and Eastern Europe).

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The 6th Symposium Programme

The programme features two plenary sessions, five workshops with presentation and discussion of the accepted papers, poster displays, training and tool bazaar, field trips and special parallel sessions.

Plenary sessions will include the welcome addresses, introduction to the general topic and presentation of the localities where the field trips will take place, plus reports from the workshops, plenary discussion, summary and conclusions. **Two special parallel sessions** will focus on CAP reform issues and development of organic farming in the European Union. Five parallel Workshops will deal with five different major topics and will be the major component of the Symposium.

Organisation of workshops and discussions
A small team will coordinated, reviewed and organised the papers submitted for each workshop theme. The organisation of the workshops during the Symposium is left to the responsible team. Time spent in workshop activities will be maximised and the participation of all members of the group ensured. In general, the format of each workshop will be as follows: (1) *Presentation*: A presenter will introduce the papers to be dealt with in each session; (2) *Discussion*: Workshop participants may break up into small discussion groups if wished. Each discussion group will have a reporter; and (3) *Reporting from workshops - General discussion*: The reporter of each group will present the results of the group discussion to be examined and discussed by all the workshop participants. A summary will be presented in the final plenary session on Wednesday by a reporter for each workshop.

Topics and Content of Workshops

Workshop 1
Food System: Food Quality and Safety for Sustainable Rural Development
Coordinators: Donato Romano and Geir Lieblein
Events of recent years have heightened the awareness and concerns that consumers have about food quality and safety. Food quality taken in its widest meaning will include the organoleptic quality of food for the individual consumer to food security at household and to national levels. Food safety touches on the psychological and physical health of people, consumers' welfare, their cultural appreciation of food, the right to food and indeed all the questions of food ethics. These may all be primarily the reactions of the non-farming population.
Equally important are issues and concerns of the farming population on how to keep the money circulating in the region for its development. Linking the typical agri-food productions with their consumption, and accounting for the environmental, recreational and cultural services provided by farmers, can represent an important drive for sustainable rural development in many European rural areas. In this regard, 'food systems' is a way of embracing the whole, linking the farming and the non-farming sectors of society and the social contract between them.
Some of the questions to be considered in this workshop will be: Is it possible for the characteristics of excellence linked to productive processes set by local traditions to be maintained, even in the presence of a significantly growing demand, and therefore of increased production? In which way can aspects of the traditional Farming Systems (productive structures, production techniques, institutional relationships, legislation, personal capacity, and relationships between producers and consumers) cope with the expansion of the market, without a degeneration of the specific characteristics of the local systems? What innovative models do we need to fill the gap between the large players dominating the food systems and the small-scale alternatives that have emerged to date?

Workshop 2
The sustainability of small scale farming
Chairpersons: David Gibbon, Jacques Brossier and Luigi Omodei Zorini
This theme will continue with some of the debates and ideas which were illuminated by the Volos (2000) and Florence (2002) meetings. We would like to explore the continuing roles of small-scale farming, both as a component within broadening rural livelihood systems and in providing ecological and environmental services that society at large demands. We will also examine the linkages between farming systems research and the rural livelihood framework, which includes the analysis of the importance of institutional, social, physical, natural, financial and human capital, in the evolution of more sustainable systems. This theme will welcome contributions from small-scale organic farmers who are building new alliances in production systems, research and marketing methods.
We would appreciate contributions of both theoretical studies and case studies from widely differing contexts, which will contribute to our ongoing debates. We would particularly like to encourage joint contributions from natural and social scientists, advisers and farmers that demonstrate synergy, systemic thinking and evidence of learning in the approach to these complex issues.

Workshop 3
Natural resources management and farm functions in landscape construction
Coordinators: Herman van Keulen and Jacques Baudry
The societal demand on agriculture is shifting from production of commodities, with special attention to avoid pollution or depletion of natural resources, to integrated natural resources management, including rural landscape management and development. Increasing public concern for sustainable development is leading to increased attention for multi-functionality as a boundary condition for farming activities. This theme will be discussed in the Workshop, considering the following objectives:
- To identify options for improved natural resources and landscape management;
- To identify ways to evaluate potential impacts of improved natural resources and landscape management;
- To review methodologies for assessing the efficiency of various incentives in terms of environment; and

- To analyse possible conflicts among environmental objectives in specific natural resources management and landscape management in a farming system setting.

Workshop 4
Knowing and Learning: Labour and skills at stake for a multidimensional agriculture
Coordinator: Bernard Hubert

The Learning network will meet again in Vila Real, with new issues: the consequences on labour and activities of overall societal evolution (individual values, common sense, relation to work and quality of life) and new market requirements in the fields of quality of products, food and health security, environmental management, social conditions. This year we suggest to focus our discussions and interactions on some radical transformations at work in individual identities and social structures such as professional bodies, farms, agri-food enterprises, local communities, in the sense that new skills as well as labour management are required, relevant networking between existing skills (in complementary social positions) is required to enhance their efficiency.

How are those skills built in an intertwined questioning that addresses the role of numerous agencies and actors, with a specific stress on the local level, since a strong hypothesis may be that territorial assets are core components of the evolution of agriculture towards multidimensionality? These questions are addressed by a wide range of disciplines, in the human sciences (ergonomics, psycho-sociology, sociology, anthropology, political sciences and economy) as well as bio-technical sciences (agronomy, animal husbandry, forestry, food technology). Hence, this workshop will welcome such diversity and has for ambition to cast an interdisciplinary light on these questions.

Skills can be considered as products as well as conditions of professional history. We look for papers describing and analysing individual learning processes through personal trajectory, the role of training agencies, educational systems and local or professional communities or any interactive systems of skill building. How generic and specific skills are identified, translated into training products and implemented through the cooperation between different actors, including workers/workplace providers, relationships or innovative territorial projects? Beyond individual skills, this co-operation highlights the need for collective or organisational skills, which are the products as well as the conditions of actions and interactions between stakeholders.

Workshop 5
Combined micro-economic and ecological assessment tools for sustainable rural development
Coordinators: Peter Zander and Tommy Dalgaard

Sustainable development of farming systems requires profound knowledge of complex interdisciplinary processes. These comprise scientific as well as agricultural, social, economic and political processes. Changes in farming systems management depend on the decisions of a number of decision-makers in agricultural enterprises and public authorities from the local level up to European agricultural and environmental politics. Farmers generally follow the economic rationality in their decision making, which is implicated by the economic conditions. These conditions currently undergo considerable modifications through the actual practice of subsidising agriculture in Europe. In the future, the EU funded agricultural subsidies will increasingly be linked to the environmental performance of agricultural practices (EU-Commission 2000).

To develop an effective agro-environmental policy, tools are needed that allow detailed ex-ante economic and environmental analysis of different policy options at a regional level. The sustainability of a certain land use combination can only be defined in a participative societal discourse, which requires adequate information. At the same time, much of the correlations between different aspects of sustainability are not known, because of knowledge gaps on processes, data or lack of models which can generate adequate information at the regional level. The provision of tools that are able to analyse the interdependencies between the relevant indicators of sustainability at a regional or national level will contribute substantially to sustainable development. These issues will be debated in this Workshop, with the contribution of all participants.

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- Zona Florestal de Basto

WORKSHOP 1

Food System: Food Quality and Safety for Sustainable Rural Development

Interdisciplinary Dialogue for Sustainable Systems

Alice Woodhead*, Abigail Jenkins and Roger Packham*****

Abstract

Why do 'birds of a feather flock together?' Is it possible for individuals and groups from different philosophical backgrounds and disciplines to agree on ways to solve problems? Arguments abound about the importance and necessity of involving all stakeholders in decision making. Some say that interdisciplinary groups are essential to such a process to avoid the narrow focus of uni-disciplinary groups, yet others argue that competition among disciplines may be more fruitful than co-operation. Most do agree that the way forward, to achieve more sustainable development so as to avoid past mistakes, is seen as requiring more debate from a broader stakeholder base, one that does not just involve 'experts'. Why then does this so rarely happen satisfactorily? There are many blocks to the interdisciplinary approach at societal and policy levels. Even though, at different levels in our daily lives we interact with many different citizens. But, when it comes to professional decisions, we seem to feel more comfortable interacting with those of the same 'feather'. Linking farming with the many levels of government and private sectors and other parts of the food chain system is a complex process. This paper reviews the dialogue between experts at an interdisciplinary workshop funded by the Organisation for Economic Co-operation and Development (OECD) in Ballina, Australia. The Pressure State Response model formed the basis of the dialogue. Within the example of a biophysical context of diffuse source pollution from agriculture, 50 experts from the social, environmental and economic disciplines, therefore representing the sustainability model, discussed how to overcome the barriers to effectively, aligning policies and acknowledging and working with the vastly different world views of the participants.

Introduction

Transparency, traceability, capacity building, partnerships, inclusion, and diversity are all part of the new sustainability vocabulary. *Ad infinitum* these terms appear in reports and policy statements. There is also continuing pressure for the reform of institutional arrangements, and demands for greater transparency and participation by civil society in debates that shape our common future. Major institutions such as the WTO Ministerial meetings are confronted with civil action, because civil society believes that they are not being adequately accounted for within the discussion process of the WTO and other such bodies.

But what processes do we use to negotiate this new reality? What reality do we want to create? Each individual and organisation and link in the food chain differs in the way they see, perceive and define social, economic and environmental issues. Therefore how these issues are acted upon differs. How do we define and manage the change process within all this complexity? This was the focus of the dialogue at the OECD Cooperative Research Program (CRP) workshop on Agriculture and Ecosystems

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Management in Ballina, Australia. The key aims of the Ballina dialogue were: to identify a process through which the stakeholders in rural ecosystem management can progress to envision new options, for which appropriate policy support and enabling instruments can be developed; and to evaluate the workshop process as a model for wider OECD use. Such an outcome has applicability to any system seeking sustainability, such as the food chain system.

Why Interdisciplinary?

An interdisciplinary dialogue process is an attempt to include a broader range of participants who bring different frameworks of ideas to the decision making process. Interdisciplinary dialogues are made up of representatives from different disciplines, cultural backgrounds, and institutional affiliations. This may not appear very revolutionary in day-to-day life, but in government decision-making processes interdisciplinary forums are not very common. Interagency groups meet more frequently, but how often do these groups actively try to balance the perspectives of the sociologist, the biophysical scientist and the economist?

Since environmental issues frequently cross farm, local council, state and country boundaries, as does diffuse source pollution that is from many sources, improvement requires collective decision making and action across water sheds. Developing greater collective action to reduce run off from agricultural land and to encourage sustainable agricultural practices are therefore key policy issues in Australia and other OECD countries. To many stakeholders these complex, systemic environmental issues seem intractable. These issues require a holistic approach, with social, environmental and economic dimensions all being included in the policy development process. Indeed participatory research and effective public-private sector partnerships are considered to be key components of successful research projects in many countries (Pretty and Ward 2001; Lovell et al. 2002). Changed attitudes are required by government agencies, landholders and the community alike, and new models are needed to facilitate broader decision making platforms.

What is Dialogue?

Dialogue is a process developed to answer the question “Why do seemingly intelligent people keep on making matters worse?” Our culture has conditioned us to debate, to argue, to engage in dialectic, which may or may not lead to a synthesis. This kind of dialogue is more of “a cacophony of monologues” as Bohm and Factor (1996) describe it. What they proposed was a group conversation where people join together to explore whatever seems important, such as the assumptions that are making a particular topic seem important. The word “dialogue” comes from the roots *dia* meaning “through” and *logos* which means “the meaning of the word”; so dialogue can be seen as a flow or stream of meaning, which never becomes fixed but continually forms and reforms; out of this emerges some new understanding, something creative. It is different from but complimentary to *discussion*, which emphasises the idea of analysis rather than synthesis.

In dialogue, the aim is not to try and gain points for your particular view. Bohm used the metaphor of the laser light, which produces a very intense beam because all the light waves are coherent – going in the same direction – rather than being incoherent as in ordinary light, with the waves not in phase. At the heart of dialogue lies the *suspension* of thoughts, impulses, judgments and the like. Suspension involves attention, active listening and looking, and is essential to exploration. When we are upset by what someone else says, we have a choice between voicing a reaction or letting the matter go, thereby suspending our reactions. The choice of suspension is particularly difficult if it is perceived that a particular point has been misunderstood or misinterpreted, never the less if suspension occurs, often further conversation clarifies the issue and active intervention can be avoided. Suspension helps a person to know their thoughts as they are having them (Issacs, 1993).

The dialogue *process* is as essential as the task or goal of the group and proponents believe that dialogue is the root of all effective group action. While dialogue emphasises the natural flow of conversation, it discourages feedback and direct interpersonal encounters, with the *whole group* being the object of learning. The group members share the potential excitement of discovering collectively ideas that individually none of them might ever have thought of.

One response to seek answers to some of these questions and dilemmas was a unique gathering that occurred in Ballina, at the mouth of the Richmond River in Eastern Australia in November 2002. The objective of the four day workshop was to put the theory of interdisciplinarity into practice. The next section outlines the process of the Ballina workshop and overviews the papers that were presented.

The Workshop Methodology

The OECD, the University of Western Sydney and NSW Agriculture hosted an *interdisciplinary dialogue* in Australia, to discuss the relationships between agriculture and the ecosystem (Woodhead, Jenkins, Packham, 2003). The fifty delegates invited broadly represented the sustainability model, that is disciplines represented included environmental scientists, social scientists, psychologists, economists, government representatives, from the local, state and federal agencies, farmers and other stakeholders. Therefore they also represented all levels of society from senior government to community level and from within and outside the agriculture and natural resource management paradigm. They also represented different cultures; twenty-five were from international locations including Canada, Denmark, France, Great Britain, Japan, New Zealand, The Netherlands, and USA, together with 25 Australians.

The environmental pressure driving this debate was declining water quality in agricultural watersheds. This is a complex problem encountered all over the world. While the science of water quality decline is quite well understood, water quality continues to deteriorate - the human element has proven to be less tractable than the technological one. The Ballina dialogue enabled the examination of technical, economic and social aspects of this issue from a range of perspectives and interests, along with the policy options for improvement through economic incentives, establishing clear property rights regulations, standards, best practice, education and research.

Contributors prepared papers that avoided discipline specific jargon, and that provided case studies rather than theoretical arguments. Authors prepared papers with a theme of either *Pressure State* or *Response* based on the OECD (PSR) model. Specifically

- ***Pressure*** on agricultural ecosystems from diffuse source pollution,
- ***State*** of agricultural ecosystems as a result of pollution
- ***Response*** within agricultural ecosystems including policy and community action to address pollution

The dialogue process

Following the framework of the PSR model, delegates debated in interdisciplinary groups what the nature of the problem was and how to deal with it in the future. The dialogue process revolved around five interdisciplinary groups with between eight and 10 participants in each group. Participants were members of three such groups that were reformed progressively over the week of the workshop. The role of the first group was to consider the papers about 'Pressure and State' and the summary presentations of them, and to formulate and ask questions of the presenters. After a one and half days in these groups, participants then changed groups and the role of the second group was similarly to consider the papers about 'Response'. The third group was formed on the final day to discuss some provided (new) case studies, and to develop policies that might work in these particular contexts to improve the complex environmental issues that the workshop had learnt about through the week. Such policies are often developed by groups of people that do not know each other well, but that come together at infrequent meetings to develop policies. Thus the workshop was reflecting this real-life circumstance.

In conjunction with the 'pressure' paper presentations, a tour of the Richmond River to look at oyster farming and the impacts of diffuse source pollution on aquatic systems was held at the end of the first day. Similarly, after the 'state' paper presentations, a tour of cane farms and water management facilities was held.

The three groups and tours were used to ensure that by the end of the workshop, individuals had interacted in small group dialogue formally and informally with most of the other workshop participants. This allowed for different perspectives to be raised in response to the papers, and for informed questions to arise from the group dialogue process, not just from individual perspectives. It also aimed to ensure that an interdisciplinary approach was maintained throughout all sessions of the workshop. The next section looks at the scope of these responses and also introduces contributed papers.

The dialogue

Five overview papers provided the basis for the dialogues over the three days. These scene-setting papers discussed the PSR model and the role of indicators for monitoring change (Parris 2003) and the role of a State agricultural agency in natural resource management (NRM) (Scott-Orr and Banks 2003) along with the major challenges for achieving sustainable agriculture. A paper about the psychology of change (Furnham 2003) explored why it is difficult for individuals and groups to change and what are the drivers of this change process, such as technology, globalisation and the changing nature of the workforce. Two papers discussed the biophysical case study, acid sulfate soils. One focussed on participatory interdisciplinary mechanisms (White 2003) and the other on the institutional context (Williams 2003). According to White and Williams, both representatives of the Acid Sulfate Soils Management Action Committee, interdisciplinary groups produced a workable situation (state) in relation to the issue of the systems sustainability of acid sulfate soils in Northern NSW Australia. In the acid sulfate soils study dispirit visions and conflict amongst those involved were overcome through participatory interdisciplinary mechanisms.

Several authors noted the importance of the time factor, which is vital if groups and individuals are to co-learn and build up trust and rapport. They argued that all too often the significance of time is not appreciated. That it takes considerable time to build trust and rapport in communities and between organisations. However, Morris (2000) also concluded that the predominant ***pressure*** is time. The environmental imperative is *now*, time is 'running out'. The pressures placed on the ecosystems such as the Great Barrier Reef (GBR) is *now*, yet there are no easy solutions (response), since many of the impacts are land based and beyond the GBR park authority's control. While time may be short, Morris acknowledged that the complexity of diffuse source pollution issues makes an interdisciplinary approach critical. Authors agreed that dialogue and learning that happened in these fora generated new and useful information to enable forward movement. White and Williams argued that maintaining constant dialogue reduced the conflict that surrounded the acid sulfate soils issues, and enabled useful action to emerge. However, they acknowledged that it took several years to reach consensus and for most representative to move from their entrenched positions.

Move forward, but to where? According to Röling (2003) pressure is the realisation that we have got it wrong. With rapid change causing crisis, the challenge is to develop the ability to learn together and to be able to see our reality as something we have the power to invent (within biophysical limits), rather than just assuming it is something there to discover. Thus the process of creating policy requires conditions in which dialogue can be effective, despite the fact we will never totally agree. Röling asked "Whose truth? if everyone is inventing different ones?" Röling inferred that what we need is a mechanism to learn together to bridge those truths. The important point is to look for what will work in what situations. What makes this challenging is that our rich and messy reality is characterised by non-linear feedback loops (Waltner-Toews 2003). As such, the creation of a vision of sustainability is not easy. Drawing on ideas from the systems sciences, Waltner-Toews proposed that the continually changing pressures on complex multilevel ecosystems require continuous adaptive processes. Both Röling and Waltner-Toews show the necessity for an interdisciplinary process to solve complex issues and to measure change. Röling suggests that everyone's reality is different, therefore the indicators that individuals choose to determine the success of a given project or reality will be different. This difference is essential to make that reality encompassing. While Waltner-Toews suggests that these issues are not static, and therefore any indicator or measure and the process must be flexible to encompass these issues as they occur.

The three papers looking at the ***state*** of agricultural ecosystems also highlighted the necessity of interdisciplinary dialogue in agro-ecosystems management while mentioning the blocks that exist. A paper about a case study of water sharing and management across national boundaries outlined an attempt to find a middle ground between the top down enforcement approach and the bottom up voluntary approach (Jiggins 2003). Adaptive policy formulation was rooted in the local area, allowing for the feedback that was required for this kind of activity to continue. Farmers and naturalists needed to be both involved in discussion about environmental issues, and how to set plans based on individual farms and environmental objectives.

This approach has ramifications far beyond the individual landholding / catchment boundary, such that there must be interdisciplinarity at all decision making levels to ensure representation from all levels. Specificity is particularly important. Interdiciplinartiy is more than different disciplines, it is also different levels of governance. Those making policy at 'higher' levels have to be brought into the local picture: Local actions can be thwarted because the decisions occurring at higher levels are not informed by an interdisciplinary approach (Steyaert 2003). The indicators and points of view at any one level are no more important that at another level. The challenge is to develop communication and transparency between the levels.

However there are blocks in functioning through all levels of decision making, because each level has their own goals, language and culture, making dialogue a challenge. Valentine *et al* (2003) argued that in New Zealand the use of soil indicator tools were hampered by the lack of interdisciplinarity, "for research organisations to be successful in applying their output to the management of natural resources, the users should be involved in the development" New Zealand farmers "feel that *(they*) have lost certain rights to manage the land resource" because they have not been consulted about policy changes.

Group dialogue following these papers took up these issues, particularly focussing on how much representation would be satisfactory, how to get that representation, and what mechanisms could be used to get dialogue going between the people drawn in, rather than people only defending their existing positions. The groups agreed that there were no simple answers, and that each local context had to be treated on its merits. All that could be generalised were the overarching principles that people should strive to achieve. However, listening to other people's stories of successes and failures helped others to plan future actions, and so such stories needed to be made available through conferences, meetings and publications; they gave encouragement to people to keep seeking better ways to act.

The ***response*** section presented papers that discussed the complexity of the change process and methods to facilitate interdisciplinarity. This section was split into two parts with eight presenters. The first section dealt with institutional, policy level responses and the second with community level responses.

The role of ***policy*** in interdisciplinary dialogue was a strong theme of the workshop. There was a strong argument for vertical interdisciplanry dialogue. Conflicting policy messages interfered with biophysical signals received by farmers to manage land sustainably (Legg 2003). According to Legg, policies and markets need to be consistent and lead to a sustainable outcome, which means in particular the phasing out of environmentally harmful subsidies. A mix of regulation, education and economic measures can be used to promote the sustainable management of water resources (Journeaux 2003). New Zealand policy and regulation allows for some site specificity, so there can be a mix of incentives and regulation, while economic measures are targeted at providing answers through research rather than by direct payments to farmers. The education/ facilitation arm of this package involves interdisciplinary groups that contribute to policy development and interpretation in their local region.

Scientific understanding and technical knowledge are not limiting factors; rather the limits relate to the socio-cultural, economic, and political environments within which technical solutions need to be implemented (Brezonik 2003). Indeed it was stated that: "Stakeholder participation is a necessary but not sufficient condition for developing more sustainable ways of managing natural resources" (Campbell 2003), highlighting the fact that these other limiting factors still needed to work within the bio-physical constraints of a particular context.

Community response to pressure made up the second part of the *response* section. One of the reasons that this workshop was held in Australia was because of the *Landcare* program. Landcare facilitates cross-disciplinary dialogues and as such interdisciplinary dialogue at a community level has been a policy initiative in Australia for over 10 years. The Landcare program provides a framework to form groups. It brings together 'neighbours' in a geographical defined community for collective action to address environmental issues that are prioritised by the Landcare group. As such the groups are frequently diverse with lifestyle farmers, urban dwellers and professional farmers dialoguing about land management issues. The success of *Landcare* in Australia, and its role in building social capital to facilitate action according to Curtis (2003) has been substantial. However, Curtis acknowledged that there was criticism of *Landcare*. Criticisms about the limitations of *Landcare*, especially those regarding its reliance on voluntary action, the ongoing support it needs to ensure long term viability, and that *Landcare* has been used as a way for governments to divest themselves of responsibility for acting on NRM issues at a local level. Curtis argued that a stronger policy mix to 'back up' *Landcare* was essential. Ringleman (2003) argued that the success of *Ducks Unlimted* was due to the diverse nature of the group, that included policy makers, landholders, conservationists and duck hunters. This Ringleman argued provided diversity both in paradigm and realities along with stronger institutional support.

In another community response from Japan, researchers functioned as catalysts for the development of new technology, but more importantly they helped to set up soft systems processes that facilitated the uptake of this new technology. While they enabled the new technology to function properly, forces outside their control (changes in national trade conditions) meant that the marketing of rice became the most pressing issue. (Sato & Taniguchi 2003). This further reiterates the message by Waltner-Toews above, that unforseen issues will arise. A process of true interdisciplinary dialogue needs to encompass these dynamic events.

The nature of the processes and partnerships that occur between some human activities and institutions was a key theme throughout the three days of papers, tours and dialogue. Ison (2003) put forward the argument that as an individual is only able to respond to his or her own apparent area of responsibility, *systems practice* can be a useful means to orchestrate ecological conversations between these individuals. In this way, communities can be enabled to enact a *learning process* that will help them to respond in appropriate ways to environmental issues of concern.

But systems practice needs to be incorporated into all levels of decision making. While groups such as Landcare may be effectively negotiating horizontal relationships at a community level, there appear to be problems with vertical integration among levels of government, scientific disciplines and the community.

Participants reactions to the process was overall very positive, and gave the participants an understanding of what was involved, and encouraged them to try interdisciplinary dialogue out in their own research settings. Reaction to the final day was varied and depended on the case study and the facilitator. Because the case studies were 'not real' to many people, particularly those from non-Australian backgrounds, they therefore felt they had no responsibility to help create new policies for change. This highlights the need for policy makers and others to be involved in the situation, to view the biophysical issues, and to have interdisciplinary dialogues before enacting assumptions they may be holding. This was very evident as a result of this workshop process. Why was it that this was the first time many of these people had met in this way with people from other disciplines? All agreed that there was a need to encourage such processes in complex issues such as those that formed the basis of this meeting.

Learning outcomes
Discussion

Advocates of the interdisciplinary approach argue that by forming third party interdisciplinary groups (Allison et al. 2003; Hoggett 2001), decision makers from different levels are brought together, for example from the international government level through to the local government level. Benefits emerge such as increased integration between disciplines, thereby challenging individuals to acknowledge and accommodate different interests. Consensus on management can often be achieved, albeit after a period of negotiation (Ewel 2001) with moving from collaboration to conflictive representing an important part of this negotiation period (Ramirez 2001). Advocates also argue that an interdisciplinary framework provides the opportunity to incorporate other perspectives into discussions on how to define and value sustainability leading to appropriate re-writing of the rules. The credibility of science with the general public relies on a broader base of decision-making. Freudenburg (2002) argues that the "true need is thus not to argue about differences - or to create them - but instead to develop synergies across differing points of view”.

A single agency or uni-disciplinary group cannot accommodate the required broad scope of views necessary with complex societal issues, nor is it able to develop the ‘ownership’ of proposed improvements that an inter-agency group can. A single agency cannot stimulate the level of debate in a third party organisation that is needed to manage complexity; there is the further potential benefit, as the adage goes, that “a problem shared is a problem halved?”. Shared ownership avoids one group colonising an issue. Single discipline ownership implies domination over how issues are dealt with, valued and acted upon. Third party interdisciplinary groups potentially have strong communication and negotiation powers. Group representatives that straddle federal and state agencies, local councils, industry and NGO groups can influence a broader scope of decision makers. They can also increase agency ownership and facilitate the transfer of knowledge among groups including scientists, policymakers, producers and civil society.

In a paper to the OECD Workshop on Accounting Frameworks to Measure Sustainable Development, Smith (2003) described an experience in Canada with a cross agency group. It was noted that had the group not existed, a government ministry would have had to fill the role. “*Given the ministry’s roles of advocating policy in specific domains, their ability to seek and find common ground on a question as broad as sustainable development is somewhat compromised*.” Smith concluded that ‘open and free debate’ was needed to resolve the complex issues surrounding sustainable development. The aim of interdisciplinary groups or inter agency groups is to avoid the mistakes of past single disciplinary groups, who often do not know what it is they do not (but should) know. When uni-disciplinary groups do not deal with the issues and points of view of other groups in the decision making process, important considerations can be neglected, thereby influencing the success of an activity, a policy or the like. Uni-disciplinarity, however, is not always intentional, but often occurs simply because *‘you don’t know what you don’t know’*.

Detractors of the interdisciplinary dialogue process frequently fail to extend their meetings to third parties because of organisational and time constraints. Opposition may not be overtly stated but occur by simply failing to broaden the scope of participants. Building networks beyond their immediate professional interests takes time and effort. Conflict of views and the resultant increased time needed to reach conclusions can result in an initial sense of chaos, and the perception that the issues are not being resolved; more confronting still is a fear of loss of control. Homogeneous groups tend to be inward looking, that is they reinforce their own belief systems and insufficiently acknowledge the breadth of complex issues (Furnham, 2003). Interdisciplinary groups can threaten exclusive clubs and power blocks. Moreover, some would argue that competition among disciplines might be more fruitful than co-operation.

Some politicians are currently arguing that issues should be sorted out before meetings, as exemplified by the following quote by Craig Knowles:

> “*Differences between government agencies should be sorted out before meetings so that a single, coherent government position can be presented to other stakeholders, not myriad turf arguments*”.
> ‘Hard road to hoe’, Sydney Morning Herald, 20 May 2003.
> Craig Knowles is the NSW minister for the newly created department of Infrastructure, Planning and Natural Resources.

Other politicians fear that this approach is suffocating dialogue. Governments presenting one point of view can deny important information on the scope of the debate. One danger with this approach is that ideas become over simplified and diluted, and important messages from the broad range of agencies involved in Natural Resource Management (NRM) will not be delivered to the general public. After all, the major aim of including different parties in a dialogue is to avoid the uni-disciplinary decisions that have caused many of the current environmental, social and economic problems, even if this is a time consuming, noisy and chaotic process. Members of the New South Wales Acid Sulfate Soil Management Advisory Committee (Woodhead et al. 2003) have said that the interdisciplinary, multi-agency process they developed was invaluable because the complexities of the problems: '*don't sink in until you see it and hear all the different viewpoints*'. They also said that the most important part of the meeting process (they meet four times a year with one two day field workshop) were the two day workshops where they had time to talk with all the other members and make visits to sites.

Criticism of many interdisciplinary projects was that they failed to be truly interdisiciplinary, either because they failed to integrate vertically and involve policy within their ranks or that they failed to involve a diverse representation of skills. Therefore the groups were reinforcing their own beliefs. Many workshop participants also agreed that the time factor works against interdisciplinarity. Building interdisciplinary teams takes time yet the imperative problems faced by NRM issues is a lack of time.

The outcomes from the Ballina workshop can be seen to be twofold; first there is the set of agreed principles that are described in the 'Summary, Lessons and Conclusions' paper (Woodhead and Legg 2003) of the Agriculture and Ecosystems Management proceedings. These aim to guide dialogue amongst stakeholders when developing policies for diffuse source pollution. The main points from the conclusions are that:

- Effective ecosystem management in agriculture needs to draw on a wide range of disciplines, but often there is too little dialogue and understanding across the different interests;
- Evidence from the scientific analysis of ecosystem management is sometimes too remote and not meaningful to be practically applied at the farm level.
- Interdisicplinary dialogue is essential for developing policy.
- Evidence of policies success or failure must be provided from a great range of indicators that are developed from many realities.

Secondly there is the proceedings record itself (Woodhead, Jenkins, Packham 2003), which has a particular function to play in feeding in to government and community thinking and action at all levels. Given the complexity and broad scope of the issues that the Ballina dialogue dealt with, no single proceedings can possible claim to be all-encompassing; however those and this paper do represent an expansion of the concepts of the pressure/state/response model, and an attempt to integrate the thinking of diverse perspectives and actively work through how interdisciplinarity can be built into sustainability and policy frameworks.

Conclusion

The papers and the workshop process clearly make a strong case for the benefits of interdisciplinary dialogue, even though this requires extra time and effort. There is an inevitable learning process and adaptation of concepts and language from the different disciplines. While this is not an easy road, and often there is no roadmap, the potential benefits make it well worthwhile. To ease the way, we need to experiment with new and innovative approaches, and the Ballina dialogue was an example of this. Such innovations need to be documented to help those that follow to avoid pitfalls and to build on successes, for surely this is a big part of the function of interdisciplinary dialogue. We would encourage the incorporation of these ideas into research, policy and activities associated with food systems, to deal with the many complex issues raised by this workshop.

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The Role of Geographical Labelling to Insert Extensive Cattle into Beef Marketing Channels. Evidence from Three Spanish Case Studies[1]

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Abstract

Beef cattle sector is readapting to increasing requirements from the demand, which looks for a differentiated product, with constant quality, in a market beginning to be dominated by great distribution companies. Mechanisms to differentiate production are been implemented in this context, co-ordinating both production and marketing processes and integrating livestock farmers into the commercial system.
Extensive cattle systems have an important weight in Spain because of their social and environmental values. However, their structure and level of profitability are obstacles for their adaptation to new market trends. This situation requires instruments able to insert the farmer in this adaptation process and to add value and differentiate products. These instruments can be promoted by institutions or the own private sector by mean of quality labels based on the geographical origin of the product. This paper aims to characterise the process of adaptation of Spanish extensive cattle systems through three case studies representing three different kind of extensive systems located in the Northern, Central and Southern mountains of the country. The development of a Logit model based on a survey to farmers has allowed to identify which are those variables with greater influence in the decision of integration into quality labels based on the geographical origin. The study conclude that mechanisms are not unique. Some factors like the institutional framework or regional market impose differences among mechanisms determining the final degree of success.

Introduction

Beef production faces an important changing process in Spain affecting primary marketing processes but also having repercussions on production systems. Due to consumers' loss of confidence, specially intensified after the BSE crisis, the beef sector has been forced to renounce to marketing strategies based on quantity and prices and to redirect them those strategies towards consumers' demands. Consumers demand not only a guaranteed safety product but also with a constant and homogeneous quality. In this context Common Agricultural Policy (CAP) plays also an important role, due to the low profitability of extensive cattle farms, CAP direct payments and requirements increasingly influence production decisions.

Extensive systems are characterised by the use of natural pastures, low use of out-farm feed and low costs and productivity. Most extensive farms sale their calves 6-7 months of lactation (breeding farms)

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to be fed in intensive fed-lots (feeding farms), while the rest feed their own calves (breeding & feeding farms). Extensive systems present severe structural problems: low dimension of farms, low qualification of farmers, high marketing and transport costs, problems to access markets, etc. In opposition, these systems conserve social and environmental values potentially able to constitute competitive advantages considering consumers' willingness to compensate the maintenance of these values through product prices.

Labels based on the geographical origin of products present at a same time potential to respond to consumers' quality demands, to impulse structural changes, organisation and co-ordination of extensive systems, and to capture the latent demand for social and environmental values.

This paper aims to characterise the process of adaptation of Spanish extensive cattle systems through three case studies representing three different kind of extensive systems located in the Northern, Central and Southern mountains of the country. The paper analyses the process of integration of farms into the differentiation instruments (labels) existing in each of the studied areas analysing those factors explaining farmers' decision of participation. It is also studied the importance of these factors in the success of each mechanism and their potential to be considered in the designing process of agricultural policy.

Methodology is based on econometric models (Logit models) used to explain farmers' decisions to participate or not in those labelling systems. Models have been specified for each case study. Results allow to analyse the role of geographical labels on each case, factors highly influencing on it and to prospect their future evolution.

Main problems of extensive cattle systems

A great proportion of Spanish beef production is characterised by the physical separation of the breeding phase (mainly located in mountain areas where pastures are available) and the feeding phase, due to climatic limitations. Breeding phase presents an extremely atomised structure of farms and a high dependence of the land factor. Although it exists a tendency to feed calves (closing the productive cycle of the farm), breeding farms selling calves after lactation to be fed in intensive farms are still a majority. These systems remain far from vertical integration processes and other concentration frequent processes in the current agri-food system.

Atance et al. (2003) have identified the main problems and obstacles for the participation of cattle farms in marketing channels. Problems detected are: low profitability of farms, absence of integration and atomisation. Experts perceive low profitability as an increasing problem in the long term that can not be attribute to the absence of public aids. In opposition, integration and atomisation problems are viewed as decreasing problems in the long term. Other endogenous problems are the mentioned consumers' loss of confidence, the insufficient level of differentiation of products and the poor structures of the cattle sector. All of them are perceived as decreasing problems in the long term. On the contrary, experts do not currently concede importance to the possible suppression of reduction of CAP payments and to international competence but both increase in the long term.

All these problems detected affect directly to extensive systems. However, extensive systems are also receptors of consumers' appreciation towards beef as a quality product. Thus, Gilg and Battershill (1998) consider that production conditions, taste and wholesomeness are attributes highly valued by consumers that associate them to traditional production systems. In this sense, the increasing demand for quality meat can be a satisfactory element to maintain those traditional systems, including extensive cattle systems, supporting rural communities and reducing their dependence from public payments.

According to this, Atance et al (2003) shows how successful strategies should be focussed on promoting those attributes of the product related to quality when differentiating it. Thus, competition against other products would fall on differentiation based on quality attributes, far away from price strategies (Fearne and Kuznezof, 1994). In consequence, strategies must point more attention to inform than to promote.

Differentiation requires not only a correct election of attributes but also to look for homogeneous products. In fact, homogeneity has been the key factor in the differentiation of other meat products (pork, chicken) and the consumers is not willing to renounce to it. Differentiation requires co-ordination among production and marketing phases, thus operating as a mechanism of integration of the production systems (Ward and Estrada, 2002). In the case of the beef sector, this co-ordination is frequently assured by the use of two different and alternative kinds of mechanisms: private brands and geographical labels.

Intensive systems present those elements most needed for their integration into marketing channels: lower problems of heterogeneity in their products, larger farms and a close relation with slaughterhouses and meat industries (both able to impulse private brands). Thus, private brands are the most adequate way to integrate intensive systems into modern marketing channels.

However, extensive systems must cope with serious inconveniences to join marketing channels due to the own structure of their farms and their organisation. First, farms are small and scarcely profitable. Their production would require greater concentration to access markets in favourable conditions. Second, there exists a lack of homogeneity in their products. Third, it is extremely frequent in these extensive systems the coexistence of breeding, breeding & feeding and feeding farms, making difficult to organise their production. Geographical labels present a great potential to solve these inconveniences, favouring at the same time the social and environmental values of extensive systems (Gómez Ramos and Iraizoz, 2003).

Geographical labels as product differentiation mechanisms

The final objective of a quality label based on the geographical origin of production is to guarantee to consumers the existence of better product’s attributes based mainly in its geographical origin. In the case of meat, these attributes are reinforced by breeds selection, fed and sanitary controls and traceability of products (Fernández Barcala et al., 2002).

Geographical labels can be promoted either by private agents or public agencies. In the case of private agents, geographical labels would operate similarly to private brands: both production and promotion fall on the same agents and external independent companies carry out those quality controls required. In opposition, public promoted brands present a clear separation between production (cattle farmers) and promotion (public agency owner of the label). In this case, there exist a public independent institution (“Consejo Regulador”) leading the process. Tasks of the Consejo Regulador would include the elaboration of label’s regulations, monitoring of quality controls, information to potential participating farmers and promotion to consumers.

Geographic Protected Indication (GPI) is the most used quality label used in the case of quality beef labels promoted by public agencies. GPI guarantees a differential quality based on the geographical origin of the basic product or the place where it has been transformed. In the case of beef, GPIs must be considered explicitly a promotional instrument to increase consumption, but implicitly they support extensive systems facilitating their access to markets at competitive prices.

Three geographical labelling case studies from Spanish extensive systems

Case studies selected

To assess the role played by geographical labelling in extensive systems we have chosen three case studies representative of Spanish extensive cattle systems. First system, Navarra, is located at the North representing extensive systems from Atlantic mountain areas. Sierra of Guadarrama (Madrid) is located at the Central mountains and represent Spanish continental mountains systems. Valley of Pedroches (Andalucia), at the South is a good example of mountain 'dehesas'. Main characteristics of these systems are described bellow and summarised in Table 1:

- *Navarra*: High rainfall and cold winters characterise climatically this area. Cattle must be frequently supplemented with grain and fed during winter when it is kept under cowsheds while in summer natural pastures are abundant. Farms have a medium-low size, averaging 25 cows. Calves are usually fed at the own farm (breeding & feeding farms). Cattle farming is not combine with crops or other livestock activities, but a great proportion of cattle farms in this system has been reconverted from dairy farms.

- *Sierra of Guadarrama*: The area presents a continental and mountain climate, with cold and humid winters and hot and dry summers. Cattle require important fed supplementation both in winter (when it must be kept in stables) and summer (since pastures are frequently dried, scarcely productive from August). Farms average 60 cows (medium size) and present low livestock densities but there exist some located problems of over-intensification during summer. Breeding and breeding & farming farms are present in a similar proportion in the area.

- *Valley of Pedroches*: Under a Mediterranean and mountain climate, with mild and humid winters and hot and dry summers, cattle is not kept in stables but requires fed supplements in summer. Farms' size is medium-high (50-100 cows), livestock densities are low, but over-intensification is extreme in the most flat areas. Farms correspond to both breeding and feeding farms (breeding & feeding are not representatives). Cattle livestock is frequently combined with pigs. In farms combine pigs and cattle, pigs used to be the main activity.

Table 1: Main agro-climatic characteristics of the case study areas

	Navarra	S. Guadarrama	V. Pedroches
Climate	Atlantic	Continental	Medtierranean
Farm size	Small	Medium	Medium-large
Extensification	Medium	Medium-high	High
Productive orientation	Cattle	Cattle	Cattle and pig

Geographical labelling in the case study areas

The Navarra's and Guadarrama's GPIs have been developed by the initiative of their respective regional governments, promoting the product at an institutional level. 705 farms are included in Navarra, representing 57 % of total farms in the region. In Guadarrama, 120 farms participate in the GPI representing 11 % of total farms in the area (Iraizoz, 2003).

Finally, the geographical label in the Valley of Pedroches is not a GPI but a geographical private brand promoted by 'COVAP' co-operative with 210 members involved. COVAP is a leader co-operative operating in the beef, pork and dairy sectors whose experience and commercial fame has allowed the impulse of the brand as a quality label protected by the regional Government. In his case, public impulse is reduced to the authorisation to use a label officially recognised, while promotion and obviously commercialisation fall only on the co-operative owner of the brand. The members of the co-operative are breeding farmers supplying calves to be fed at the co-operative's feedlots. Price negotiations between farmers and co-operative are one of the key factors under this scheme.

The main marketing channel in this case is the processing sector, but in recent years COVAP has contacted some local supermarkets as an alternative channel. To use these alternative and more direct channels, the co-operative needs to increase production by building additional feedlots.

Table 2 below shows main requirements of the three geographical labels studied. The main differences observed is the requirement of calves' origin. Navarra and Madrid impose that calves must be born in the same region. This constitutes an important obstacle for the integration of feeding farms. As it can see there are no special controls in the production process along the three cases. The private brand imposes some condition in the payment of products and the exclusivity of sales.

Table 2: Main requirements of the three labels analysed

Requirement	IGP "Ternera de Guadarrama"	Quality Brand "Valle de los Pedroches"	IGP "Ternera de la Sierra de Guadarrama"
Age of the animals	Yes	Yes	Yes
Weight of the animals	Yes	Yes	Yes
Natural feed	Yes	Yes	Yes
Authoctonous origin of the calf	Yes	No	Yes
Control of the production process	No	No	No
Payment condition: price and time	No	Yes	No
Need of investment	No	No	No
Exclusivity agreement	No	Yes	No

Navarra and Sierra of Guadarrama could be considered quite close models. Both cases are located in urban populated regions where the maintenance of livestock farming is considered strategic for the preservation of rural communities and environment. Atomisation and low profitability make extremely difficult for farms in these areas to promote mechanisms to increase added value from livestock activities. The institutional response from public agencies has been the promotion of geographical labels under the figure of GPIs.

However, the development of the GPIs differs among both cases. Associative is well rooted in Navarra where a great part of cattle farmers are members of a co-operative. The existence of the co-operative allows supply concentration and better marketing, improving producers position along the marketing chains. Since the existence of the GPI reinforce these advantages, the own co-operative has also promoted it collaborating with the regional Government. Thus, farmers integration into the GPI, with the subsequent improvement in their position along marketing channels, has been facilitated by the double promotional functions developed by the regional Government and the co-operative.

In opposition, there is not an 'associative spirit' among Guadarrama farmers thus information to farmers about the GPI must be developed alone by the regional Administration, mainly through the work of the rural agricultural offices. As a result, farmers integration in the GPI varies along the potential area depending of factor such as the kind of farms and the own impulse given to the GPI promotion by each territorial office. Integration must be so qualified as more spontaneous than in the case of Navarra deriving in some troubles to adjust supply (breeding farms) and demand of calves (breeding & feeding and feeding farms).

Additionally, the horizontal integration through a co-operative explains also some of the marketing differences among Navarra and Madrid. Navarra must be considered better integrated into marketing channels. Thus, the presence of the mentioned co-operative in the Navarra GPI, does not only undertake promotional tasks but also participates actively in marketing duties, negotiating with supermarkets and other retailers chains. This situation allows farmers integrated in the GPI to receive higher prices for their products.

In the case of Guadarrama, marketing is still an individual and atomised activity. Each farmer must assume this task usually conducing to local sales to butchers located in rural areas. Due to atomisation only the larger feeding farms (most of them out of the GPI) can supply to supermarkets. Consequently, Guadarrama must be considered standing some step below Navarra in the process aimed to insert extensive systems into modern marketing channels.

Logit models results

Quantitative comparative analyses of the three case studies have been developed using Logit models. In this case, the Logit models analyse the influence of qualitative and quantitative variables in the decision of participating or not into the geographical labels. The models allow establishing relations between specific characteristics of farms and their probability to be integrated into the labelling schemes.

Models have been developed from 229 questionnaires to farmers. 73 questionnaires correspond to Navarra, 58 from farmers participating in the GPI and 15 from not participating farmers. 102 questionnaires were carried out in Madrid (55 participating and 47 not) and the rest 54 correspond to the Valley of Pedroches (25 participating and 29 not).

Variables selected in each case study can be classified as farmer's variables (age, studies, dedication succession), farm's variables (size, type) and marketing management's variables (buyers, attitude towards prices, investments, etc.). Table 3 shows the explanatory variables used in the models.

Table 3: Summary of explanatory variables used in the Logit models

Farmer's variables

- **Age:** Continuous variable expressing farmer's age.
- **Training:** 1: no studies or primary studies; 2: second or high studies.
- **Dedication:** 1 full time; 2: partial time.
- **Succession :** 1: succession in the farm is guaranteed , 0: not

Farm's variables

- **Type:** 1: breeding & feeding; 0: breeding or feeding
- **Size:** Continuous variable expressing number of cows.
- **Density:** Continuous variable (livestock units/acreage)
- **Area:** 1: near to the area of GPI influence, 0: not near to the area of IGP influence.
- **Hired land:** 1: yes 0: no.

Marketing management's variables

- **Prices**: 1: preference for a good price, 2: preference for sure prince.
- **Sales**: 1: preference for assuring sales by exclusivity agreement 2: preference for diversifying sales.
- **Quality:** 1: perceiving the quality as a mean of protection against market crisis , 2: perceiving the quality as guarantee to consumers .
- **Investment** : 0: no one , 1: < 6000 €, 2: 6-18000 €, 3: 18-30000 €, 4: > 30000 €
- **Financial** : 1: by own resources , 2: borrowed
- **Marketing**: 1: sale to the great distribution channels, 2: sale to butcher, 3: sale to a co-operative, 4: sale to dealer, 5: sale to slaughterhouses, 6: sale to feed farms.

Table 4 summarises models' results, indicating the signification rate for each of the explanatory variables. Percentage of correct predictions of the models range from 77% to 89% suggesting good models fit.

Table 4: Signification rate for each of the explanatory variables for three IGP considered. (t-value in parethesis)

C.F. De Navarra "Ternera de Navarra"		**Valle de Los Pedroches "Covap**		**Sierra de Guadarrama "Ternera de La Sierra de Guadarrama"**	
Age	-0.0719 (-1.0545)	Age	0.0366 (0.8179)	Age	0.0221 (0.2506)
Training	-0.5125 (-0.3673)	Training	-0.5803* (-1.2247)	Training	0.6987* (1.3289)
Dedication	2.5769** (2.1710)	Dedication	0.2542 (0.2759)	Dedication	-0.1142 (0.1350)
Succession	3.7444** (2.3378)	Succession	-1.5654* (1.2127)	Succession	-0.2832 (-0.4960)
Type	2.6750** (2.0400)	Type	-1.5822*** (-1.9926)	Type	0.5275* (1.0632)
Size	2.5990*** (2.5135)	Size	-0.0057 (0.3403)	Size	0.0084** (1.6631)
Price	0.34961 (0.39224)	Price	-0.6924 (-0.5770)	Price	2.1770*** (2.2777)
Sales	-0.60506 (-0.6078)	Sales	0.5863 (0.6036)	Sales	-1.0977* (-1.4438)
Quality	0.8652 (1.5171)*	Quality	0.6869 (0.6738)	Quality	-0.3719 (-0.5125)
Investment	-0.1813 (-0.3760)	Investment	-0.0946 (-0.2199)	Investment	-0.0586 (-0.2192)
Financial	-0.0114 (-0.1283)	Financial	0.8156 (0.8347)	Financial	0.4402 (0.3816)
Marketing	-1.2342*** (-2.5004)	Marketing	0.2030 (0.5955)	Marketing	1.2294* (1.3872)
		Hired Land	1.9596** (1.5660)	Density	-1.8465** (2.4126)
				Area	-2.6762*** (-4.3244)
% of right predictions	**89,04**	**% of right predictions**	**77.2**	**% of right predictions**	**82.6**

*,**,*** Significant at 10, 5 and 1% confidence level

Results from the Navarra's model show how the greater probability to participate in the GPI would correspond to larger farms selling their products to those commercial agents closer to consumers (butchers, supermarket, etc.). Additionally, breeding & feeding farms, partial-time farmers, guaranteed succession and perception of the label as a tool to give information to the consumer are also significant variables to explain farmers' integration in the GPI. According to these results it is possible to identify two kind of farms staying out of the differentiation mechanism: feeding farms and smaller farms. Feeding farms do not participate due to the scarce availability of calves for feeding, that should be born in Navarra to be allowed to participate in the GPI. In the case of smaller farms, they use to correspond to breeding farms, selling their calves to dealers or intensive feeding farms and without guaranteed succession. Most of these farms will probably disappear in the short and medium term, facilitating the increase of size and competitiveness of the remaining farms integrated in the GPI.

In the case of Sierra de Guadarrama, the probability of participation in the GPI is greater for breeding & feeding, large and low-density farms. Two additional variables must be highlighted: area and marketing. As it was commented before, farmers' integration into the Guadarrama GPI varies substantially among the territory covered by the instrument. As a consequence, the variable 'area' results very significant explaining how farms from the *Valle del Lozoya* and *Colmenar Viejo* areas would have greater tend to participate. Related to marketing, those farmers selling their products to commercial agents closer to consumers present also have a greater probability to participate in the GPI. Finally, farmer's education and attitude towards price risk would also contribute to explain participation.

For the Valley of Pedroches, farm and farmers characteristics are essential to explain participation in the label. The probability is greater for breeding farms, based on hired land and for training farmers. Those larger farms, devoted also to feed the calves stay out of the label, probably due to their own capacity to access markets.

In a comparative approach it is important to point the relevance of off-farm variables, both related to institutional but specially marketing issues to explain participation in geographical labelling systems. These variables would explain how farms with similar characteristics, located in areas such as Navarra and Madrid (not too different, as it was previously set out), would differ in their decisions of joining geographical labels. These off-farm variables would be closely connected with the role of regional Governments, the regional economic development level and the marketing trends in the region. On the contrary, the own development of each label and the mentioned external variables would affect decisively into their success and their effectiveness for reaching their final objective of integrating the extensive systems into marketing chains.

Conclussions

Extensive cattle systems have an important weight in Spain because of their social and environmental values. However, their structure and level of profitability are obstacles for their adaptation to new market trends. This situation requires instruments able to insert the farmer in this adaptation process and to add value and differentiate products. These instruments can be promoted by institutions or the own private sector by mean of quality labels based on the geographical origin of the product. Along this paper we have studied the role of these instruments through three case studies in Spain. From these case studies, three main conclusions must be pointed:

1. Mechanisms to insert farmers into modern marketing channels are not unique, even in the case of using a common figure such as a GPI. Indeed, some factors like the institutional framework or regional markets impose differences among mechanisms determining their final degree of success. Thus, two identical farms, with same characteristics can adopt different decisions in front of two different GPIs.

2. Participation rates in these instruments show their current role in the insertion of extensive farms into modern marketing channels. However, although accepting the importance of off-farm variables, models have shown also the existence of some kind of farms that remain out of these instruments. First, feeding farms due both to their problems to buy calves to feed within the territorial boundaries of each label and their usual direct access to markets. Second, smaller farms, a significant variable in Navarra and Guadarrama models, but not in Pedrches, probably due to the larger size of farms in this area. And third, those farms that sale their products to marketing agents (cattle dealers, intensive feeding farms) more distance from consumers, probably because they do not perceive the utility of these labels.
3. The existence of co-operatives or other market-oriented institutions in a geographical label, as it is the case of Navarra or Valley of Pedroches, contributes to its success. Their capacity to concentrate production and access marketing channels is an extra incentive for farmers to participate in the label. Indeed, the future of these labels is influenced significantly by their capacity to concentrate production in order to reach markets in a most favourable condition. In this sense, the Sierra of Guadarrama GPI would stay in a developing phase, requiring a higher level of internal structure of production to face future in better conditions.

Demand for each of the three labels also has a strong influence in their development. Navarra faces a demand formed by consumers that value majority the quality associated to the geographical origin of the product and accept a higher price. Furthermore, there exist a certain quantitative balance between production and demand.

In the case of Guadarrama, the GPI must face the major demand of the country. Paradoxically, this fact currently limits its potential of growth as far as promotional actions must be limited to avoid consumers unsatisfied. Moreover, GPI should access to supermarkets and other retailers chains to satisfy this large demand, something currently impossible under its restricted production. So, it seems necessary for the GPI to determine previously which are its production objectives in order to structure properly its marketing.

Finally, although the current demand for Valley of Pedroches' label is rather confined to the local production area, growth potential for this label is great because of the absence of restrictions imposed to the calves' origin. Indeed, without this restrictions imposed in the other two labels due to the own requirements of the figure of a GPI, the Pedroches quality brand could find potential participating farms in adjacent areas able to supply calves to be fed in the new feedlots that have been currently planned.

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Creating and Fixing Quality Relationships in the Organic Producer to Consumer Chain: From Madagascar to Germany

Cathy Rozel Farnworth*

Abstract

How can quality relationships with the world be conceptualised, created and captured? This is the question the author is in the process of exploring. The field of analysis is producer-consumer relationships in organic agriculture. It is argued in this paper that the human observer is free to create meaning in their world rather than have to search for purpose. This is fundamental. We are in the position to establish our own relationship to phenomena and, consequent upon this, to establish our ethical behaviour in the real world. This relationship is not restricted to the merely necessary, it goes much further. Human beings can determine their personal responsibility for the quality of that relationship. This is surely astonishing, for it endows us with huge power and creative potential.

The producer-consumer relationship in organic agriculture is impoverished. Although producers and consumers are linked by a physical organic product, potatoes for example, the broken-up nature of the production chain means that consumers and producers tend to inhabit different 'realities' with little knowledge of each others' lives and aspirations. This is all the more so when the material commodity chain spans continents. People in the chain lack physical presence for one another: they exist in the realm of ideas.

This paper presents research with organic smallholders and plantation workers in Madagascar, and with organic consumers in Germany. The aim is to see how rich pictures created through use of a quality of life toolkit with farmers can inform both social certification initiatives in organic agriculture, and social labels attached to organic produce.

How can quality relationships with the world be conceptualised, created and captured? This is the question the author is in the process of exploring. The field of analysis is producer-consumer relationships in organic agriculture. In part one of this paper the concept of a quality relationship with 'the world' is presented. In part two an overview of the study domains is given. These are (1) social certification in organic agriculture, (2) the development of a quality of life toolkit to capture well-being among smallholders and plantation workers, and (3) the development of a social label for organic produce. In part three some theoretical considerations pertaining to quality of life toolkits are introduced. The methods used to acquire data in Madagascar are outlined. Part four follows the same pattern for discussing social labels and the fiedlwork in Germany. In part five selected research findings from both study sites are presented. The conclusion brings these strands together .[1]

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1 The arguments presented here are discussed in greater depth in the author's doctoral thesis and other papers. Please contact Ms Farnworth if you would like more details.

Part One: The Concept of a Quality Relationship to the World

Human beings exist in an ever-creating world. Like our fellow creatures human beings are not simply made. They participate in a process of co-creation, in a perpetual interaction which makes the world different to what it was yesterday. It is increasingly accepted that non-human animals shape the world through building physical structures, through behaviour derived from instinct and also – for some species, a degree of formal reasoning and goal-orientated behaviour (see Gould and Gould, 1999, for evidence of this). However this paper proposes that human beings create in a specific and unique way, namely through actively seeking to develop and fix a qualitative relationship to the world.

It has been suggested that the *'Copernican revolution led to a denial of the view that the universe had been created for humans; humans no longer had unique status in the cosmos'* (Wye College/Open University, 1997). That is to say, they were disempowered. This is a rather disingenuous comment. When humans were dislodged from a pre-ordained place in the 'great chain of being' they were set free to make their world. This is very empowering. The 'sun-centred theory' (ibid.) not only enabled scientists from Galileo onwards to scramble free of religious stricture; it also led to the slow end of the idea of trying to decipher pre-determined purpose in the world[2].

When Descartes said, 'I think, therefore I am,' he meant that the only thing of which one can be sure is that 'I' exist (see Descartes 1970 for his exposition on doubt). He even argues, *'it may be a pious thought to believe that God made all things for us … it is yet by no means probable'* (Descartes, 1853: 111)[3]. Descartes' doubt helped lead to a later understanding that human beings (and all creatures) pattern the world continuously as they process signals from it in a manner significant to each organism. Unique among animals however, human beings have come to realise that they ascribe meaning to the world. The world is out there, but the truth is not. Maturana and Varala (1987, in Capra 1997) do not assert that 'nothing exists', but rather that 'no things exist' independent of the process of cognition – the map making itself brings forth the features of the territory. Since individual organisms within a species have a similar structure, they bring forth similar worlds. Maturana and Verala further argue that, by virtue of their abstract world of language and thought, humans can bring forth their worlds together.

The understanding that the human observer is free to create meaning in their world rather than have to search for purpose is fundamental. We are now in the position to establish our own relationship to phenomena and, consequent upon this, to establish our ethical behaviour in the real world. This relationship is not restricted to the merely necessary, it goes much further. Human beings can determine their personal responsibility for the quality of that relationship. This is surely astonishing, for it endows us with huge power and creative potential.

Part Two: Overview of the Study Domains - The Producer-Consumer Relationship in Organic Agriculture

Based upon the arguments above, the author makes four key assumptions:

1. We are able to think about the kind of relationship we want to have with the world.
2. This relationship can be ethical in character (as well as being aesthetic, for instance).

[2] Though creationists and a few other groupings still seek pre-determined purpose.

[3] The author is not suggesting that Descartes did not believe in God.

3. We can take responsibility for the effective working of that relationship.
4. We try to seek coherence between what we think about the world and how we act in the world.

The producer-consumer relationship in organic agriculture is impoverished. Although producers and consumers are linked by a physical organic product, potatoes for example, the broken-up nature of the production chain means that consumers and producers tend to inhabit different 'realities' with little knowledge of each others' lives and aspirations. This is all the more so when the material commodity chain spans continents. People in the chain lack physical presence for one another: they exist in the realm of ideas.

Farmers' markets in the North[4] are seeking to re-connect these two stakeholders in organic agriculture through shortening the production chain. However, enriching relationships between Northern consumers and Southern producers scarcely exist. Why does this matter? One reason is that northern consumers who want to translate their ethical views into effective purchasing action find their room for manoevre limited. The information flow from the producer is limited and mediated by other stakeholders in the food chain, rendering the platform upon which ethical decisions are made by the consumer shaky and open to question. Southern producers likewise tend to lack effective decision-making power with respect to market values, and often have little understanding of consumers. A finely-textured qualitative relationship cannot be created or thrive in these circumstances.

In order to develop an enriched understanding of the concept of quality relationships, the author decided to study - and help co-create to differing degrees - three initiatives to develop quality relationships and the structures necessary for their maintenance in the real world. These are:

1. Social certification in organic agriculture.
2. The development of a quality of life toolkit to develop and capture criteria for well-being among organic smallholders and plantation workers.
3. The development of a social label to enable organic consumers to reward 'more than purely price' values in the marketplace.

Clearly each of these initiatives, or domains, is wrought with tension and contradiction – they are not neat packages but rather bubbling cauldrons of contested meanings and unequal power relations. The first aim of the study was therefore to unpack each initiative and, by thinking through some of the key issues, contribute to a clarification of the debates in each domain.

Domain 1: *'Social certification in organic agriculture'*, existed prior to the author's study. A number of actors, including the Soil Association (the leading organic certifier in the UK) and IFOAM (International Federation of Organic Agriculture Movements) have recently started examining how to certify the production chain not only for its organic properties, but also for its contribution to producer well-being. The author suggests, on the basis of her study, that important aspects of producer well-being are not being captured by current initiatives.

For Domain 2: *'The development of a quality of life toolkit to develop and capture criteria for well-being among organic smallholders and plantation workers'*, the author developed and piloted a quality of life toolkit in Madagascar. The first objective was to assess the toolkit's ability to assess producer well-

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4 Here the terms South and North refer to entities elsewhere defined as developing and developed countries, third and first world or majority and minority world. The choice of the terms South/North seeks to avoid notions of superiority and inferiority, being more conceptual than geographical in nature. They remain problematic however, for instance rendering invisible substantial numbers of indigenous peoples in areas like Australia, always defined as North. The history of the South has been very different to that of the North, this is why it is preferable to analyse the two seperately.

being, thus providing a new method for social certification in organic agriculture. The second objective was to contribute to improved producer-consumer relationships through providing information for social labels. The toolkit was developed and tested in Madagascar with organic smallholders and plantation workers.

With respect to Domain 3: *'The development of a social label to enable organic consumers to reward 'more than purely price' values in the marketplace'*, the author developed the concept of a social label. This is a 'fair trade plus' label. A social label would move beyond the levy of financial premiums on Southern products in order to support community projects - the norm in fair trade. Instead (or in addition) attention would be paid to other values and aspirations producers hold, the aim being to ensure that these are supported, rather than eroded, through production for the Northern market. An important feature of the label would be its ability to acknowledge and build upon the ethical values held by the consumer. Indeed, a central selling point of such a label would be its dynamic character. It should evolve as quality of life aspirations among organic producers and consumers change. An iterative learning process would need to set up between producers and consumers to achieve the goal of a true social label. Research was carried out with organic consumers in Germany in order to assess their potential receptiveness to such a project.

The domains can be brought together in a practical manner through taking the findings and ideas from the Malagasy quality of life index into on-going debates in domains one and three. Questions such as the following arise:

- Does involvement in producing certified organic goods for export bring about positive change in the lives of both men <u>and</u> women producers in Madagascar? How can we know this?
- Can, and should, social certification standards be shaped in part by producer values? That is, can the development of standards play a role in enabling producers to create the world they want?
- Should social certification have a remit to contribute to 'development', in the sense of leading to growth (however defined) in the community? Or should it be simply about measuring adherence to particular standards?
- How can German consumers connect and engage with the lives of producers in meaningful ways?
- Can, and should, social labels be shaped in part by producer values?

The domains can also be examined at one remove. This involves examining some of the issues raised through the applied thinking just discussed by asking further questions:

- Is it possible to create new relationships along the producer-consumer value chain?
- What are the pre-conditions for the forging of successful quality relationships along the producer-consumer chain in organic agriculture?
- What difference might the emergent properties/ higher values arising in such relationships make to the three initiatives?
- Fundamentally: who is the system for?

These questions informed and orientated the author's fieldwork studies in Germany and Madagascar. They cannot be answered in the space of this paper, but should be kept in mind when reading the following sections on (1) how to capture indicators of a good quality of life among organic smallholders and plantation workers, and (2) how to enable the consumer to act in accordance with their ethical beliefs in the marketplace.

Part Three: The development of a quality of life toolkit to develop and capture criteria for well-being among organic smallholders and plantation workers

This section is divided into three sections. Section A demonstrates that there is a lack of agreement on how to understand and measure quality of life. Section B presents some principles which can help inform a quality of life toolkit, and against which it may be judged. Section C presents the Malagasy quality of life toolkit.

Section A: Understanding and Measuring Quality of Life

Over the years there have been many attempts, including measuring gross domestic product, devising genuine progress indicators, a women's empowerment measure, and the human development index (see Neumayer, 2000; Kabeer, 2000; Hamilton, 1999; Murray, 1991 for comments). Work has also been done at the micro-level. Nazarea et al. (1998) aimed to correct the biases, as they saw it, of most mainstream development projects in the Philippines by measuring the target population's internally defined standards, many of which turned out to be qualitative, nonmonetary, nonmaterial, and long-term. Gender, age and ethnicity of the respondents significantly structured the responses.

Eckermann (2000), in a study of the Australian health sector, discusses the seemingly puzzling discrepancies between objective conditions of well-being and subjective perceptions. Eating disorders, high rates of suicide, and drug abuse among people having all the objective conditions necessary for 'good health" point to the reality of people feeling deeply unhappy with the way the world is organized. She concludes that quality of life indicators need to reflect people's lived experience more accurately, which can only be achieved by abandoning universalistic assumptions. These and other studies (see Richmond et al., 2000; Ahluwalia, 1997; Farlinger, 1996; Shepherd, 1995) demonstrate that subjective perceptions of well-being sometimes have little to do with the provision of 'objective" conditions of well-being.

However there are two frameworks, the functionings framework devised by Sen (1985 in Saith and Harriss-White, 1998) and the capabilities framework devised by Nussbaum (2000) that plead the need to assess basic levels of functioning and capability according to indicators everyone may agree are valid, below which truly human living is not possible. The functionings framework argues that it is not possession of a commodity or the utility it provides that is a proxy for well-being, but rather what the person actually succeeds in doing with that commodity and its characteristics. Saith and Harris-White (1998) use Sen's framework to discuss three basic functionings: being healthy, being nourished, and being educated. They assert that in developing countries, gender differentials may exist even at the level of such basic functionings. Their assumptions are first, that these three functionings are so elementary as to be necessary for well-being, and second, that a differential in any one of these functionings will result in a differential in well-being.

Nussbaum's (2000) capabilities framework promotes a cross-cultural normative account of human capabilities. This approach asserts that there should be basic constitutional principles respected and implemented by all governments. Such principles should focus on human capabilities, that is, what people are actually able to do and to be. These principles are informed by an intuitive idea of a life that is worthy of the dignity of a human being.

Acknowledging the validity of all these insights made by researchers seeking to understand and measure well-being suggests that a quality of life index capable of eliciting subjective perceptions and also levels of basic functioning and capability through the use of objective indicators could be very powerful.

Section B: Principles for a Quality of Life Toolkit

The author has devised, on the basis of the material above and wider reading on quality of life, nine principles for forming a quality of life toolkit. They are presented here. The principles are interlinked and aim to be mutually supportive. The numbering does not indicate the priority of any principle. The aim is rather to create a flow of logic between each one.

1. Quality of life research means thinking about real lives

In the morass of theory it is easy to forget, sometimes, that we are talking about real people living real lives. Thus the endeavour to measure quality of life is not just about objective indicators such as the state of housing. It is also about appreciating human emotions like hope and aspiration, poverty and desperation, anger and pleasure.

2. Assessing quality of life is an ethical issue

Des Jardins says (2001: 18) *'One of the first and most serious challenges in any study of ethics involves identifying an issue as an ethical issue. We all need to practice this stepping back in order to recognise ethical issues in our everyday experience.'* Kavka (1978) presents two fundamental ethical guidelines against which, the author argues, assessments of quality of life must be made:

- There cannot be degrees of membership in the human moral community
- Substantive concepts of the good life need not be shared.

There is plenty of evidence to suggest that these guidelines are frequently flouted in the real world. For one reason or another, particular categories of people suffer severe disadvantage. Reseacher ignorance of these two principles, whether conscious or not, can compound such disadvantage. This is why it is imperative therefore to 'step back' and recognise everyday issues as ethical issues. Ballet et al. (2003) take this view to a logical conclusion, saying that actors connected in one way or another to poor people are placed under an <u>ethical obligation</u> not only not to harm, but also to enhance the effectiveness of the poor's capability sets.

Recognising quality of life as an ethical issue takes us closer to understanding what is necessary for people to achieve their 'maximum selves' (Ho, 2000). Ho's concept of maximum selves shares ground both with Kavka's (1978) injunction that there cannot be degrees of membership in the human moral community, and with Sen's (1990 in Clark 2002) insistence that people be viewed as ends in themselves. The ethical concept of intrinsic value is embodied in these three approaches. A person's gender, among other markers, can affect the likelihood that he or she is seen as a bearer of intrinsic value.

3. People's subjective understanding of their life-worlds is important

There are a number of difficulties with actually capturing the way in which people subjectively experience their 'life-worlds.' However it is nonetheless necessary to recognise that people experience their particular situations in myriad forms, and from this basis aspire to different goals. This insight should be built into the research project. The aim is not to correlate provision of certain material conditions with satisfaction with those conditions, but rather to gain a <u>rich picture</u> of what actually matters to people. We are speaking fundamentally about trying to understand how people create 'quality relationships to the world', and the ingredients necessary for this endeavour. Blindness to that '*flash of revelation at what we are from the inside out'* (Firouz 2002: 288) will lead to a profound disconnection between internal and external appraisals of the same situation. Indeed such disconnection could lead to unwitting removal by policy makers of the conditions necessary for a subjective sense of well-being to thrive.[5]

[5] This has tremendous implications for social certification and social labelling initiatives, among others.

It is possible to establish some degree of correlation between markers such as gender (others include race, disability etc.) and how people experience their world. At the same time acceptance of 'puzzle' and 'strangeness' is vital. It is not possible to fully know *'the unique random blend'*[6] of other human beings. Furthermore, acknowledge of the fact that many values are incommensurable is crucial.

4. All indicators are proxies

Indicators are signs trying to signify something. There will be always be a gap between 'what is', and what we think 'is'. The aim of research can only be to seek a reasonable approximation.

5. The naturalistic fallacy must be avoided

Ethics is concerned about how we should live, how we should act and the kind of persons we should be (Des Jardins, 2001: 132). We need to acknowledge that although quality of life is fundamentally concerned with ethics, we have to be particularly concerned about committing the naturalistic fallacy, that is reasoning from facts (what is) to values (what ought to be). Descriptions of the world do not commit one to particular conclusions about how the world should be. It is also possible to commit another kind of error, based on an inability to recognise that substantive concepts of the good life might not be shared, namely reasoning from value to fact. In combination, these two errors set up a self-reinforcing feedback loop admitting of no new knowledge.

6. The concept of agency and meaningful choice is critical

The ability to shape one's world depends on the ability to make meaningful choices and thus to move forward. Developing new preferences depends on a person being able to imagine and experience alternatives. It is here that the concept of agency arises. Agency, it has to be pointed out, does not only have an explicit functional character. It is also about disruptive, boundary-skipping, elusive, hard to capture behaviour.

7. Quality of life is not only a state of persons, it is a process

An understanding quality of life as a process is crucial to any robust concept of quality of life. As Ho (2000) suggests, people are not themselves coherently bounded entities. Naess (1973) argues for an appreciation of human embeddedness in the world, the idea that relationships constitute who we are.[7] The author adds that one can conceptualise people as being in a state of flow. They are in dynamic interaction with their world, which is itself ever changing. A consequence of this perception is that concepts of what constitutes 'the good life' will likewise be in a state of flux.

The concept of process is of course ineluctably bound up with the concept of time. Inter-generational and intra-generational processes need to be considered. Other time processes relate to seasonality and the pattern of daily activities. Understanding how time is conceptualised in a particular place enables a better insight into how concepts of the good life are transmitted, and also how to break poverty cycles through strengthening the capability sets of poor people.

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6 Quote from a poem 'Ambulances' by Larkin, P. (in Jones, ed. 1999: 134)

7 Naess (1973) bases his ideas in part upon *gestalt* theory. He insists upon 'rejection of the man-in-environment image in favour of the relational, total field image. Organisms as knots in the biospherical net or field of intrinsic relations. An instrinsic relation between two things A and B is such that the relation belongs to the definitions or basic constituents of A and B, so that without the relation, A and B are no longer the same things.'

8. The material conditions of existence form an important platform for a good quality of life

The functionings and capabilities framework, and the so-called Scandinavian approach (see Rapley 2003), both overtly proclaim the necessity of providing certain material conditions in order to allow people to achieve basic functionings (such as being healthy, being nourished and being educated). Enabling 'people to live really humanely' (to have) is a prerequisite for them 'to be' and 'to do'. The necessity of a reasonable standard of life is also acknowledged in the American tradition (ibid.). This tradition emphasises the importance of subjective appraisals of well-being.

9. Bounded thinking is of limited value

Quality of life is a multi-dimensional concept which can be analysed across a series of subjective and objective domains. Correlations between subjective and objective axes may or may not be sought. Yet category-based models run the risk of binding and limiting what we understand. Perhaps, and also, they bear little relation to the ways that real world people actually think and behave. The researcher runs the risk therefore of 'making sense' of complex information by slotting it into a particular category whilst at the same time snipping away at the links which give this information meaning. The researcher therefore needs to pay attention to the effectiveness of category thinking and to consider whether, and when, it might be useful to blur the boundedness of the concepts he or she is using.

Section C: The Malagasy Quality of Life Toolkit

Although the theoretical considerations might be complex, the tools selected for the fieldwork in Madagascar had to be simple to use. This is because the quality of life toolkit has to be flexible enough to be used anywhere, specific enough to produce unique meaning in a particular situation, and yet universal enough for the results to be understood and operationalised by other stakeholders. The toolbox did not seek to produce 'objective data' on the respondents' quality of life, by directly measuring the health status or checking the educational qualifications of the respondents for example. Rather, the aim was to capture the respondents' perceptions of their quality of life, in other words to gain some kind of insight into their lived and experienced world.

A sampling frame was designed with the objective of canvassing opinion from different groups (by wealth) in each community. Permission to move around the community was sought from the village head – the *Tangalemena*. The meetings with the Tangalemena were crucial in establishing rapport and gaining first insights into the constraints facing each community, critical locally-relevant quality of life components, and beyond this the aspirations of village members. The author chose to weight the Malagasy toolkit with widely-used participatory methods such as transects, participatory maps, seasonal calendars, daily activity diagrams, historical calendars and the like. An access and control profile was also elicited (see Pretty et al 1995; Mikkelsen 1995; Chambers 1994, and Feldstein and Jiggins 1994 for examples and discussion of these and other participatory methods). The methods chosen aimed to elicit spatial and temporal data, the thought being that quite simple, easy to use tools could create a complex picture if used flexibly and imaginatively.

It should be noted that the methods to be used in a particular situation were not decided upon in advance. Rather, extensive discussion with smallholders and plantation workers took place in the first instance. Such open-ended discussions provided a clear picture of the main concerns of the respondents – in other words, themes were permitted to emerge. In order to understand these themes further, specific participatory methods were then selected to enable 'fit' between the theme and method. Furthermore, methods were adapted *in situ*. For example a 'well-being transect', not known to the author from the literature, was devised. This was not only spatial, but also temporal, in character because the well-being of ancestors and of children appeared important to the respondent population. Gender sensitivity was woven into all stages of the process. Women and men were usually interviewed separately by someone of the same gender. Data remained gender-disaggregated throughout.

In order to specifically allow surprising findings, new themes and fresh ideas to emerge thematic apperception tests (TAT) were also used. This was devised by Murray (1943 in Nazarea, 1998: 161). In its original form cards with ambiguous representations are presented to respondents. The respondent is asked to tell a story about each card and the account is recorded verbatim. The premise behind this is that informants identify with some of the figures. In the process of story telling the respondents reveal their own self-concepts and deep wishes. The TAT was chosen as it explicitly allows for complexity and emergence. It is worth noting that visual tools and story telling are especially valuable when working in other language cultures. In addition a simple camcorder was used with the plantation workers. The aim was to permit respondents to convey their sense of quality of life in their own words and images. The video itself was made after several days of discussion with the respondents on themes such as local conceptions of happiness and the constituents of well-being. Filming was done separately with men and women.

No quantitative work in Madagascar was undertaken by the author. However in order to study objective quality of life indicators, statistical reports on the research sites issued by the Ministère de l'Agriculture, statistics compiled by local health and education workers (Centre de Santé de Base; Collège d'Enseignement Général) and by local and international NGOs (for example the Fédération des Associations Femme et Développement and Développement Agro-ecologique Régional de USAID) were collected. Key informants from a range of professions were also interviewed. Triangulation of 'objective' and 'subjective' data was however not used as a way of achieving rigour – critiqued by Winchester (1999, in Crang, 2002: 252) as another attempt to seek empirical realist, objective generalisability. Rather, the purpose of seeking statistical data was to gain an understanding of objective indicators, to add to the rich texture of the data being produced from work in the field and to raise questions to be discussed with respondents. Triangulation of data also – and significantly – should not be permitted to allow closure by ironing out irregularities and dismissing puzzling data. Rather it should be taken as an opportunity to reflect upon what apparently incompatible data on one theme - acquired by use of different methods - might be telling us.

Part Four: The development of a social label to enable organic consumers to reward 'more than purely price' values in the marketplace

This section is divided into two sections. Section A presents a short theoretical overview of ethical consumption. Section B provides an overview of the research process.

Section A: Overview of Ethical Consumption

Social labelling is a means of providing consumers with information on the well-being of the producer by including these details as part of the packaging, or via other channels of communication such as the Internet. It is not quite the same as fair trade labelling, which is marketed to the consumer as a means of ensuring that a 'fair price' be paid to the producers for their goods. Although fair prices also form part of social labelling, 'more than purely price' values (i.e., nonfinancial and nonmarket) are given explicit weight in social labelling initiatives. Browne et al. (2000: 70) concur that fair trade labelling is not rich enough as a concept and suggest that ethical trading (with which social labelling may be aligned) embraces the idea of sustainable resource management as well as fair trade agreements and safe working conditions. Here is the conundrum: a social label must be simple to appeal to the consumer, yet behind it will lie a world of deep complexity. Its sole aim must be to enable consumers to act in line with their ethical reasoning. Yet to achieve this means establishing transparency all along the food chain, ensuring accountability, and most profoundly, providing the certainty that consumers, through their purchases, indeed are helping the producers create the world they seek – or, at least, not actively harming the producers' ability to do so.

It is already known that a substantial body of consumers take into account 'more than purely price' values when shopping. Browne et al. (ibid. 79) in their study of British consumers, distinguish between different tiers of ethical consumers. 'True' ethical consumers make up 2% of the population, and a further 20-30% are 'semi-ethical': they are willing to pay a modest premium but will not go out of their way to purchase ethically. However, it is estimated that 80% of the population is willing to be ethical if no price premium is involved and if no special effort is required to shop ethically.

Although the Browne study has gone some way towards disentangling the threads, to say that consumers have ethical concerns has undoubtedly become something of a lazy commonplace. Indeed, 'ethical' seems almost to have become synonymous with 'good', with other shoppers by implication 'bad'. It would seem vital, if we are to better understand the complex world within which all consumers make decisions, that we refine our understanding of the ethical frameworks consumers draw upon. These are most likely not coherently bounded frameworks, nor are they necessarily explicit to the consumer. However, *sense-making* in this muddled situation - disentangling the threads with consumers themselves - might help towards the development of a genuinely empowering social label: empowering in the sense that it will permit consumers to 'act in the real world' in line with the way they ethically perceive the world.

Consumers, as citizens, are influenced by a whole range of ethical frameworks, for example utilitarianism and rights.[8] Briefly expressed, utilitarianism considers that the right action in any one situation is the one that causes the most happiness, or at least minimal unhappiness, to those affected. Its proponents argue that utilitarianism enables individuals and their representatives to take moral decisions in a rational way. In this scenario, the consumer may be hoping to increase the happiness of, say, children in other countries through *not* purchasing particular makes of trainers, or, more positively, through buying a special brand of chocolate.

Rights theories view individuals as moral agents, with duties and obligations to others. By the same token, each person has expectations of what others may, and may not, do to them (or should/should not do for them). These constitute their rights. Thus one person's right is another person's duty. In this scenario, consumers may view themselves as moral agents with particular duties towards the rights bearers, i.e. the producers.

The lives of other consumers may be infused, for example, with Biblical injunction. Here each purchase symbolizes solidarity with other human beings seen to be of tremendous intrinsic worth. A further group may be seeking to counter global capitalism through selective purchasing from cooperatives, for example, and still another group may simply be interested in sharing the goodness of the world equally, not only among members of the present generation but also those yet to come.[9]

8 The definitions provided here are drawn from Wye College/Open University (1997).

9 Please refer to Kavka (1978) on ´The Futurity Problem' and Howarth´s (1992) thoughts on 'Intergenerational Justice and the Chain of Obligation'.

Ethical purchasing is thus about the practical application of considerations of how one should live and how one should treat others. It involves an examination by the consumer of whom they consider to form part of the ‘moral community’, and whether they are convinced that they can actively influence the well-being of members of that community.[10] Ethical purchasing also very much demonstrates the point that the ‘local is created’, and is not merely geographical in scope. Farmers´ markets or a social label are pertinent cases in point. The latter is indeed a particular expression of the belief that farmers in Mali are equally the neighbour of a consumer in Germany as the person living next door.

In the real world the patterning of these theories will be highly complex, and they are unlikely to be present in pure form. Rather, an intermingling will inform behavior. A useful image is that of various ethical standpoints converging to form a spotlight upon a particular issue.

Section B: The Research Process in Germany

A two step process was devised. During 2001 questionnaires were applied to almost three hundred organic consumers. The first version was piloted at the world’s largest organic trade fair, the Biofach (www.biofach.de), by Dr. Hiltrud Nieberg (Farnworth, 2003e). A revised version was applied in Berlin and Braunschweig by master’s student Lilja Otto (2002). This provided substantial data which not only had independent value but helped inform the second round of research.

Gender-balanced focus groups with organic and fair trade consumers were held in Hamburg in 2003. The questions themselves aimed to provoke lively and thoughtful discussion and thus needed to echo with participants’ lives. At the same time they had to fit within the ethical and systems thinking analytical frame planned by the author. Three sets of questions were asked under the following theoretical headings (1) Do organic and fair trade consumers have different ethics in action? (2) Is ethical consumption an effective way of bringing about the kind of change consumers want? And (3) What kind of relationship can be established between organic/fair trade consumers and farmers in the South?

Part Five: The Reseach Sites and Research Findings from Madagascar and Germany

Research commenced in 2001 with smallholder organic farmers in an isolated region near Brickaville on the east coast of **Madagascar**. They harvest plantation and wild-sown cinnamon for Phaelflor, a small private Malagasy-owned organic company exporting essential oils to the USA and Europe. First order distillation of the cinnamon oil takes place locally with further refinement in the capital Antananarivo. This endeavour is supported by the US Agency for International Development, since it is seen as a way of preserving important forest biodiversity by encouraging economic use of the buffer zone between the forest and farmland. Research continued with plantation workers at Plantation MonDésir (PMD), which is located close to urban centers and tourist resorts likewise on the east coast. PMD produces organic oils, spices and black pepper for use in European pharmaceutical and charcuterie industries.

The findings did not resolve themselves neatly into a clear pattern. However distinct - sometimes complementary, sometimes contradictory - themes emerged as fieldwork progressed. The author has identified the following clusters:

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[10] Readings on where to draw the line of the moral community, and who or what is ´morally considerable` (to be taken into account in its own right in ethical judgements) include Leopold (1949), Goodpaster (1978) and Elliot (1991).

- the ways in which the respondents sought to achieve security in the context of chronic insecurity (for instance through land ownership or the possession of cattle)
- respondents' interest in upward mobility (through running a business, for example)
- a sense of 'entitlement'among respondents (e.g., to basic literacy or affordable health care)
- affirmation of local values by respondents in a situation where such values are seen to be increasingly under attack due to a generally perceived worsening economic macro-climate and the promotion of entrepreneurial values by government and NGOs (respondents resist by promoting food self-sufficiency and rejecting wage labor in favor of personal independence, for example, even though this restricts cash income)
- methods the respondents used to manage the complexity of their lives. For example, both men and women plantation workers found their lives constrained by 'clock time' – *de rigeur* at the plantation. This seriously limited their ability to accommodate other polycyclic rhythms governing their existence: the agricultural year, pregnancy, festivals, cooking, and childcare. Research showed that they developed many strategies to manage the complexity of their world.

Land and zebu cattle were seen by all as playing a central role in the achievement of well-being by virtue of the economic stability and cultural recognition they conferred, yet neither was in reach of the plantation workers. The research demonstrated that other culturally specific concepts of well-being could be discerned, some of which were highly personalized in expression, others more clearly structured by variables such as age and gender[11]. For the Malagasy respondents, well-being clearly was neither a unitary concept nor an end-state. Rather, it is constantly being achieved, it is in a process of becoming. As the situation changes, so do the strategies aiming to define and achieve well-being. Though local concepts of well-being are in flux, they are closely aligned with the particular circumstances prevailing in the research areas. The cultural expression of well-being in the local Malagasy culture is intertwined with multiple influences coming from elsewhere.

The questionnaire-based research in **Germany** took place in 2001, parallel to the Malagasy work. The focus groups were held in 2003. Although sustained analysis has yet to be carried out, the findings from these studies can be tentatively clustered as follows:

- For both fair trade and organic participants a strongly holistic view of the world emerged. The interdependencies between animal, plant and human life were emphasised.
- With respect to responsibilities to future generations, concern about the state of the world was balanced by an equally firm faith in progress and the ability of future generations to ameliorate living conditions.
- Participants were ambivalent about their relationships to people in the South. On the one hand many rejected neo-colonialist attitudes and argued that people should choose their own development pathways. Equally if not more strongly, many participants felt that the North could help bring positive and necessary change to the South.
- It emerged that participants consistently associated fair trade labels with producer well-being, even if they purchased these products in supermarkets. Yet only those participants who purchased organic goods direct from the farmer considered producer well-being. This group were more likely to consider environmental issues, the use of pesticides and animal welfare than those who purchased organic goods in supermarkets. This latter group did not consider the person behind the product and tended to prioritise the health and flavour aspects of organic food.

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[11] For an extended presentation of the findings, see the two working papers by Farnworth et al. (2002 a, b). See also Farnworth's key paper for the Overseas Development Institute - AgREN email discussion on Globalisation and Pro-poor agricultural development in May 2002 (www.rimisp.cl/agren).

- When asked whether all food retailers should pre-select goods according to ethical criteria, opinion was divided. Many argued for consumer freedom of choice. Almost everyone made an automatic association between higher ethical standards and higher prices – which was seen as undesirable.
- On the other hand participants supported the idea of raising the bar by making higher standards across the European Union, and for goods entering the EU, compulsary. However scepticism was rampant as to whether this could be achieved.
- Participants felt that their age undoubtedly had a bearing on their decision to purchase organic and/or fair trade products. Some were doubtful though as to whether gender played a role. When gender was seen as significant, participants argued consistently that women were more conscious shoppers, given their caring and familial roles.
- When asked whether they would support Southern-based farmer initiatives that might clash with their own values, some participants said they undoubtedly would. Others however argued that a balance between consumer and producer values would be required.

The findings showed that participants were, in the main, thoughtful and concerned consumers who certainly considered ‘more than purely price’ values when shopping. Ethical purchasing was one way among several in which they expressly tried to contribute to a better world.[12] Two snaps in the holistic world views so clearly expressed in the opening round of discussion can be discerned. Firstly, participants tended to have highly ambivalent or highly politicised attitudes to people in the South. This was in many cases evidently due to a lack of founded knowledge about the lives of the people there and what they wanted. The second break relates to the shopping experience – supermarkets appear to render invisible the producer to consumer chain.

Conclusion

It is possible to employ a quality of life toolkit as part of social certification procedures in organic agricuture. The toolkit should aim to not only to record, but also to help bring into existence, local conceptions of well-being. The rich pictures thereby created will help ensure that the process, and the product, has meaning for the respondents. Social certification can thus contribute to a process whereby producers can move towards attaining the worlds they seek. At the same time, returning to the functionings and capabilities frameworks, it is important to assess levels of functioning. This may help ensure that the respondents can be objectively agreed to have a life ‘worthy of the dignity of a human being.’ In this way a powerful set of social standards in organic agriculture with meaning to stakeholders across the producer to consumer chain can be created.

If quality relationships are to be built between consumers and producers, consumers also need to have an awareness of the producers’ rich pictures and their aspirations. Such rich pictures can be provided by the quality of life toolkit. In this way consumers may be enabled to achieve more coherence between their ethical views and the translation of these in the real world. It would be essential to build in acceptance of flux and a level of complexity into these initiatives. Concepts of quality of life are not and cannot be static. An iterative learning process between producers and consumers is key.

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12 For an extended presentation of the focus group fndings, see Farnworth, CR. and Raabe, W. (2003c; 2003d). Otto (2002) presents and analyses the questionnaire data.

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Organic food initiatives and their transformative power on the conventional food system

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Introduction

Food production and consumption created tight bonds between people and nature, as well as among people, in Western Europe and USA well into the 20th century. The consumption of food depended largely on what was produced in diversified local ecosystems (Harris 1969). Social and ecological closeness, and the dominating role of agriculture were key characteristics of the food system, which includes production, processing, distribution, use, recycling and waste management (Dahlberg 1993). Local and regional solutions for production and consumption of food have now largely been replaced by a globalised structure where space has been disconnected from place (Kloppenburg et al. 1996). This is related to what has been called the first agricultural revolution (Bawden 1991), which took place when agriculture was industrialized with the advent and widespread adoption of chemical fertilizer and mechanisation, supported by science and technology. The process was characterized by a focus on optimization of biological and physical components on the farm, on productivity growth. However, the success of production has been overshadowed by its inadequacies from a broader perspective. One side effect was the loss of connections in food systems at the community level and the emergence of global corporations that dominate the food and agriculture systems, where time and space are disconnected. These systems are guided by an instrumental logic, dominating the life world. The gradual transformation of the life-world by the same systems logic that governs economical and political transactions is the significant transformation of Western society in the late 20th century (Hendrickson et al. 2001). Therefore the critical issue we are facing is resisting the commodification of our personal, private lives, and the search for alternatives where personalised food systems can emerge.

Organic farming and marketing at the local level represents a new course for agriculture described by Østergaard and Lieblein (1994) as a potential second substantial transition in agriculture and the wider food system

We were interested in understanding whether organic farming and its holistic foundation has *transformative powers* that extends into the whole food system. Studies have shown that organic farming tends to mimic the conventional food system, through commodification and consolidation (Hendrickson et al. 2001). But are there still spaces within organic farming that have resistance and potentials for developing new alternatives – where power is distributed and where respect is paid to the life world, where food origin becomes important?

Research questions

In order to investigate the transformative power of organic farming we draw on different theoretical bodies within social science such as the concept of social embeddedness (Granovetter 1985, Giddens 1991, Hinrichs 2000,) and the theory of conventions as it is discussed, developed and applied by Storper and Salais (1997), Murdoch et. al (2000) and Wilkinson (1997). As will be discussed further in the

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methodology section, studying changes in the food system means to explore the complex context of daily life, as seen from the different social actors. Social changes require joint actions, which imply that the actors involved share some common knowledge, motivations and values. According to the convention theory there are certain dominant conventions within a social system, that the actors involved must relate to. Following Wilkinson (1997) rules, norms and conventions determine the content and the form of the production and circulation of commodities. 'They are therefore dynamic representations of negotiation and as such depend on the existence of prior commonalities among the actors involved' (Wilkinson 1997,318). In our project we have asked the following research questions:

- To what extent do the actors involved in handling of organic food share some common conventions about food products and the food system?
- Under what circumstances do sustainable conventions about food 'rub off' and have significant influence on the 'conventional' food system?
- On the other hand, under what circumstances are sustainable conventions overlooked and subdued in their meeting with the 'conventional' food system?

Methodology – research frame work

Overall methodology

In order to grasp the manifold of the changes in food systems, we have chosen a case study design. According to Yin (1989) the essence of a case study is that it illuminates real life situations without being controlled by the researcher. In relation to both complexity and change in nature and complexity and change in society, it is important to grasp the diversity and richness of variation. Understanding the food system thus essentially implies understanding the people of this system as acting humans. This research perspective provides a shift of focus from merely describing the food system from the outside, to understanding the world in terms of people's *acting* in relation to the world (Østergaard 2003).

Following Flyvebjerg (1991) cases may be randomly or more strategically selected. In this project we have made a strategic choice of cases to get as much relevant information as possible. This implies that we have chosen case regions where we beforehand knew that there were ongoing organic food initiatives. The cases are selected from three different Norwegian regions (Hedmark, Østfold and Røros) and one region in Denmark (Sjælland). The regions differ in many important respects, such as the level of urbanisation, population size and density, the importance of agriculture, agricultural diversity and the presence of organic farming in the region (Table 1):

Table 1: Characteristics of the case regions

	Røros	**Hedmarken**	**Østfold**	**Sjælland**
Urbanisation / population	Low	Medium	Medium/high	High
Importance of agriculture	High	High	Low	High
Agricultural diversity	Low	High	Low	High
Organic farming	Low	Medium	Low	High

The three Norwegian regions are all situated in the South-eastern parts of Norway. While Røros is a mountain region, the other two are closer to the capital, Oslo. Sjælland is the island were the Danish capital Copenhagen is situated, thus it is a densely populated area as well as an important agricultural area. Within all regions we have identified special organic food initiative. However, in this paper we will focus specially on three initiatives that in different respects have been successful.

Selection of units within regions

A key element of the methodology is that we started with a food flow analysis, where we traced the products from the organic farms in the region and all the way throughout the food system, up to the retailers. We then both identified the units that dealt with the organic food and quantified the amount of organic food that was handled through different units. This approach was used to find the relevant actors in the regions of Hedmarken and Østfold. At Røros and Sjælland we identified units or actors that was involved in special regional organic food initiatives.

The double layer model

To every subsystem - from production to consumption – is connected people in real situations. In the subsystem production you will find producers with their knowledge, motivations, learning processes etc, and so you will find also in the other subsystems. Between the subsystems there are not only flow of food, goods or services, - we will find all sort of interacting and interrelating which are connected to innovation, knowledge and learning processes. Acting together implies sharing some common knowledge and values. In order to conceptually grasp the totality of the food systems, we describe the food system In terms of a double layer model (figure 1). The lower food flow system is continually pervaded by the values and knowledge of the people dealing with the food. And vice versa; the motivations and knowledge of the persons Involved In the food system is Influenced by and developed in relation to their actual handling and dealing with the food in the food chain.

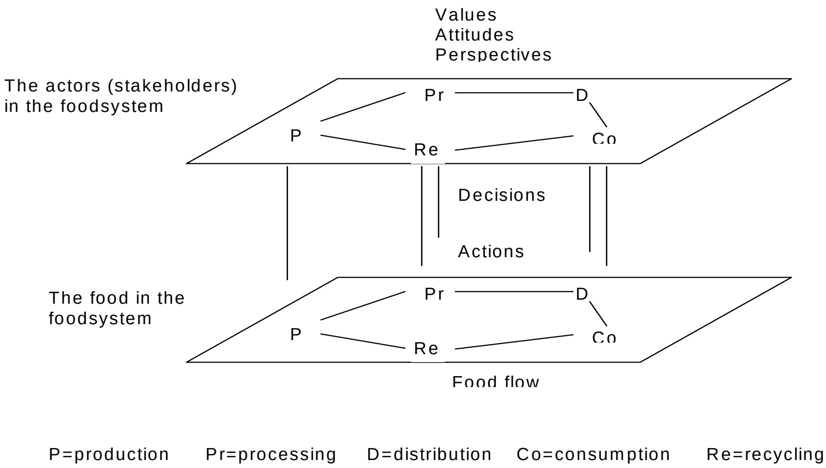

Figure 1: The food system as a double layer consisting of the food flow (lower layer) and a actors layer concerning values, knowledge, information flow etc.

The investigation starts by describing the actual food flow and the role of each actor. There are two reasons for this: Firstly, the food in the food chain is common for all of the participants. They participate in the same system through coordinating the flow of goods. Secondly, this approach provides us a point of departure in the persons` actual dealing with food, not their *thinking* about the food. This is in accordance with research strategies in anthropology and phenomenology where the perspective of people's participating and acting in the world is stressed. As expressed by to the French phenomenologist Merleau-Ponty, our relation to the world is primary a doing, not a knowing relation. Our consciousness and our ability to think are based on our already being and acting in the world: "Consciousness is in the first place not a matter of ´I think´ but of ´I can´" (Merleau-Ponty 1945/1962: 137).

Methods for data collection

We selected interviewes among key actors from different sectors of the food system, such as farmers, processors, distributors and retailers. The interviewees represented either a local, regional or national level of the system. All together we made 27 interviews including 29 people (at some interviews there were two people present). The interviews took place in the period June 2000 – March 2002 (Table 2):

Table 2: Number of persons and interviews within each region

Region	Persons	Interviews
Røros	10	9
Hedmarken	9	9
Østfold	6	4
Sjælland	1	2
National actors	3	3

By following the product from the farm and by interviewing representatives for actors within all steps of the local food chain, we have been able to make an analysis of relations both between the different actors and their relations to the organic and local products. This has given us a picture of the different actors role in the food system and the possibilities to develop local distribution systems for organic food.

Methods for data analysis

All interviews were taped and transcribed verbatim. The interview texts were then analysed with the help of the soft ware programme ATLASti 4.1. In the analysis of the interviews we used the central concepts of the convention theory, as it is formulated by Murdoch et. al (2000) and Wilkinson (1997). The concepts of the convention theory have functioned as a tool to explore the interviewees' practices within the food system and their perceptions of the food products and the food system. Each interview was coded according to concepts of the convention theory as presented in the table below (Table 3):

Table 3: Coding of the interview texts

Conventions	Emphasised qualities
Sustainable	
- domestic	- inter-personality - transparency - traditions - craft & craftsmanship - taste
- civic	- local employment - local environment / activity
- ecological	- organic farming - short transport distances - resource efficiency - health
Conventional	
- commercial	- price - visual appearance / colour, freshness - date stamping
- industrial	- industrial standards - logistics
- public	- branding - trademarks

Murdoch et. al (2000) have identified six conventions that applies with different 'worlds' or systems of production. In our case these conventions may apply with our two ideal types of food systems. In the table we identify two sets of conventions, which we have labelled 'sustainable' and 'conventional'. The sustainable set of conventions contain the domestic, civic and ecological convention. We anticipate that actors within a 'sustainable food system' would emphasise qualities such as: environmentally sound farming- and distribution practices (ecological conventions), general societal benefits from production and distribution of food (civic conventions) and local food, traditions and inter-personality between the different actors (domestic conventions). On the other hand actors or players within the 'conventional' food system would emphasise qualities such as effective logistics and industrial standards (industrial convention), price, freshness and colour of products (commercial conventions) and the development of socially disembedded information systems such as branding and trademarks (public conventions).

Case descriptions

Below we will present three cases where we found that sustainable conventions had a significant impact in the local food system. These cases include distribution of local, organic dairy products in the Røros region in Norway, a small-scale organic milk initiative at Sjælland in Denmark and finally an initiative for local processing and distribution of organic meat at Hedmark, Norway.

Røros

Røros is an old mining Town in a mountain region of the eastern parts of southern Norway. The agricultural food products stem mainly from animal husbandry, such as dairy products, eggs and a range of meat products from cattle, sheep, reindeer and game. We find local processing of milk at Røros Dairy and local slaughtering and processing of reindeers at Stensaas Reinsdyrsslakteri (Stensaas Reindeer Slaughterhouse), as well as other meat products at Røros Slakteri (Røros Slaughterhouse). Some egg producers are also distributing their eggs locally. In addition, we have several other small scale producers of local and traditional food products in the region. The local organic producers are organised in a regional branch of the national organic association (OIKOS). These farmers played a key role in the establishment of distribution of local and organic food in the region. An especial important task has been the establishment of local processing of organic milk at the Røros Dairy.

It was the organic farmers that back in the early 1990ties launched the idea of processing a local organic dairy product at the Røros Dairy. They wanted this to be a local product that could be distinguished from the organic milk, "Dalsgården", that was launched on a national basis in 1995 by the Norwegian milk farmers co-operative (TINE). The organic producers at Røros wanted to produce 'Tjukkmjølk' ("Thick milk"), which is a traditional, local curdled milk/yoghurt variety. This is a typical product traditionally consumed in the summertime at the mountain farms.

After the conversion and launching of 'Tjukkmjølk' in the local market, TINE was still not very enthusiastic, and felt this organic drive more as a duty than as an interesting marketing project. And when the economic subsidies went to an end, a new crisis emerged at the dairy. Some in the TINE system saw this as an opportunity to close down the dairy, however the organic milk farmers, well supported by other local key players and local interests (as well as a local consumer demand), started to lobby for continues production of organic milk at Røros. The local retailers protested against a closing down of the local dairy. They feared loss in sales and poorer service to their customers (Flø et. al 2000). Even the Minister of Agriculture was contacted by the local stakeholders, and eventually there was found a solution which resulted in that Røros Dairy could continue to produce the ‘Tjukkmjølk’ as well as organic light skimmed milk “on license” for TINE. In addition they were free to produce other old and new local dairy varieties. Today the dairy ha five different local and traditional dairy products.

Sjælland

The dairy at Øllingegaard was established in 1995 on the grounds of a common agreement with the retail chain; ‘ISO Supermarked’. The dairy is situated on a former organic milk farm on Sjælland (not far from Copenhagen). Initially the idea was to process and market organic milk from the Øllingegaard farm and other organic farmers in the region. Today the milk production on the farm is closed down, however, the dairy production has expanded and is now based on deliveries from nine local organic producers. The dairy take care of all the steps from transportation and processing of the milk to the distribution of products to the customers. Besides the distribution through ‘ISO Supermarket’ and other retail stores, Øllingegaard deliver dairy products to catering businesses such as kindergartens, schools, cafés and restaurants. There are about 30 different dairy products in the assortment including milk, cream, yoghurt, butter, crème fraiche and chocolate milk.

Hedmarken

At Hedmarken there have been different initiatives to organise local distribution of organic food, including vegetables (mainly through farm outlets), milk (a local dairy which however now is closed down) and meat. In this paper we will focus on the meat initiative. At Hedmarken there exists a local butcher, complete with a small scale slaughterhouse. In 1999 almost as much of the organic meat produced within the region (the municipalities of Stange, Hamar and Løten) was distributed through this local butcher as through the regional, conventional meat distributor, HedOpp. HedOpp belong to the national meat producer cooperative, Norsk Kjøtt (Norwegian Meat). Local organic farmers work closely together with the butcher to strengthen this initiative. Local slaughtering opens up different opportunities regarding sales channels for organic meat. Most of the meat is sold through the butchers’ own outlet, but farmers also have experiences with selling meat directly to restaurants, mainly in the Oslo region.

Results and discussion

In the following we like to discuss three important preliminary findings from our field research that can tell us more about the transformative powers of organic food initiatives:

a) Organic food initiatives are important for the *local distribution* of *organic food*
b) However, organic food initiatives are still small on a regional and national scale, and play a minor part regarding *the volume* of the overall food distribution
c) On the other hand organic food initiatives *challenge* the dominant food distribution systems, regarding *future conventions* about how food are being distributed and what qualities that are emphasised among the actors involved

Organic food initiatives’ importance for local distribution of organic food

By tracing the organic food flow from the farm gate to the food outlet we have been able to measure the importance of local distribution of organic food. In the Hedemarken region we found that in 1999 just 6

% of the organic milk and 18 % of the organic vegetables were distributed locally. However, almost 60% of the local organic meat production was distributed locally, mainly due to the special local meat initiative (Rålm 2000). Although not measured, we believe that the initiatives at Røros and Sjælland are of similar importance for the local distribution of organic food. Seen in this light, it is interesting to investigate further the conditions for local food initiatives and what are important constituencies of these initiatives compared to the conventional food system.

The volume of organic food distribution

Organic food production is small compared to the overall agricultural production both in Norway and Denmark. However, the production is considerably higher in Denmark than in Norway (Hamm et. al. 2002) (Table 4):

Table 4: Organic production as a % of total production 2000

	Area	Milk	Beef	Potatoes	Vegs.
Norway	6,2	0,8	0,2	0,6	1,0
Denmark	1,9	9,4	2,9	2,2	15,9

Source: Hamm et. al. 2002

There are also considerable regional differences concerning the importance of organic farming (see table 1). Both in Denmark and Norway the processing-, distribution- and retail system are dominated by a few big actors, which make regional food initiatives difficult. Previous studies have shown that small, unknown and in some contexts' 'controversial' products, like organic food, meet special hindrances when introduced in the conventional food market (Brendehaug & Groven 2000, Michelsen et al 1999, Vittersø 2001). In our research this problem is specially emphasised in the meat case from Hedmarken and the milk case of Sjælland.

We will use Øllingegaard as an example. The local organic dairy initiative at Øllingegaard stands as a clear alternative for consumers that want a special quality or want to support other producers than the national 'monopolist' Arla. However, the dominant position of Arla makes it difficult for Øllingegaard to enter the retail market. At Øllingegaard they insist on the necessity of small scale processing for creating excellent quality. This brings about a question whether the dairy business can be transformed. Is it possible or thinkable to restructure the highly industrialised dairy business into smaller processing units? The manager at Øllingegaard states that this will take a long time. Murdoch et. al (2000) states that ecological objectives must act to displace established conventions if they are to profoundly reshape socioeconomic forms. In the case of Øllingegaard it is the 'conventional' conventions that is dominating both among the retailers, that Øllingegaard have an extensive co-operation with, and not least inside Arla which is the dominant, main competitor in the market. Building alliances with the consumers seems to be the chosen strategy of Øllingegaard, and as a small local player it is surely a long-term project to really have an effect on the overall distribution of dairy products both locally and not least nationally.

Even if the initiatives that we have been studying do not challenge the conventional system in terms of quantity, we have found that these initiatives offer qualitative new conventions about food in the food system. According to the double-layer model this concerns both the relations between the actors in the food system and their conceptions and handling of the products. We will first have a closer look on how these quality conceptions are expressed, and then see how the relations between the actors function in the different cases.

Quality perceptions

There are several important factors in the three cases that point in the direction of a potential future reshaping of the food system. The introduction of small-scale processed organic milk has had an important effect on the market in the cases of Røros and Øllingegaard. The main contribution stems from the new and broader differentiation of quality, which have resulted in a grater selection of dairy products in the market. Both at Røros and Øllingegaard they emphasize that organic milk is a unique raw material that vouch for a special quality. This is a conception of quality that differs radically from what we found among the managers at the 'conventional' dairies.

In the Øllingegaard case freshness and taste are important qualities along with the idea of small scale processing and environmentally sound production. They want to tell the consumers true stories about their products, by presenting the farm and the dairy at Øllingegaard and describing the way the milk is produced. The quality is seen as a consequence of the gentle and crafts like treatment of the milk, which you will only get within a small scale processing. This stands in contrast to the conventional dairies where milk has become a highly standardised product, where qualities that differentiates for instance between the different seasons, regions, production systems or farmers, are left out.

The products from Røros raise a new awareness of local products both among Norwegian consumers, producers and processors. It is said that Norwegian consumers are brought up to trust "Norwegian food" (Berg 2000), which have resulted in that local varieties are overlooked. In the Røros case local, traditional products are emphasised, which also is associated with small scale, crafts like production. The fact that it is based on organically produced milk adds to the list of positive properties that the products hold, and it fits nicely with the conception of pure and clean products. It is important that the milk has been transported as short as possible. The combination of the traditional, local product 'Tjukkmjølk' with the organically produced milk has given a synergetic effect between the civic and ecological convention.

The experiences from Røros Dairy have influenced TINE to take a more active stand concerning their own marketing and distribution policy – and made a clearer distinction between bulk products and other food specialities. Today the Røros case is often mentioned as a success story of niche production in the public debate, even by TINE. It is also in many ways used as an example and model for TINE's new strategies on niche products. TINE has established a separate unit, 'Ostecompagniet' ('The Cheese Company'), that among others shall take care of the many different small-scale initiatives from farmers that are members of the national dairy co-operative. However, it remains to see the consequences for the organic- and local products from this reorientation.

At Hedmarken both the organic farmers and the local butcher focus on the transparency in the production process and the traceability of the products. Animal welfare is also an important consideration in this case. The consideration for local employment was a decisive factor when establishing the organic production at Røros, and it is also highly regarded by the actors in the meat initiative at Hedmarken. This emphasis on the wider societal benefits by producers are in keeping with aspects that 'organic consumers' also emphasise, according to a consumer survey from the Hedmarken region (Torjusen et. al 2001).

Together these cases illustrate the multitude of marketing opportunities that exists within local and organic food initiatives. The chosen 'marketing strategies' are influenced by the specific local situation and also affected by what kind of product that is being marketed. These diversified conceptions of qualities and multitude of marketing opportunities is seen as a challenge and inspiration for actors in the conventional food system as well.

Relations between the actors

Another important contribution from the introduction of organic food is in relation to how transparency, trust and reciprocity are looked upon and secured between the actors in the food system. Again we found two different ways of handling these issues within and between the conventional and local food systems. Within the conventional food system these questions are taken care of by establishing information systems such as quality standardisation programmes (i.e. HACCP), brands (Arla, TINE) and date stamping (that gives information about the freshness of the produce). In the alternative distribution systems a shorter distance both mentally/socially and physically between producer and consumer is considered as important in creating transparency and trust in the system, and emphasised in all three cases.

At Røros the close social networks that have been established during the years, have been a prerequisite for the success of the local, organic food products in the region. They have succeeded in creating an environment for co-operation where 'sustainable' conventions are emphasised among central actors in the region, including the organic farmers, staff at the local dairy and retail businesses as well as local consumer interests. One outcome of this co-operation has been the regional business organisation, Mat fra Fjellregionen (Food from the Mountain Region), and the three local distribution companies; Rørosmeieriet (Røros Dairy), Røroskjøtt (Røros Meat) and Rørosmat (Røros Food).

In the Øllingegaard and Hedmark case the local structure seem more fragmented, and the organic initiatives are from conventional actors to a greater extent viewed as competitors. The structural barriers are also important here, such that the decisions within the retail- and processing system are taken centrally and not locally. An explanation of these differences between Røros and the other two cases may be that Røros is situated in a marginal area, both regarding labour market, food market and agricultural production, whereas both the 'meat-initiative' at Hedmarken and the Øllingegaard Dairy are closer to the greater markets, and are situated in more diversified agricultural areas. Other explanations may be sought in the cultural, historical and social differences between the regions.

Grasping the interaction between organic farming and changes in the food system

It is a main challenge that the effects of organic farming upon the food system cannot be studied under controlled conditions. It is not possible to study the transformative effects of organic farming on the conventional food system because the food system is as a totality influenced by numerous other forces and is itself influencing the subsystems. It is however, primarily a task of research to go beyond the mere description in terms of causality: the emergence of a more organically and environmentally sound food system is not necessarily a result of organic farming. It is more likely to describe this emergence as being in the same societal process which organic agriculture is embedded in. Methodologically it is a challenge to analyse the parallel emergence of different tendencies in rural community, not in a cause-effect relation, but rather in a *cause – effect network*. In real life, motivations for one action are interconnected with other motivations, and effects of one action can very well under other circumstances appear as a cause for other actions. Thus, food system participants` motivations are expressions of an ambiguous and complex interplay among a wide range of individual and social factors. This web can be described a dynamic network of causes and effects. The network is dynamic because the various factors and their mutual relations are continuously changing.

Preliminary conclusions

Organic food initiatives play an important role in creating local systems for organic food, but they play a more marginal role in the overall, conventional food system in terms of volume and money. However, in this paper we have shown that organic food system initiatives have a potential in transforming the conventional food system, not least because of the multitude of marketing opportunities that exists within local and organic food initiatives. But local initiatives also face some important dilemmas, regarding the possibilities for keeping the product genuinely local and organic when expanding the market. The challenge for local organic food initiatives is on the one hand to develop the concept without being overtaken by the conventional system, but on the other hand if these initiatives shall have any real impact on the general food system, they must not stay too small and marginal. Herein lie important challenges for the local organic food initiatives to build alliances in the food system, where commonalities and visions are shared among the actors involved. We have not argued that the cases in this study represent large scale transformations of the conventional food system, but rather areas where alternative visions can be developed, as spaces of hope for farmers and consumers in their search for sustainable food systems.

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Recognizing the farmer: Local food systems can provide improved social conditions for farmers

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Abstract

Farming activity has a considerable impact on rural development. An interview study conducted during the autumn 2001 indicates that Swedish farmers perceive their way of life as unsatisfactory in terms of working hours, financial position, but also in terms of social conditions:

- Farmers sense that they have too little influence on decisions that affect their farm business.
- Farmers perceive an impoverished social situation with few contacts with other farmers and also with the consumers of their produce.

These deficiencies contribute to make farmers retire from farming and/or leave the countryside.

The aim of this paper is to discuss 1) recognition as an important source of well-being and motivation for farmers, but also to 2) stress that increased collaboration among farmers and among farmers and consumers enhances the farmers' ability to be recognized by others.

In 2003 another interview study was conducted to penetrate the issue of recognition; loneliness, feedback and appreciation, further. The findings conclude:

1. The public image of farming activity is a negative one. It tells the farmer that the general public of Sweden doesn't appreciate him and what he produces. This is not necessarily the accurate interpretation of the public opinion, but that is what the farmer sees.
2. Collaboration that involves farmers and consumers, such as local food systems provide better contacts between them and gives the farmer an opportunity to give a positive image of his work. It also gives the consumer an opportunity to show his appreciation.

Every human being needs to be recognized an individual, as an equal member of society and as a member of particular group/with particular skills. This is the core foundation of existence. The farmer's experience of loneliness makes him non-recognized on the first level (which represent *love* and *care*). On the second level he can perceive that he is deprived of his *equal rights* as a member of the Swedish society, when he is given worse conditions than other people. Finally on the third level he may lack the proper appreciation and respect for agricultural production and the farm way of life (this level represents loyalty and solidarity).

My preliminary conclusion is that agriculture needs different measures of collaboration to solve the problem with the sense of dis-respect and non-recognition at different levels. Collaboration is needed between farmers as well as between farmers and consumers and other stakeholders. There is a need for further research on the actual effects on perceived recognition and other social conditions in collaboration projects.

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1. Background

1.1 Rural development and farming

Farming activity has a considerable impact on rural development. Without healthy and happy farmers rural development will be difficult. The social dimension is central to keep farmers farming and at good health, and to accomplish a sustainable development for agriculture. For rural development it is important to link consumers to producers and to develop/withhold a local economy. The aim of my research project is to create a deeper understanding of how to achieve a social situation that is perceived to be sustainable by the farmer.

1.2 The social condition at farms

My first case study was conducted in autumn 2001. In-depth interviews with 30 farmers in three marginal areas of Sweden were carried out with questions that covered the main conditions for farming in these areas. One area was in Småland in the south of Sweden and two areas were in Lappland in the north. Ten farmers were chosen in each of the three areas. Strategic sample was applied with purpose to get different perspectives of being a farmer. With the help of local farmers' federation members, farmers from different age, sex and production aims were selected.

The result of the interviews shows that Swedish farmers perceive their way of life as unsatisfactory in terms of working hours, financial position, but also in terms of social conditions (Nordström Källström, 2002a; 2002b). Some conclusions concerning the social conditions are:

- Farmers perceive an impoverished social situation with few contacts with other farmers and also with the consumers of their produce. Decreasing interaction with other farmers derives from long working hours, many farmers living alone on the farm (without a family) and farms constantly shutting down leaving only a few large farms left on the countryside. Few contacts with consumers derive from the dominance of large-scale retailers and by some means from an ongoing specialisation on farm level.
- Farmers sense that they have too little influence on decisions that affect their farm business. Farmers sense that they are in an exposed position towards authorities and consumers. They feel controlled and under suspicion from authorities that handle regulations and subsidies. As well as powerless and undesired by the consumers that, through media, complain about farmers not caring for their livestock or polluting the environment. Farmers today perceive a great distance to policymakers and to consumers.

These deficiencies contribute to a perceived unsatisfactory quality of life and make farmers retire from farming and/or leave the countryside. The following question must be: How do we manage this situation and contribute to better social conditions for farmers? In my research I want to study how we can facilitate or improve the conditions for farmers in this respect.

1.3 The role of local food systems

Farming in the countryside can some times be seen as equal to unsatisfactory social conditions. Local food systems and other forms of collaboration could be favourable for keeping financial resources in the region and thus enabling rural development. Collaborative processes could also be important for the rural social conditions. Food systems could be a way to link farming with non-farming sectors, connecting people to people and improve social conditions.

2. Aim

In the conclusions from my first case study[1] and from other studies made in Sweden recent years[2], recognition seems to be important. A lot of Swedish farmers have too little contact with others; colleagues, friends and consumers. This deprives the farmer of feed-back and appreciation for his work. It is also shown that the farmer often feels more like a burden than a resource for his country and society.

I want to discuss recognition as an important source of well-being and motivation for farmers. What would happen if we introduced recognition in local food systems or other collaboration projects? Can local food systems or other forms of collaboration reinforce the feeling of recognition for farmers? My hypothesis is that increased collaboration among farmers and among farmers and consumers enhances the farmers ability to be recognized by others; consumers, colleagues and society at large.

3. The relation between collaboration and recognition

Here I develop how I perceive recognition and the role it plays for farmers' social conditions. Collaboration between farms and between farmers and consumers are possible ways to broaden networks and enable feedback in the system.

3.1 Recognition

The following discussion builds on theory of the importance of recognition developed by Axel Honneth and also by Charles Taylor. I describe the three dimensions of recognition, how recognition affects identity and the effects of non-recognition.

Identity derives from recognition

Person's or a group's identity is closely connected to the amount of recognition he or they receives from other people or groups (Taylor, 1999). A person's identity can be defined as a person's perception of who he or she is and what characteristics he or she has as a human being. Our identity is partially created by the recognition or the absence of recognition. The absence of recognition could be a form of oppression and could cause great damage. People get forced into a false, distorted and narrow way of life.

Recognition effects people's identity by leading to a disparaging image of people and groups. The image of inferiority gets internalised within the group or individual identity: *"Due recognition is not only a courtesy we owe people, it is a vital human need"*, Taylor states (1999)[3].

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1 **Nordström Källström, H.** (2002a). Att vara lantbrukare eller inte: En studie av förutsättningar för livskraftigt lantbruk i tre nedläggningsdrabbade områden i Sverige. Jönköping: SJV.

2 Conducted, for example, by **Djurfeldt, G.** (1998). Familjejordbrukets sociologi. Porträtt av den svenske bonden före EU-inträdet. *Sociologisk forskning.* and **Bergsten, M.** (1999). Bonden i bladet. In *Svenskt bondeliv. Livsform och yrke.*, (ed. A. Salomonsson). Lund: Studentlitteratur.

3 Taylors discussion on recognition and identity is a development of George Herbert Meads description of how we create our identity partly by communication with generalised and important "others" (**Mead, G. H.** (1934). Mind, self and society - from the standpoint of a social behaviorist. Chicago: University of Chicago Press.). The socially derived identity is by definition depending on the social environment of a person or a group. Recognition is therefor very important to our lives.

A person (farmer) has a personal identity but also several social identities. We are, for example, both parents and have a professional identity. One person may, in different contexts, be a member of a local community, a farmer, a hunter, a car-owner, a member of farmers' federation and a man. All these identities have a social origin, some being more accepted than others.

Three dimensions

Recognition can be found in three independent modes (Honneth, 2000)[4]. To develop a personal identity, or a positive relation to oneself, you need multidimensional recognition from others. People need to be able to refer to oneself from the perspective of an approving and encouraging "other". The three different levels of recognition are (figure 1):

1. The individual is recognized as a person whose needs and desires are of unique value to another person. This mode of recognition is often referred to as "love" or "care" and imply a conditional care for the well-being of the other for his or her sake. Love and care build a person's self-confidence.
2. The individual is recognized as a person who is ascribed the same moral accountability as every other human being. This kind of recognition has the character of universal equal treatment and is often referred to as "moral respect". It implies the moral duty to recognize the accountability of all others. The experience of moral respect builds a person's self-respect.
3. The individual is recognized as a person whose capabilities are of constitutive value to a concrete community. This kind of recognition has the character of a particular esteem and is often referred to as "solidarity" or "loyalty". It implies the conditional care for the well-being of the other for the sake of our common goals. The experience of solidarity or loyalty builds a person's self-esteem.

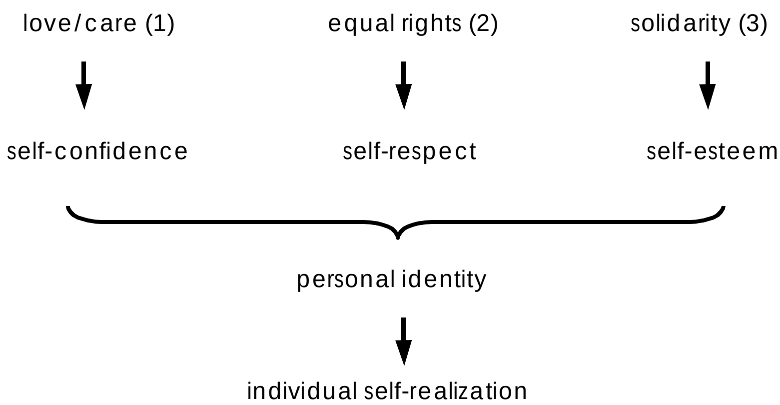

Figure 1. The three levels of recognition and their effect on the individual by Heidegren (2002)

The three dimensions of recognition present us with moral obligations and duties. We have a moral obligation to emotionally care for others in the perspective of the first level of recognition. We have the moral obligation to treat others equally in the perspective of the second level of recognition. And finally, we have the moral obligation to show solidarity, interest and commitment to others' work and activities in the light of the third level of recognition.

The non-recognition

What happens when persons and groups lack recognition on one or more levels? There are a number of examples of violations on the three different levels of recognition.

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[4] With a reference to the thought of Hegel, that there are three patterns of recognition. To Hegel, a persons self-consciousness depends on the experience of social recognition.

a) On the first level the lack of love and care deprives us from the feeling of security that derives from the ability of physical well-being. A person can loose trust in the value of his own needs from others point of view. Extreme cases of violation of the first level of recognition are for example rape and assault. It is not the amount of physical pain that is the issue, but the perception of being exposed to the will control of another human being.
b) There are several acts of moral violations where a person's moral accountability is disdained. A person's perception of self-respect can be damaged through not having the experience that people recognize the value of his or her judgement. Fraud or betrayal could be such violations, but also deprivation of one's human rights such as social welfare and democracy; to be able to influence decisions that are crucial to your future.
c) Moral violations of the third level of recognition could be when one or several persons, through humiliation or dis-respect, discover that their skills and efforts get no recognition. This damages the feeling of being socially valuable within an actual community. Examples of such violations are forms of cultural degradation and could be everything from not exchanging greetings when meeting to extreme cases of stigmatisation.

Social dis-respect can be seen as the mental correspondence to physical illness. Symptoms of social dis-respect could be negative emotional reactions such as shame, indignation and anger. In the moral aspect of recognition lies the expectation of a particular response. It is the disappointment in the absent recognition in relation to these expectations that causes damage to the identity of a person or a group (Heidegren, 2002).

3.2 Collaboration

Due to, among other things, the deteriorating social situation on farms, Ljung (2001) concludes that there is an urgent need to develop venues and meeting places for collaborative learning; where farmers are able to collaborate with their colleagues, rural citizens as well as other stakeholders within the whole agri-food system. Ljung aims to use collaborative learning as a model to manage environmental problems in Swedish agriculture. In my research I want to study these methods further to investigate how they can contribute to an improved social situation as well as managing the environment. Most studies of collaboration is done for the purpose of solving a problem, like an agri-environmental issue or to get better financial conditions, but I argue that the effect that collaboration might have on social conditions, such as network building, positive feed-back and better relations to colleagues are equally important.

What do these collaborative processes look like? In Sweden we have traditionally worked with systems for food production for the local market and collaboration on agricultural machinery. These processes have been practised and studied and are working well to accomplish its objectives, such as increased locally consumed agricultural products or lower costs for agricultural machines on farm level. But these processes also have a social and a political impact. Collaborative processes can contribute to new networks in the countryside as well as new contacts with farmers and consumers. Further, collaboration is also a way to achieve participation in decision-making and it can serve as feedback and new input to policy makers and authorities. It is a part of social learning among actors.

The actual results of collaboration between farms has recently been studied in three master theses (Blad, 2003; Samuelsson, 2003; Skargren, 2003). The studies show that farmers chose to work together partly because of economic advantages, but also because of the loneliness and isolation they perceive. Statements such as wanting to share important decisions with other people or wanting to have a working companion are frequent in the three studies. Working and learning together is a social activity and has social implications for farmers and the rural community.

4. From the farmers' point of view

To investigate farmers' experience of recognition and feedback interviews were conducted in the middle-part of Sweden.

4.1 Interviews

In this paper I use results from an interview study with nine farmers conducted during winter and spring of 2003. The farmers were from two different areas in the east-centre of Sweden. One was in Västmanland where four male organic farmers participated in the study. The other area was in Södermanland where four male farmers and one couple participated. In the group from Södermanland there were no organic growers. Västerfärnebo in Västmanland is an old genuine farm region with high cultural and natural values and Sörfjärden in Södermanland is situated at a bay of the lake Mälaren and is a place of high interest for nature conservation.

Semi-structured in depth interviews were conducted with the farmers. The purpose with the interviews was to study how environmental work on farm level contributed to motivate the farmer and also how farmers perceived the feed-back and appreciation that they experienced regarding to their work. There were mainly men among the interviewees and they were all involved in rural development or nature conservation projects. The study is ongoing and will finally be published in a report (Ljung and Sonnvik, In production)[5].

When analysing the interviews I placed statements into themes, that was developed during the analysing process and that were connected to the notion of recognition. The general results from the interviews were obtained by empirical saturation. I give an account of the general result of the interviews below each theme and I exemplify with perspectives from one or several farmers that illustrates the general opinion.

4.2 Results

While processing the outcome of the interviews, themes emerged to divide the testimonies in. Obvious themes of interest to this discussion was; the picture of farmers in the media, their relation with consumers, perceived response from politicians, the experience of loneliness, received appreciation and feed-back on production.

Farmers in media

A majority of the interviewed farmers believe that Swedish people in general, and also the government and other authorities, have and show little understanding for agriculture. According to the interviewees, farmers are seen as villains responsible for pesticide residues in rivers and nitrogen leakage. This is also shown in other interview studies.[6]

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5 Special thanks to Per Sonnvik, who conducted the interviews and shared his data with me.

6 For example by **Djurfeldt, G.** (1998). Familjejordbrukets sociologi. Porträtt av den svenske bonden före EU-inträdet. *Sociologisk forskning.*

Most of the farmers are sceptical to the knowledge journalists have of farm business and also of the media coverage of agriculture at large. The farmers think that media treats them unfairly. The general picture in newspapers and magazines is that farmers pollute the environment, make farm animals suffer and earn money on subsidies (Bergsten, 1999).

This is a picture that has been spread for quite some time. During the 80's there was a debate on agricultural subsidies in Sweden and a lot of farmers, already by then, felt that they were a burden to society. One farmer in the study said "I used to joke about that you quit your farm business because you have placed a radio in the barn".

Meeting consumers

A farmer talks about when he sold organic milk in the local shop in the 90's and met a lot of customers. He felt really encouraged by their positive comments and that they bought his milk. Several of the interviewees would like to meet their customers on a regular basis.

When the specialized farmers of today, who meet fewer and fewer of the consumers of their goods, see the negative picture of farming that media spreads they start to believe that it is the view of the public and the consumers. Farmers who meet consumers in local shops or at the market get more positive feedback and increase the feeling of *recognition*.

Some farmers complain about not having enough contacts with consumers. "You never meet the consumers or other stakeholders in the food chain that can give you any feedback or appreciation", one farmer declares. "Farming is not enough an outward activity".

Politics of agriculture

"Swedish politicians, don't view agriculture as a resource", says one farmer during the interview. Some of the farmers perceive that Sweden got a worse deal than other countries in Europe when Sweden joined the European Union. This reflects a belief that the Swedish politicians opinion of agriculture is that it is more of a nuisance than a resource.

Loneliness

Today farmers work alone a lot. A way to overcome the problem of loneliness is to work together, but in some areas of Sweden this is difficult because of the physical distance. Collaboration has both economic and social implications, you can share machinery and help during periods of heavy workload and you have company and someone to talk to.

Several farmers in the study refer to farming as something you do alone. By such statements they relate to the past when you did much of the farm work together with members of the family or other farmers. Some farmers declare that they, for weeks sometimes, do not speak to another person during work hours.

The number of farm businesses continues to decline in Sweden. One farmer suggests that they are doing this to themselves; farmers buying new farms to create bigger units. It is not a favourable change in the long run because of the loneliness it creates.

Appreciation

All of the interviewed farmers express the need for appreciation and feedback for their work. It makes the work more fun, easier and works like a driving force. "Every person wants to be appreciated for what they do", says one farmer. "As a Swedish farmer you want to be appreciated for producing good food for the Swedish citizens. If you get positive feedback from the consumers for what you produce, it gives you self-confidence", says another farmer.

“Consumers’ will to pay for their produce is another way to show appreciation. If you get less paid and get a lot of critique for the work that you do, you most certainly consider to change line of production or quit farming”, one farmer tells us.

Public opinion and the self-confidence of agriculture

Farmers’ perception of public opinion is to a high degree reflecting the picture distributed by the media. Farmers believe that the general public has little knowledge of farm life and farm business. Some claim that it is necessary to start educating young people on the conditions for agriculture, to, in the long–term, build knowledge in society.

“More out-wards activities will give the opportunity to improve the public image of agriculture and indirectly strengthen the self-confidence of the farming community as a whole”, some farmers argue. One farmer states that untidy farms give farming bad reputation. He says that we have to keep the farms neat and organized to give farming higher status. People tend to look down on farmers, assuming them to be dirty and dull, he continues.

Farmers try to adjust their activities according to the public opinion. One farmer states that the increase of organic growers in Sweden is partly due to the common picture of a polluting farmer. Farmers want to get appreciation from the consumers not complaints.

5. Discussion

The interviews show that the experience of recognition is important to motivate the work. Honneth (2000) also suggests that it is crucial to survival. Some farmers lack recognition on all three levels. Loneliness is one level; other levels are equal rights and respect for agricultural production and their way of life. He may be very lonely and lack recognition from family or friends (love/care), it is possible that he feels unjustly treated in relation to his equal rights as a member of society (moral respect) and he may not get appreciation for his work/the products from consumers/society (solidarity/loyalty). There are three levels of recognition and if unsatisfactory they have to be improved in three ways; on each particular level. To be recognized as an individual, as an equal member of society and as a member of a particular group/with particular skills is a foundation of our existence. The themes from the interview results are illustrated below to clarify the impact on the farmer (figure 2).

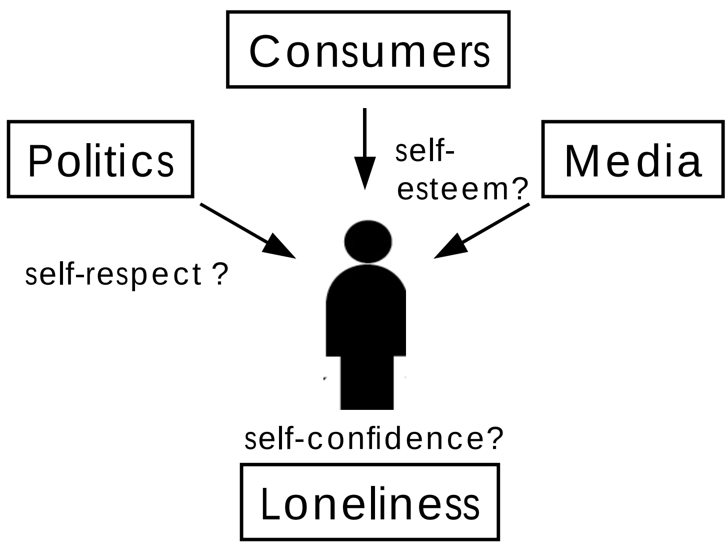

Figure 2. The impact on the farmer of non-recognition from different actors in society

Collaborative learning between farmers and between farmers and consumers and local food systems can provide conditions for increased contact between consumers and colleagues. It can reduce loneliness. In the process of collaboration it is also possible to influence political decisions and improve unfair treatment of farmers in comparison to other people. Even more important is the effect to the *feeling* of being treated unjust. It can also help the farmer to improve the image of farming and also discover the consumers' appreciation of his work. While collaborating the consumers learn about farming and farmers learn about consumers and they also learn about food production and consumption.

6. Conclusions

The results of this discussion can be drawn to two basic conclusions, which also can be bases for action:

1. The farmer perceives the public image of farming activity as negative. It tells the farmer that the general public of Sweden does not appreciate him and what he produces. This is not necessarily the accurate interpretation of the public opinion, but that is what the farmer sees.
2. Collaboration that involves farmers and consumers, such as local food systems provide better contacts between them and gives the farmer an opportunity to give a positive picture of his work. It also gives the consumer an opportunity to show his appreciation.

Collaborating is a learning process where the collaborating actors learn about each other, themselves, the actual issues (like local food production and consumption) and the procedure of collaboration. In this learning process people develop pictures of the other actors and that is the foundation for appropriate recognition. Farmers get recognized by consumers of their produce and the consumers get the satisfaction of recognizing the producers of their food.

The newspapers and television often show a negative picture of agriculture, which does not necessarily correspond to a public opinion. But the farmers see no other opinion because they lack contacts with consumers and citizens. There would be a lot to gain by establishing closer connections between consumers and farmers on the local level. In the notion of recognition lies also the duty to show appreciation, respect and care for others. This duty, if carried through, gives satisfaction to those showing it (consumers and society) as well as it renders recognition to the ones receiving it (the farmers).

Agriculture needs different processes of collaborative learning to manage problems with the sense of dis-respect and non-recognition at different levels. Collaboration is needed between farmers and between farmers and consumers. Collaboration between businesses can produce food on a smaller scale but still act on a larger scale (that is together) when it comes to buying supplies, delivering products and coping with times of heavy workload. Hence collaboration provides measures to strengthen the local economy and keep control of resources within the region in order to create a rural development. This is especially useful in regions not suitable for large-scale agriculture.

Extensionists should be made aware of their twofold roles; they have the task to pass knowledge on to the farmers, but they can also take responsibility to create arenas for collaboration. The extensionist can play a part by recognizing the farmers as a qualified professional with unique skills. It is also important to appreciate that social issues can be equally important to economy when it comes to decisions on farm level.

More research is needed on the effects of collaboration between farmers and between farmers and consumers (for instance local food systems). I intend to continue working in this field and in my next case study I will investigate one or more collaboration projects and its effect on social conditions such as recognition.

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Agri-environmental Problems in Farming Systems of Central and Eastern European Countries Change During Transition 1989-2003[1]

John Sumelius[*], Stefan Bäckman and Timo Sipiläinen[**]

Abstract

Transition to market economy began the 1990s in most of the Central and Eastern European Countries. This paper gives an overview of some of the most widespread agri-environmental problems in the CEEC with particular reference to case studies of farming systems. Suggestions and remarks on possible means to resolve the problems are made. We will mainly refer to well-documented issues and cases which we have had good access to, partly through a large EU funded research project 2000-2003 called CEESA and to quantitative data collected in 12 countries (Estonia, Latvia, Lithuania, Poland, Czech Republic, Slovakia, Hungary, Slovenia, Croatia, Romania, Bulgaria and Ukraine).

1. Introduction

The transition to market economy in the Central and Eastern European Countries (CEEC) has influenced farming systems in many respects. The collapse of planning economy and the transition of large state owned farms into private farms has implied that the organisational structure of farms changed. Market prices of product, inputs and resources have replaced the planned economies. All these factors combined have implied a change of technology used on farms and a change in the organisation of resources on the farm. This has in turn affected the environment in various ways. Some of the influences have been beneficial from environmental point of view (e.g. reduced pressure by high intensity in crop and animal production, reduced soil compaction) while others have been negative (e.g. existing biodiversity reserves are under threat (Sumelius 2000). The new systems have been going through a transition period but are still not stable. Structural problems from the heritage of the large co-operatives have created transition problems and unstable agricultural production. Six countries in CEE are considered to be Low Income Food Deficit Countries with considerable food insecurity problems (Tanic, S. 2002a).

The purpose of this paper is to describe the relation between farming systems and environmental issues in twelve different CEEC countries and to discuss some possible general recommendations for resolving the problems. Five cases of the twelve farming system have been studies were examined more in depth in the CEESA research group on farming systems. Two case studies related to water in two farming systems (Romania and Croatia), two to landscape and biodiversity (Estonia and Hungary) and one to water (Bulgaria). The farming systems in these countries were chosen by separate researchers who identified the farming systems and their main interaction with the environment. A detailed description of these faming systems is given in Tanic et al. (2001). A crucial issue of the CEESA research in this group was to assess the sustainability development aspects of alternative farming systems. The EU

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[1] This paper has been carried out within the CEESA project QLK5-1999-01611in cooperation with FAO/SEUR . CEESA stands for Sustainable Agriculture in Central and Eastern Europe.

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requirements of environmental protection will further affect the process of restructuring the agricultural sectors in the CEEC.

Some trends in the twelve CEEC were common for all countries. Privatisation and de-collectivisation of large-scale production units has led to declining production. Especially animal production has decreased in almost all CEEC. The animal production has also faced strong technological development. At the same time the number of family farms with low use of purchased inputs has increased. Unfavourable economic conditions and weak instituted policies could be identified as the largest obstacles for family farms to adjust to structural change. Switching from a protected institutional environment to an environment with uncertainty and competition with some missing rules is a problem in farming. Since the mid 1990s economic recovery and production have started to increase or at least to stabilise (Bäckman et al. 2000). In the next section we describe some of the most widespread agri-environmental problems in the CEEC during the transition period with reference to particular case studies. In the third section we make some suggestions and remarks on possible means to resolve the problems.

2. Agri-environmental issues in selected farming systems during transition

It is obvious that agri-environmental problems are widespread in all CEEC. Some of the environmental problems are inherited from the period before transition, when the use of external inputs, e.g. fertilisers and pesticides was intensive and the manure of large animal units was a severe cause of water pollution. During transition the production has become more extensive and the number of animals has reduced considerably. Thus the environmental burden from agriculture has decreased. However, simultaneously the deterioration of old structures like irrigation canals led to the adoption of less favourable practices. For example, in Bulgaria irrigation with ground water as a substitute for canal water irrigation increased the risk of salinization.

The case studies carried out have shown the importance of supplementing analysis of agri-environmental problems with farming systems cases. Based on general analyses of the situation in the CEEC it is possible to conclude that the problem of excessive use of plant nutrients leading to *water enrichment* was common in the pretransition period. In spite of decreasing intensities, which tend to decrease eutrophication the case studies show that in some regions that still are intensively cultivated or have intensified only after transition, this problem continues to exist. The Croatian mixed farming system situated in the region of Lonja indicate that farmers use higher than economically optimal nitrogen doses, on average well above 200 kg/ha of pure N, including artificial fertilisers and manure, in wheat and maize cultivation in 1999 and 2000. Excluding manure, the 20 farms have used from 158 kg N/ha to 193 kg N/ha of pure N in wheat production and from 144 kg N/ha to 176 kg N/ha in maize production. The estimated content of N in the manure was 50 kg N/ha on dairy farms, 57 kg N/ha on pig farms and 59 kg N/ha on beef farms (Grgić and Mesić 2001). These intensities seem to lead estimated nitrate (NO3)-levels of 160-192% higher than stipulated by the Nitrate Directive. Technically the situation could be improved by applying alternative crop husbandry practices, which may make better use of the manure applied. Improving extension, introducing cross compliance measures and introduction nitrogen taxes or nitrogen quotas were also found possible ways of reducing nitrate leaching (Sumelius et al. 2003a).

In the Romanian region of Cazanesti, water pollution problems are mainly due to intensive livestock production. However, the environmental situation has clearly improved during the last ten years, The indicators collected at farm and rural community level, based on farm surveys were combined with water quality assessment in two “receptor points”, upstream and downstream the critical region. It is obvious that the state of waters improved after the largest pollutant, a large former state farm privatised in 1999 was liquidated (Toma, 2001, Bäckman et al. 2001).

Intensive agriculture seem, however, to be an exception of a more general tendency, lack of sufficient plant nutrient inputs to the soil. Therefore, the more widespread phenomenon seems to be that of *nutrient depletion*. In this case, the reserves of phosphorus and potassium tied to soil particles are depleted, which leads to problems with the fertility of the soil. This, in turn, may aggravate processes like erosion and phosphorus runoff. With the exception of Slovenia, use of mineral phosphorus fertiliser decreased from 1989 to 1998 by over 100% in all the twelve countries examined. The reduction in nitrogen fertilisation was somewhat less, still over 100% in most cases (Bäckman et al. 2000, CEESA national inventories).

Soil degradation has been a major environmental problem in many farming systems of the CEE. Yet, the most widespread problem, erosion, existed prior to the economic transition, and still remains there. Erosion, as well as compaction, is particularly common on the large-scale farms that are common in most of the CEE countries. A severe phenomenon is also the salt accumulation that is taking place in some arid regions where agriculture is dependent on irrigation. This was the case in the Bulgarian farming case study in the region of Plovdiv. Salt accumulation is the most significant soil degradation problem in this region. Of 22 villages surveyed within CEESA (76 villages is the total in the region) three were found to suffer from primary salt accumulation. Switching to alternative farming practices for the salt-affected soils were found reducing salt accumulation. The main elements of such practices include deep tillage (levelling), water quality (frequency), organic matter (mulching) and crop rotation. The alternative farming practices, were found economically viable. A low level of vocational training, fragmentation of parcels and too small financial sources for farmers to switch to other farming practices were found to be the main obstacles (Aleksiev, 2002). It seems also from the experience of Ukraine that a part of soil degradation could be prevented by a set of management practices. Therefore, institution-building and the improvement of human capital through better education, extension and information-spreading in order to promote the uptake of such practices are needed.

Large-scale *abandonment of land* is a recent trend in many farming systems of the CEE countries. This abandonment serves as an indicator of the loss of rural cultural patterns. Abandonment indicates the presence of severe land-use problems. While land abandonment is common in most CEE countries, it seems to be particularly widespread in particular countries or regions. Abandonment may severely decrease landscape values in countries such as Estonia, where almost 40 % of former agricultural land still was in fallow during the last reorganisation of agriculture in Estonia (Hiiemäe and Roosma, 2001). There are at least two reasons for these circumstances 1. property rights for land are unclear or the privatisation process has not been finished. 2. agricultural policies have been almost completely liberalized which has lead to imports, reduced profitability of farming and reduced use of agricultural land.

Abandonment of traditional farming systems poses a *threat to biodiversity* in some CEEC. While agriculture in the major areas of Europe has become intensified, there are still relatively large areas in the CEE countries that are dominated by natural and semi-natural grasslands, areas that are rich in natural features or important for wildlife. In mountainous areas like the Carpathians grasslands play an important role regarding the preservation of biodiversity. Toma (2000) mentions 57 endemic and 171 subendemic plants species in Romania, of which, eight species are listed as vulnerable. An additional 25 species are listed as rare, including two that are very rare. According to Toma, without adequate conservation management, their protection and sustainable use will be threatened. A similar situation also looms for mountainous regions of Slovakia, the Ukraine and the Czech republic where extensive farming systems still exist (Brouwer et al. 2001, Křůmalová and Bäckman 2003). Not only in mountainous regions does agriculture have a big value for biodiversity. In the flatlands of Hungary traditional grazing management is important. Farming systems are a major preserver of the rural step like landscape and the main wildlife habitat for many species, for instance the Great Bustard (Oitis tarda) (Podmaniczky et al. 2001). These cases show that traditional farming systems have not received enough attention in order to preserve the biodiversity. Many farming systems are under strong pressure to change. The political, commercial and institutional environment the work in is not stable. To create a stable setting for their preservation would be important.

It is obvious that poor profitability, poor credit possibilities and insufficient compensation payments for good agricultural practices all impede the implementation of alternative sustainable farming practices. Development of farmer associations, farmer advisory services, and information services and exchange remains an important challenge. In some cases negative effects are a consequences lacking property rights regimes and the associated fair distribution of costs and benefits. Another difficulty resulting from the privatisation process was land fragmentation and land abandonment. The restitution of land to farmers has resulted in a large number of small plots. In addition, in many countries, land titling has been slow and the property rights have not been clear. Fragmented parcels of land are costly to manage and maintain which often leads to abandonment of those fields.

How can the situation be changed? What would be the remedies for the problems? How could a more sustainable agriculture be encouraged?

Measures to resolve agri-environmental problems in the CEEC.

To improve income opportunities and food security for the rural population and to decrease some of the environmental pressures that exist, farming systems in CEEC will need to become more intensive but at the same time more sustainable and diversified (Tanic 2002b) The farming systems have to provide that:
- farm productivity is sustained or enhanced over the long-term;
- adverse impacts on the natural resource base of agriculture and associated ecosystems are minimized or ameliorated;
- residues resulting from the use of chemicals in agriculture are minimized;
- the net social benefit derived from agriculture is maximized;

Such farming systems could improve the well being of individual farming families by approaching both the private and social goals. They also need to be sufficiently flexible to manage risks associated with the variability of climate, markets and instituted policies. To be able to design and to develop such farming systems, it is important to have the appropriate knowledge about the environment (natural, social, economic and political) in which farmers operate in order to assist them in the adoption of appropriate production and management practices.

Achieving sustainable development in the farming sector requires solidarity and a sense of community, independence and empowerment among the farming community which can help in creating a community driven civil society (Petersen and Norman, 2002). The property relations in Central and Eastern Europe needs also to be taken into account. In many CEEC landowners are not farmers and there exists a high number of tenant farmers. After privatisation, many small landowners in CEEC have sold or leased their land to large co-operatives or limited liability companies. These pay very low rents, if any, and continue agricultural activities on a medium to large scale.

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Traditional Products and industrialization processes: The Coherence of Geographical Indications

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Abstract

Geographical Indications are used to protect and promote a product whose characteristics are related to its geographical origin. The acquisition of a Geographical Indication (GI) rests on processes of coordination and legitimization in which are involved the actors of the supply chain, institutions and consumers. The aim of this paper is to analyze the coherence of Geographical Indications by discussing the paradoxical fact that they correspond, for the consumer, to the image of a traditional product but at the same time lead to an industrialization and standardization of the production process. The analysis of the mechanisms of quality signaling on the one hand, and a case study on the Protected Geographical Indication "Foie Gras ducks from the South West" on the other, have enabled us to examine the co-ordination mechanisms at work when Geographical Indications are implemented. The results show that the coordination of actors in a production area does not guarantee the respect of a certain tradition (when tradition is considered as the preservation of a local know-how). The choices of the technical criteria defining quality and the appropriation of the image of the product linked to its origin must then take into account the expectations of consumers concerning the origin. At the heart of the problem lies the establishment of the product's reputation. Resulting from sectoral and territorial logics and from consumers' perceptions, this reputation rests on processes of legitimization that are the object of negotiation.

Keywords: label, Protected Geographical Indication, co-operatives, "Foie Gras", origin, coordination of actors

Introduction

Economic literature on signs of quality has shown the importance of the processes of negotiation between the different actors of a sector (Beranger and Valceschini, 1999; Lucatelli, 2000) and the crucial role played in the construction of a product's reputation by the certifying body and the organization that owns the collective sign (Letablier, 2000, Valceschini and Maze, 2000). The analysis we propose fits in with the reflection on Geographical Indications used as signs of quality. Geographical Indications are used to identify a product whose characteristics are connected to its geographical origin through its definition, and through the conditions in which it was produced. In France, a group of producers is in charge of establishing the product' specifications. This French perception of origin, which has been adopted at European level, raises the question of the appropriation of the designation of origin by the group of actors and that of the credibility of the sign of quality for consumers (Peri and Gaeta, 2000; Barham, 2003). In Europe, where there is a legislation concerning the protection of products whose characteristics are related to their origin, Geographical Indications must take into account both the specificity of the relation to the origin and the production processes at work within the chains. Many "traditional" products are at the heart of this reflection because of the evolution of the modes of production and consumption. In such a context, how compatible is the identification of a product whose

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characteristics are attributable to its origin with the development of an industrial logic whose objective is certification and standardization? To answer this question, it is necessary first of all to examine the coherence inherent to the signs of identification related to the origin. Indeed signs of identification are supposed to protect a geographical area and therefore a know-how and traditional product. But a reduction of the specificity of the product, resulting from the industrialization of production processes, has been observed. In this paper, we shall therefore try and discuss this paradoxical aspect of the defence of traditional products and will base our reflection on the following question: Does the implementation of Geographical Indications necessarily lead to the industrialization of production processes?

In this article we propose the following hypothesis: although the co-ordination of a diversity of actors at the different stages of the production chain is necessary to prevent the collective name from being misappropriated for the benefit of a few private producers, it may not be sufficient to protect the initial production area. This risk is a source of instability that could jeopardize the very specificity of the product, embedded in the definition of the Geographical Indication. In this article we analyze the case of the Foie Gras sector that is representative but seldom studied; Foie Gras is a product that connotes an image and a geographical origin. In a highly competitive context where the risk of relocation of the production is real, the actors of the South West have federated in an attempt to acquire a Protected Geographical Indication (PGI) that would protect and promote their product. The structuring of the sector has resulted in an increase in volumes for a given level of quality. However, there has undeniably been a standardization of the products due to the industrialization of the processes. And the reduction in the specificity of the product is a source of concern for all the actors of the sector, but at the same time, the latter are trying to elaborate criteria of segmentation in order to promote their products. This original case illustrates the tension generated by the need for product segmentation and the protection of a geographical designation. The results show that the co-ordination of actors within a production area does not guarantee the respect of a certain tradition (when tradition is considered as the preservation of a local know-how). Because of the industrialization of the processes, the standardization of the product weakens its anchorage to the original production area. Thus, actors who seek to increase the value added of their product can be drawn to strategies of relocation. In this regard, the protection of the product whose characteristics are linked to its geographical origin requires that the sectoral logics, the territorial development and the demands of the consumers be articulated in order not to jeopardize the consensus reached earlier.

In the first section of this paper we consider the need to maintain the relation between origin and quality as a guide for the actors in their decisions concerning the modes of specification of the products. A second section examines the case of Foie Gras and analyses the processes of negotiation concerning the choice of appropriate signs. The last section discusses the coherence of Geographical Indications by analyzing what causes the tensions that emerge between the actors during their search for differentiation criteria. It examines a paradoxical situation in which the specification of a product related to its geographical origin leads to an industrialization of the processes.

I. The coherence of a geographical indication: the result of negociation processes

Geographical Indications (GI) are used to protect and promote a product whose characteristics are related to a geographical origin[1]. They rest on collective processes that lie within the framework of

[1] In conformity with international regulation, we retain the following definition of a Geographical Indication: «a sign used on goods that have a specific geographical origin and possess qualities or a reputation that are due to that place of origin». This definition is accepted internationally by the member states of the WTO who have signed the TRIPS agreement (Trade Relative Aspects of Intellectual Property Rights).

national or supranational legislation. The credibility of such mechanisms is achieved through the co-ordination of the various actors involved in the process, including supermarket distribution and end consumers. The participation of this diversity of actors in the decision-making process concerning the appropriate sign makes it possible to guarantee that there is a relation between a traditional product and its geographical origin.

1.The sources of coherence of Geographical Indications

A Geographical Indication identifies a product on the basis of a criterion of geographical location. In Europe, the legislation defines two main labels referring to the geographical origin: The Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI) [2]. The European perception of geographical origin, strongly inspired by the French model of Controlled Designation of Origin, associates the geographical origin to a level of quality. The association of the origin with quality implicitly contains the source of an economic differentiation for the actors involved in these processes of signaling.

- *A European legislation framework*

European legislation on Geographical Indications is aimed to protect and promote products that are considered typical because of the natural and human conditions that have made their production possible (Letablier, 2000). Thus, the objective is firstly to protect and significantly differentiate products and secondly to provide a "relevant" summary of information to help consumers make their choices. For Peri and Gaeta (2000) the models of origin-based differentiation such as AOC and IGP are characterized by their ability to give clear information to consumers about typical products and by local systems of production individual producers would not be able to promote. For this reason Geographical Indications are part of the collective marks and signs of quality (Lucatelli, 2000). However, unlike collective marks and certification marks, which are private, the property rights of Geographical Indications mostly fall under the public domain. Indeed, the national or supranational institution must legitimize the acquisition by a number of actors of the geographical indication, give credibility to the mechanism of identification implemented and guarantee the respect of international law [3].

Valceschini and Maze (2000) have underlined the importance of the system of allocation of property rights for the credibility of signs of quality. This system combines three mechanisms: an institutional mechanism (the national or supra national organization which is responsible for allocating property rights), an organizational mechanism (a group of producers that must elaborate specifications and to which the property right is granted), and finally an inspection mechanism, via a certification body, which is generally independent. It is therefore up to the actors of the agro-food production chain to co-ordinate in order to propose a set of specifications determining the relation between origin and quality, the legal mechanisms guaranteeing this relation. The case of France enables us to examine the different definitions of the concept of origin on which the specification of the origin is based.

- *The different definitions of specification of origin in France*

In a country that is known for the typicality (or *typicité*) of its products, the qualification of a product through its origin has evolved in order to adapt to the changes in modes of production and consumption. Valceschini and Maze (2000) identify four legal denominations of origin that show how much this concept has evolved with time:

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[2] The PDO and PGI are defined by European regulation 2081/92.

[3] In return for the recognition of GI at international level States are required to guarantee their protection and ensure that the legislations are complied with, in particular with regard to free competition.

- Controlled Designation of Origin (CDO in 1919) and tradition in know how. This sign associates the geographical area (the *terroir*) to a typicality linked to a recognized tradition.
- The Red Label (in 1960) and technical reference base. It defines the specifications that establish the characteristics of the *farm* production of superior quality.
- Organic agriculture (in 1980) and productions that respect the environment. The central characteristic is that of the *natural* aspect of the product and of the production processes.
- Certification of Product Conformity (In 1990) and *conformity to technical rules*. The product must conform to a specification through a technical and normative set of rules.

The fact that France uses the European signs PDO and PGI, shows that these different definitions are taken into account. The PDO is the direct counterpart of the CDO but in France, in order to obtain the PGI it must be associated either to a Red Label or to a CCP. The CDO/PDO and PGI signs are differentiated by the nature and intensity of the relation to the geographical origin. In the case of AOC/AOP, the quality or the specific characters of a product are essentially or exclusively due to its geographical environment including natural and human factors. But the PGI label indicates a quality, reputation or character that is attributable to the area. Generally speaking, the retained criterion concerns more the means and conditions of production than the product's characteristics per se.

The definition of the relation to the origin therefore allows for different strategies of actors; the latter can in particular vary according to the type of actors (producers, enterprises downstream) mainly mobilized to obtain the label. The actors may choose to focus on the conditions in which the raw material is obtained or on the conditions of production (Letablier, 2000). However, the anchorage of the product to the territory and to its natural and human characteristics, may "freeze" the traditional knowledge and production processes in technical and legal specifications. This formalization poses the problem of maintaining the quality of the product, which might require changes in the production processes (Valsechini and Maze, 2000). The legislator proposes a number of differentiation tools to the actors, leaving them free to use the tool that is the most appropriate to protect their product and legitimize the geographical indication.

- *The territory as a source of product differentiation*

Associating a product to a territory seems to be an efficient protection and promotion strategy that makes it possible to articulate the sectoral and territorial dynamics. This strategy is part of a process of development of a resource whose specificity is a factor of differentiation for both producers and consumers.

The question of the protection of a product whose characteristics are related to its geographical origin cannot be dissociated from the question of its promotion. It is the prospect of commercial gains resulting from the differentiation of their product that encourages the actors to get involved in the procedure of acquisition of the Geographical Indication. The number and the diversity of producers in the different European countries who wish to obtain a GI reflect the interest generated by the association of a product with a geographical origin. In this regard, it must be noted that both the actors of the different stages of production and the public collectivities, driven by a wish to develop their territories, get involved in the procedures of acquisition of the GI. The mobilization of a diversity of actors has positive effects on the success of a GI. Thus for Carbone (2002) the relative failure of Geographical Indications in Italy (which is measured by the part of the production distributed under a GI label in the protected areas) can be explained by the fact that the local public collectivities have been more involved than the producers themselves in the development of GIs.

The product-territory association also raises the following question: On what is based the specificity that differentiates products for consumers. Examined from the angle of the development of a resource, the specificity lies on the characteristics of the product and the conditions and means of production on the one hand, and on the reputation of the product and of the territory on the other. The question is then to determine whether the reputation of the area has an effect on the chances of success of a GI and whether a GI has an effect on the reputation of the area. Should one privilege a set of technical rules codifying the conditions and means of production in order to maintain a tradition? Or on the contrary, should one make use of the reputation acquired by the area to facilitate technical innovation and the search for new markets? The French and European perceptions articulate both these strategies. They try to ensure both a vertical integration via the production chain and the markets, and a horizontal integration via territorial co-ordination. For this reason they are half way between a logic of regional mark (Peri and Gaeta, 2000) that aims to protect and develop the reputation of a geographical area, and a logic of industrial mark that aims to certify and qualify the processes of production.

2.Incentives for co-ordination among actors

The consensus among the producers concerning the choice of a GI is conditioned by their objectives in terms of protection and promotion. Thus the criteria retained by producers reflect the rules that they fix for themselves in order to acquire a collective name. The promotion of the GI lies then on the consumer's perception of the product.

- *The legitimacy of the acquisition of the Geographical Indication is guaranteed by the co-ordination of a variety of actors*

It is necessary to examine the importance of the process of co-ordination among the producers in their choice of a sign of identification that is adapted to their production. The choice of a sign of identification does not merely reflect the consensus reached by the producers concerning a geographical limit and a legal denomination of specification. It also reveals the producers' objectives concerning the commercial gains that the GI might generate but also the means and processes of production that they must implement in order to reach these objectives. Co-ordination is all the more necessary as the actors involved in the procedure of acquisition of the sign are situated at different stages of the supply chain. The contractualisation between the different operators of the chain is necessary in order to manage efficiently the processes of quality and promotion, and therefore to maintain the reputation of a product whose elaboration rests on the operations carried out at the different stages of the chain.

The appropriation of the label of origin is delegated to a group of actors. They fix rules used to exclude actors who are not situated within the geographic boundaries defined by the group and even to exclude internal actors if they do not adapt to the changes in the production processes resulting from new technical criteria. Inversely, all actors complying with the geographical and technical criteria are allowed to use the geographical indication. The relation between origin and quality assimilates the geographical indication to a common good that belongs to the group (Lucatelli, 2000). The mechanisms implemented by the legislator must therefore ensure that the allocation of the property right to the group of actors is legitimate. The processes of legitimization do not only concern the choice of the production area. When the legislator grants a property right to a group of actors he/she must make sure that the international legislation on the protection of GI is complied with. This requires that the specificity of the content of the sign of origin be defined and that the consumers' perception of this specificity be known. Implicitly, the group of actors must co-ordinate in order to define the demands of the potential market.

- *The consumer's perception of the product*

Ultimately, the procedures of promotion and product differentiation are only efficient if the adopted label is credible for consumers. A label is credible if consumers trust it and if the image conveyed by the product is positive. In the case of a label associating geographical origin and quality this association must make sense to the consumer. In other words, the origin of the products must represent a know-how that is common to the producers and recognized as such by the consumers (Valceschini, 2000). This recognition depends on the consumer's trust in the label that must guarantee a denomination of origin attributed to producers organized collectively. It then lies on the institutions that can guarantee that the label is reliable and that it complies with the rules concerning the mechanism of certification and of reputation. But it also requires that the image conveyed by the origin-related label be taken into account. The origin is a promise made to the consumer. And it is necessary to objectivize this promise in order to identify what consumers expect from an origin-related label. The promotional process then focuses more on meeting consumers' demands. But the evolution of the modes of consumption, related to the growing importance of supermarket distribution, tends to standardize the demand.

The identification translates a twofold interaction process. On the one hand, it shows that the actors of the supply chain have coordinated around the rules of production that are the most appropriate to promote their product. The question raised then concerns the legitimacy of the group that has coordinated to fix the rules. On the other hand, this identification is associated to the image conveyed or which makes sense to consumers. The identification of a product undoubtedly highlights its specific characteristics but also the choices made by the actors in terms of commercialization.

II. Processes of negotiation around the definition of the "foie gras duck from the south west" PGI

The analysis of the organizational and geographical changes results from a survey carried out in 2002 (Vincent et al, 2002). The strategies of the actors concerning the Protected Geographical Indications implemented have been determined through interviews of actors operating at the different stages of the chain. The question is whether or not the PGI ensures the protection and promotion of the original production area.

1.The choice of the PGI label is aimed to reduce uncertainties concerning the production

The South West is historically the main production area of Foie Gras in France. Indeed, of the four traditional production areas, 3 are situated in the South West: Landes, Gers and Perigord[4]. In the 1990s the " Foie Gras duck from the South West" PGI was implemented in a context of important changes in the supply chain and of strong uncertainties related to external determinants (competition of other production areas, European regulation) and internal determinants in terms of co-ordination and concentration of the actors in the South West.

- What is at stake for a sector under pressure?

In the last twenty years, innovations have led to the intensification of the production of ducks and geese. Until the 1960s, the force-feeding of geese represented, for small maize farmers, the opportunity to increase their income. The production was sold on local markets. Transformation and preservation enterprises contributed to reinforcing the reputation of the product and to increasing market outlets. At the beginning of the 1980s, the introduction of the Mulard duck represented a crucial stage [5]. The Mulard duck being resistant and productive it rapidly became the species favored by producers. This facilitated the implementation of a structured and compartmentalized supply chain. At the beginning of the 1990s individual cages and mash feeding resulted in increased productivity and a reduction of the hardness of the labor. The slaughtering process became centralized. The introduction of the "block of

[4] Alsace, which is still active in transformation industry, only represents 3% of the production of Foie Gras.

[5] In 1975, 35% of the Foie Gras produced was goose Foie Gras; in 2002 only 3.5% of the Foie Gras produced was goose Foie Gras.

Foie Gras" made it possible to "recycle" Foie Gras that were more sensitive to fat melting and standardized a product that became increasingly distributed through supermarkets. These changes occurred in a context of mounting pressure from downstream, following the involvement of great financial groups. They translated into a dramatic increase in the production of Foie Gras, with an annual growth rate of over 10% between 1980 and 2000, that is a doubling of the production every seven years.

The prospect of high returns led to the emergence of new production regions in spite of the rising debate on the well-being of animals.

At the beginning of the 1990s Brittany and the Pays de Loire got involved in the duck sector by playing the integration card, a method that had ensured the success of the "meat poultry" breeding business. From the start, the actors concerned built big barns and used the mash-feeding technique. The farmers involved were also younger than in the South West (SCEES-ITAVI, 1997). Until 1990 duck and goose breeding in the west was virtually non-existent but in the 1990s the production increased dramatically and the producers of the region secured a market share of 22% in 1998[6].

At international level, the existence of other producing countries conditioned the organization of the chain in France, even though the latter is by far the world leader. Indeed France is the main market outlet for countries such as Hungary and Bulgaria. Hungary, the second world producer of Foie Gras, has important human and technical resources and low labor costs. Although the volumes imported by France are stable, the risks of relocation of certain stages of the production process exist because of potential productivity gains. To this is added the threat to the practice of force-feeding, which is deemed cruel by many countries of Northern Europe. Under their pressure, a report on the well-being of force fed palmipeds was adopted on December 16, 1998 by the European commission. It requires that the use of individual cages be prohibited as from 2010.

- The implementation of the PGI

In light of these threats, can the production and the protection of the South West designation be maintained? The Chamber of Agriculture of the Landes region has initiated discussions on this question. The main preservation enterprises, who wish to get their supplies from the local producers and to preserve the positive image associated for the consumer to the South West origin have participated in these debates. The PALSO (Association for the defence of Foie Gras palmipeds of the South West) was founded in 1992. Its objective is to federate the actors of the chain. It is essentially in order to protect the South West Designation that the actors have mobilized to obtain a certification of the origin.

The actors of the chain agreed that a Protected Geographical Indication label [7] would be the appropriate label. A Certification of Product Conformity (CPC) fixing the minimal technical criteria to comply with was registered by the PALSO in 1995. The CPC was favored over the Red Label, which would have required more restrictive specifications. The boundaries adopted for the PGI zone are quite wide [8]. They include all the traditional production areas, which are characterized by the presence of fatty duck and goose markets. Provisions are also made to be able to use additional geographical labels for restricted areas: Chalosse, Gascogne, Gers, Landes, Quercy and Perigord. Finally all stages of the production process except for the brooding stage must take place in the area or restricted area in order to apply for the PGI. This concerns the breeding, force-feeding, slaughtering and transformation stages. The "Foie Gras duck from the South West" PGI was officially recognized in June 2000, following a process that lasted nearly a decade.

[6] In 1987, the South West represented 95% of the total French production of Foie Gras and over 90% of the transformation.

[7] A Controlled Designation of Origin was unlikely to be granted as the geographical aspect does not play significantly in the characterisitics of elaboration of the product.

[8] It covers the Aquitaine and Midi-Pyrénées regions, Corrèze and some *cantons* of Aude and Haute Vienne.

In a context of important production growth, 12.2 million ducks were produced under the PGI label in 2000 and nearly 16 million in 2002, that is, for the year 2002, approximately 76% of the production of the South West and 54% of the total French production. The number of operators of the different segments of the chain who obtain the PGI certification increases regularly. This success can be explained by the weakness of the constraints imposed, which has enabled a greater number of actors to co-ordinate.

- *The technical and geographical constraints remain weak in order to encourage a greater number of actors to co-ordinate.*

The necessity to maintain market shares and to protect the positive image associated with the designation of origin explains the criteria chosen for the PGI label: Large geographical area, non-restrictive specifications. The association of production and transformation is an essential aspect. These criteria result in a PGI that is original in terms of number and diversity of the actors concerned. Its implementation was accompanied by the reorganization of the chain that has become essentially controlled by co-operative groups.

The big preservation companies, knowing that the maintenance of their market share and the protection of the commercial use of the term "South West" depend on the development of the production, have played an important part in the implementation of the PGI[9]. Their relations with the local producers enables them to get sufficient supplies at a time when the questions of traceability have become important[10]. Maintaining their market shares necessitates then that a maximum number of actors be involved, which justifies the decision to choose the widest possible area for the PGI. The size of the area provides the necessary leeway for the main operators of the long production chain (co-operatives, slaughterhouses, preservation operators). In a context of concentration, their action area has extended and goes far beyond the traditional Foie Gras production areas. The criteria set up for the Certification of Product Conformity were chosen for the same reasons. They are not highly restrictive and are compatible with the search for productivity gains, as shown by the decision to authorize mash-feeding. However, the risk that production could become too industrialized justifies the decision to limit the size of the feeding strips to 1000 animals per breeder.

Co-operative groups are highly involved in the reorganizations of the supply chain. For the groups of cereal producers, the production of fatty ducks provides a source of diversification that helps them maintain the income of their members. It also provides a non-negligible commercial outlet for maize farmers[11]. Initially the co-operatives invested essentially at production level, but driven by the need to reduce costs in the supply chain they started getting involved in the different stages of the process, from the feeding of the animals to the slaughtering and transformation processes. Towards the end of the 1990s they took control of a large part of the transformation business. This was facilitated by the big financial groups' withdrawal of their capital. These changes occurred in a context of concentration of the structures; and as a result the duck and goose sector in the South West is today dominated by four main operators.

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9 The production-transformation relation is not compulsory for obtaining the protection of the name. The French law of 1905 authorises a product to bear the name of its place of transformation. The preserving companies of Alsace are in this logic because of the relocation of the production that occurred in the 1960s (Rousselot-Pailley, 2002). Similarly, acquiring a PGI is possible as long as at least one stage of the production, of the transformation or of the elaboration takes place in the protected area.

10 The risks of fraudulent use of the products in the chain were denounced at the time by several important actors in the supermarket sector.

11 During the force-feeding season, 95% of the diet fed to ducks and geese must be maize from the South West. In the Landes *département*, the ducks and geese sector consumes approximately 10% of the production of maize (agricultural survey, 2000).

2.Analysis of the organization of the chain around the PGI label

The results of the "Foie Gras ducks from the South West " PGI label are overall positive. Indeed, the PGI label has indeed enabled the South West producers to protect the South West production area which remains the first producer of Foie Gras in France and in the world, with 75% of the production. But, new uncertainties are emerging, and are revealed by the strategies implemented by the actors to differentiate and promote their production.

- *Co-ordination versus exclusion around the PGI label.*

In a context of uncertainty and organizational changes facilitated by product and process innovations, the PGI label has played its role of co-ordination of actors, which has made it possible to achieve the two objectives defined initially: the maintenance of the leadership of the area and the protection of the South West designation. This success rests on the exclusion of actors on the basis of geographical and technical criteria.

The implementation of the PGI has fostered the negotiations concerning the technical and organizational criteria that can be the object of a compromise between the different operators of the chain. These compromises were reached partly thanks to the constraints weighing on the future of the chain. Thus, the formalization of the production processes responds to the demands of traceability expressed by consumers and supermarket distribution and the structuring of the chain has become necessary to rationalize the production and reduce costs. However, divergences between actors have emerged because of the risks of industrialization inherent to the development of the production. The appropriation of the name and the risk of loosing the image associated to the PGI which would result if the industrialization of the production was too important are denounced essentially by the operators of the short production chain. The latter consider themselves as victims in two ways: firstly because they are no longer allowed to use the South West label outside the PGI framework and secondly because the PGI label authorizes production processes that they neither can nor wish to adopt and which modify the "traditional" image of the product they want to defend.

At national level, the PALSO mobilizes the interprofessional committee and the public authorities so that the "Foie Gras" designation be reserved exclusively for force-fed male ducks. They argue that female duck Foie Gras is of an inferior quality. This will constitute a regulatory barrier that will hinder imports and penalize hatcheries of the West (Rousselot-Pailley, 2002). The PGI label also ensures the official recognition of an area for which the notion of tradition can in the long term prove a decisive asset against the threats related to the well being of animals[12].

The co-ordination among actors of the South West reveals strategies that result in the exclusion of producers situated inside and outside the area. The actors refer to the demands in terms of quality and tradition to justify these exclusions, which shows the importance of these aspects in their strategies. This is confirmed by the analysis of the individual strategies of the main operators involved in the PGI.

- *Disagreements concerning promotional strategies*

The current disagreements between the four main groups[13] on the modes of promotion concern the choice of a sign of identification that would ensure that larger gains are generated thanks to the additional quality achieved. Indeed some favor an individual strategy through a mark and others argue in favor of a collective strategy via a label. These disagreements might jeopardize the co-ordination achieved in the framework of the PGI. Furthermore their choices foreshadow a new wave of exclusion,

[12] Thus cultural factors or factors related to the historical heritage can play an important role in the protection of certain practices (see bullfighting).

[13] Among the four main groups, 3 are cooperative groups and the fourth, Labeyrie, is related to a cooperative group.

in particular of intermediate operators which currently occupy the niche of the market targeted by labeled products. They also reveal the need for a regulation body that will protect the South West production area while guaranteeing the credibility of the sign.

Commercial strategies vary: Some consist in maintaining marks while others consist in investing in the label with or without geographical restrictions. Firstly, marks remain a major promotional tool. Labeyrie is the mark that has the biggest market shares on the supermarket segment and which benefits from the best reputation with consumers. Resulting from an old strategy, the reputation of the Labeyrie trademark rests on heavy demands at all stages of the production process, demands that materialize in more constraining specifications than those imposed by the PGI label. Investing downstream, the Euralis and Maisadour groups have taken control of the main preserving companies in the South West. In spite of the resulting concentration of industrial tools, their trademarks have been maintained, each being positioned on a specific segment of the market. The Vivadour group (the latest to hit the market) is different from the others inasmuch as it does not have a trademark. By taking control, with a co-operative group from Vendée, of a leading company in the commercialization of Foie Gras, it has been able to commercialize its products via a distribution mark. Secondly, by advocating investments in the label, the main groups reveal their need for additional promotional tools. The label has a positive image for consumers and can be used in conjunction with a PGI in order to benefit from a geographical sign. The question of technical specifications divides the actors. The negotiations do not strictly concern quality but rather the identification of the actors concerned by the label and the guarantees of investment returns for those initiating the certification process. Currently, the main groups position themselves in relation to two old labels which until now had little success[14]. The latter specify that their animals are fed whole grain and only concern raw products. These labels can now be extended to include transformed products which is of great interest for the main groups since this extension targets supermarket distribution. However the intermediate operators of the chain are concerned about this evolution and denounce the risks of assimilation of the Label product with an industrial product. For these reasons they campaign for the maintenance of whole grain force-feeding and for the method consisting in eviscerating the animal once it is cold, two techniques that are not so much factors of quality as they are criteria enabling them to limit the industrialization process. However, these choices result in additional costs which must be appreciated in relation to the additional promotional asset provided by the sign. Moreover, the use of a label generates the risk that actors outside the area could also produce under a label.

The analysis of the duck and goose sector shows three things. Firstly, the analysis of the "Foie Gras duck from the South West" PGI label shows that the actors of the South West have used the sign in a logic of regional mark. The establishment of rules and criteria that have enabled producers to offer a product of a given quality and to maintain the production was made possible by the fact that the area was protected. Secondly the tensions between the objective of protection and the objective of product differentiation are visible through the logics of exclusion underlying the signs of identification adopted by the actors. The main groups try to develop ranges of products in order to optimize their production processes and as a way of diversifying their promotional tools. Furthermore, creating a positive image for products whose characteristics are related to their origin reinforces the need to coordinate the actors of the chain in the geographical area concerned. The choice of strategy must take into account the expectations of the consumers and the demands of supermarket groups. Finally, the analysis of the strategies of actors highlights the fact that whatever the sign chosen, organizational and geographical constraints still weigh on the chain. The processes of concentration related to the rationalization of cost structures generate new needs related to coordination among actors.

[14] The Maisadour group uses the 12-89 label, property of the PALSO, with the labels «Landes and South West» in the framework of the PGI. The Vivadour group is positioned on the label Gers 16-89, property of Avigers, which it uses without a PGI. A transformed product label, extansion of the label 12-89 was obtained by the PALSO in 2001.

III. The tensions concerning the coherence of geographical indications

Identification signs related to the origin such as the PGI label continue to be conditioned by the ambiguity of the association between origin and quality. On the one hand, the development of procedures of traceability testifies to the evolution of the concept of “quality” of agro-food products. On the other hand, the concept of origin also evolves inasmuch as ultimately it coincides with consumers’ acceptation. Tensions between actors concern the qualification of the products and the reputation of the area. This is also true for other products that benefit from a PGI label, such as Olive Oil from Tuscany. The actors of this chain must also coordinate in order to find the most appropriate promotional tools and to define a sign that will make sense to the consumer.

1.Tensions concerning the technical criteria, fostered by the demands of the markets

The search for a consensus on technical criteria between the actors of a chain reveals problems related to the acquisition of the sign and to its image in a perspective of product differentiation. The efficiency of the choices made by the actors of the chain is estimated through the consumers’ perceptions of them.

In a logic of innovation associated to the new requirements in terms of traceability and food safety, specifications have become more demanding. Although traditionally, traceability was used as a differentiation factor for products targeting specific segments of the market, it is a property used to guarantee that food is safe to eat, and therefore concerns all producers. Thus, Charlier (2003) proposes to analyze traceability as a production standard. In their search for a consensus concerning technical criteria, the actors of the chain are guided by the need for a better organizational efficiency, made necessary by the demands of the markets. The size of the market and the organization of the chain are factors that differentiate two types of situation. Firstly, in the case of local markets and of small independent producers, the consensus between actors concerning technical criteria proves difficult to reach because of the heterogeneity of the processes of production (Carbone, 2002). This difficulty is reinforced when the actors are positioned on different segments of the market. Secondly, the implementation of a GI - whose technical criteria are based on the traceability dimension - leads to a change in the logic of the production processes. In this case, the technical criteria taking into account procedures that are increasingly standardized result in an industrialization of the production processes.

As the GI is accessible to all actors present in the area as long as they comply with the negotiated conditions, a multinational firm, via a local firm may also benefit from a GI. And, as Carbone underlines, this multinational firm possesses assets (in particular the ability to reduce costs of production, in conformity with the demands of supermarket distribution) that enable it to better exploit a GI than small producers. The GI can therefore, in the long term, increase the level of specification of the product and as a consequence lead to the exclusion of the local producers positioned on other segments of the market.

The method used for the evisceration of Foie Gras ducks illustrates this logic and makes it possible to define the positioning of the actors. Indeed the criteria differentiates the enterprises: In most big groups the evisceration process takes place immediately after animal have been slaughtered whereas medium and small producers do not have the financial and technical means to practise this technique. The relation between this criteria and quality is obviously debated and debatable[15]. Some groups hesitate to integrate the evisceration criteria in the content of the Red Label in order to differentiate Red Label products from PGI products on the one hand, and to minimize the potential risks of disorganization in the South West production area on the other. Thus the decision-making process is guided more by the

[15] The evisceration immediately after the slaughtering limits the melting of the livers and bacterial development.

need to build and manage a collective resource than by the need to define intrinsic quality characteristics. This analysis refers to the concept of club goods (Torre, 2002). Signs of quality result from the coordination between the actors who are excluded and those who can potentially benefit from them. It is the prospect of a profit associated with the use of the sign that encourages the actors to coordinate. In the case of a GI, the main incentive is the commercial appropriation of the geographical name, inasmuch as the association between quality and origin can have a positive impact on the consumer immediately; indeed this does not necessitate a long process of construction of the reputation as is the case for a trademark (Ittersum et al, 2003). The qualification of the product is then only used to legitimize the appropriation of the geographical name.

The debate on the modes of product differentiation refers to the consumer's understanding of the information about the product. The multiplication of signs via labels tends to dilute the information. Initially meant to give consumers clear information about the products, signs, because of their profusion, have become less readable and more opaque. In these conditions, the more credible the sign is for consumers, the simpler the message can be. Thanks to the diversity of actors that they mobilize (groups of producers, institution governing the sign, certifying body) Geographical Indications benefit from a high credibility. However, the potential benefits of the GI in terms of information for the consumer should not be overestimated. Consumers often know little about the differences between labels in terms of production processes. This enables the big industrial firms of the olive oil sector, for example, to advertise their products by associating them to idyllic environmental images (van der Lans et al, 2001). This can be explained by the importance of the attributes of trust in the domain of agro-food products. And these attributes concern characteristics (food safety, conditions of production, environment, ethics) that the consumer cannot verify through experience and for which he therefore has to rely on the information provided by the producer. Thus, even if a public label prevents producers from giving deceitful information, it is still difficult to provide efficient information to consumers concerning the characteristics of agro-food products (Crespi and Marette, 2003). As Carbone underlines (2002), the emergence of more industrial actors is partly due to the fact that they have the financial means to launch advertising campaigns.

The choices of technical criteria reveal the importance, for the actors of the chain, of the question related to the industrialization of the processes that could lead to a standardization of the products. They explain the high level of tension within chains and territories as one of their consequences is to lead to the exclusion of the initial local producers.

2.Tensions concerning the importance of geographical boundaries in the product-territory association

The consensus between producers concerning geographic boundaries is not sufficient to guarantee the promotion of a product. The association of a product to a geographical area must also make sense to the consumer. Considering the Geographical Indication as a signal relating quality to origin requires a joint analysis of the modalities governing the collective exploitation of the product and the exploitation of an immaterial asset, i.e. the image related to the area. By associating the product to the image, the analysis shifts towards the processes of elaboration and of guarantee of the reputation that is necessary for the consumer to trust the product.

The reputation of the label is a source of commercial gain as long as it responds to the criteria that are important for consumers. Identifying these criteria is important for the actors of the chain when they implement strategies of product differentiation and promotion. In the case of agro-food products, consumers are interested in characteristics that more or less emphasize the traditional aspect of the product (i.e. know-how, cultural aspects, geographical anchorage), or the industrial dimension (i.e. certification, standardization). Nowadays this double specification of products concerns all actors of the chains because of the changes in the modes of consumption and in the demands in terms of hygiene and food safety. Even though the opposition between traditional production and industrial production is weakened by the influence of the supermarket sector in the construction of the product's image, tensions have emerged between the consumer's perception and the industrialization of the production process that is meant to standardize the characteristics of the products, through an increase in the volumes produced.

In the duck and goose sector, the tensions between actors show that the heart of the problem is indeed the establishment of the product's reputation. In order to give credibility to the sign of origin as a sign of quality, two logics are at work:

- The reputation rests on the Red Label. In this case, defining a number of quality criteria validated by a certifying body enables the actors to give consumers a positive and clear message on the product. As a consequence producers situated outside the area also have the possibility of producing this level of quality. The aim is not to protect an area but to maintain the product's level of quality as consumers perceive it.
- The reputation lies on the geographical area of origin. In this case, the actors must make sure that the area makes sense to the consumer, for example by maintaining all stages of the chain. But the product's reputation that is attributed to the geographical area must also be legitimized.

By associating a Red Label to a PGI, French legislation creates the risk of weakening the relation to the origin as indeed, consumers tend to choose the sign which is the best known and has the best reputation i.e. the Red Label. Indeed, because all groups of producers in France and even in Europe can obtain a label, there is competition on prices that translates into a standardization of the production. The aim is then to produce a given " superior "quality at the lowest possible costs. This is part of a logic of vertical integration and of industrialization of the processes which is not necessarily compatible with the valorization of the geographical anchorage. Only the reputation of the origin in relation to the product pushes producers to coordinate and defend the protected area.

How do the actors of a given geographical area coordinate in order to find the means to guarantee the credibility of the origin-quality relation for the consumer? The property right of the sign is delegated to a group of actors whose legitimacy rests on the identification criteria of the product. Moreover, as the sign can only be used by the group of actors, the question of its legitimacy with regards the image of the product related to the origin can be raised. The positive image of a product can rest on factors that are not taken into account in the identification criteria. Indeed, it is important to avoid the misappropriation of the collective image for the benefit of some actors. Thus, in the case of Foie Gras, the artisanal production and the duck and goose markets are important assets for the image of the geographical area, assets from which the enterprises of the long production chain benefit when they try to obtain a Geographical Indication. If the actors of the short chain cannot mobilize a GI (in other words when they are no longer allowed to use the geographical origin as reference for their product) even though they contribute significantly to the positive image of the area, there is a paradox. This risk is real inasmuch as the involvement of the actors of the long supply chain in the processes of qualification and certification requiring important investments, imply the potential exclusion of the actors of the short supply chain. This paradox is partly lifted if the processes of legitimization of the GI take into account these different positions. All actors of the protected area are then encouraged to undertake additional procedures that will enable them to meet consumers' demands and expectations. The actors of an area can coordinate in order to find the most efficient ways of mobilizing patrimonial, cultural or gastronomic elements. Additional goods and services that reinforce the image of the area for the consumer can generate additional income that benefit the group of actors (Mollard et al, 2001). However, studies on the so-called " basket-of-goods " show that tourism plays a structuring part in the association of products with services, which refers to local markets. Other studies emphasize that the association between product and territory depends, for the consumer, on the products considered (van Ittersum et al, 2003). For one same geographical area, the association may be positive for one product and negative for another. These issues foster the current debates on the European certification of the geographical origin, in which the actors try to decide whether the strong relation between origin and quality should be maintained or if the origin must be considered as a sufficient and necessary criterion to protect and promote a product whose characteristics are related to its origin (Peri and Gaeta, 2000).

Conclusion

Several factors raise questions about the coherence of Geographical Indications. Meant as tools of protection and promotion of a traditional product whose characteristics are related to its geographical origin, GIs require first of all that the actors who are granted the right to use the geographical designation are legitimate. Secondly, in order to promote a product through a GI, it is necessary for the actors of the supply chain as well as the other actors of the area to take part in the coordination and negotiations and to take into account consumers'perception.

The study of the Foie Gras case enables us to analyze the strategies of actors in terms of signs. It is the necessity of defining appropriate strategies that encourages the actors of a chain to coordinate. The analysis shows that the actors of a supply chain must choose criteria that will make the signs of identification coherent. Furthermore, it shows that the search for the coherence of the signs of identification related to the origin requires that the actors of the chains coordinate and take the demands of consumers into consideration. The case of Foie Gras is interesting inasmuch as it represents a paradoxical situation. Indeed, the South West production area, the world leader in the production of Foie Gras, offers a luxury good that is distributed increasingly through supermarkets and whose identification sign has protected the production area while resulting in an industrialization of the production processes. The recent changes in the duck and goose production chain are the result of the interactions between the different actors who have developed their markets from a collective observation of the latter's behavior.

The actors choose rules of elaboration of the product (relation to the territory, know-how, reputation) according to the image they wish to give their product of origin on the one hand, and by taking into account the current demands with regard to traceability and food safety. This question of the relation between origin and quality is at the center of the European debate concerning the certification of origin. A paradoxical situation would arise if the GI facilitated the processes of industrialization. Indeed, forced to reduce production costs in order to meet the demands from downstream, the chains would have to industrialize the production even though they had benefited from the positive image of a traditional product. This paradox is partly lifted by the fact that an increasing number of actors take part in the coordination; an evolution that is necessary for the processes of legitimization and promotion of the GI. When choosing the criteria that must be retained to define the origin, the actors of the chain must meet the demands of consumers whose influence increasingly impacts the conditions of elaboration and production of the products. Their demands can shift the coordination between actors of the chains. Resulting from sectoral and territorial logics and from consumers' perceptions, the reputation of the GI rests on processes of legitimization, which necessitate the participation of a great number of actors.

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Sustainable Rural and Commercial Development (The BNU-Program): Participant Cooperation, Multi-Dimensionality and Learning

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Summary

The experiences from a case study associated with the rural development and commercial research program (the BNU-program) at the Agricultural University of Norway (NLH) from 1995-2001 will be discussed in this paper. Cooperation between three varied regions of Norway was established. The research community had as its goal to contribute to local/regional innovations and thereby developing a better understanding of rural and commercial development (BNU). Included in these goals was a focus on both the realistic challenges met by entrepreneurs, businesses and the local communities as well as the conditions within a given framework.

It became apparent that to be able to carry out both tangible and institutional changes, and at the same time generate new knowledge, is a demanding challenge. There are many pieces that need to fall into place simultaneously for this to be achieved. Nevertheless, the experiences were valuable and new insights that were an outcome of the work have given me food for thought. The main conclusions are that rural and commercial development is a complex area and requires 1) a communicative cooperation among all the participants, 2) an interdisciplinary, case-based research design, and 3) a continuous and learning innovation process.

1. Introduction

I will discuss, retrospectively, some of the approached problems that resulted from my experiences with the rural and commercial research program (the BNU-program) at the Agricultural University of Norway (NLH) from 1995-2001. This essay will include reflections pertaining to what extent local development areas and agricultural research can achieve innovation and revitalization in rural areas.

The main goal of the BNU-program was to generate new knowledge by establishing cooperation with 3 varied regions in Norway. These regions were coastal communities in northern Norway, fjord communities in western Norway, and rural communities located in the mountainous area of eastern Norway.

I will reflect on some aspects that were a result of the cooperation the program had with the 3 specified regions. The research questions are:

1. How should one develop cooperation among all participants to be able to achieve good, innovative processes in Norway's typical agricultural areas? Key terms: instrumental or communicative cooperation among partners involved.
2. How should one design professional advice which pertains to the rural reality that encompasses agricultural production? Key terms: perspectiveness, interdisciplinary and case design.

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3. How does one use what has been learned from experience as part of an innovative process? Key words: single-loop learning, double-loop learning, collective learning.

These questions will be addressed in sections 2, 3 and 4. I am making use of a case-design (Yin, 1994) and the method is associated with an essay format using a narrative form (Misher, 1986). Specific individual projects which other researchers were involved in will not be examined in this essay.[1]

My presentation of the experience with the BNU-program should be viewed in light of the fact that I was, at that time, the *coordinator* for the work. I did not have any background as a researcher and, therefore, did not take on the role of a researcher. This did not prevent me from being both a participant and observer in the many professional processes that occurred. It is the *last* role that this essay is based upon.

2. Interaction of local resources and participants

The Steigen Case

Steigen is a coastal and agricultural community located north of Bodø, Norway and to the northwest are the Lofoten Islands. As others before me have experienced, the first impression of the scenery in this region is breathtaking. When I approached the area by sea, we sailed through the skerries which have an almost bewitching atmosphere and docked at Helnessund, a harbour with a long history as being an important fishing centre. My main contact in Steigen headed out to Engeløya with me. This is an extremely fertile island with magnificent cultural landscape and many historical monuments. The island also has beautiful sandy beaches and it was from here that I experienced the midnight sun ”dancing” along the peaks of the Lofoten mountains.

The research director, at that time, from the Agricultural University of Norway (NLH) had previously been in Steigen and had discovered the area’s qualities. On one of our first visits to the area in 1997 she accompanied us. Also joining us during that visit were 2 professors in landscape management and building planning. We were a considerable delegation from the university that now felt that the landscape, the former trading centres and the traditional food and fishing cultures ought to give a BNU investment in this community a very good jumping off point. The idea was to focus on agriculture’s multi-functional role. It seemed obvious that there was potential for tourism and relocation - especially for those people who had moved to work in the city of Bodø.

We arranged two days of discussions and inspections. We met first with those who were in leadership positions both politically and administratively within the municipality; 8-10 people. As is common practice in similar cases, we started off by brainstorming about the challenges and possibilities. On the second day, we wanted to structure and organize the discussions into topics. We were rather surprised, though, when only one of the local people, a consultant in the municipality, showed up that day.

One question troubled me as we headed home. Why did only one local representative show up on the second day of our visit? We were given the explanation that they were each busy with other priorities or that some unexpected events had arisen. Despite this, it still astonished me. It is not every day that a small municipality is visited by a research director and 2 professors from the agricultural university to

1 A list of all publications dealing with individual projects under the BNU-program is available (unpublished).

discuss a cooperation that would benefit further development within that municipality. Had we seriously misjudged what this local community was actually interested in? Was this an expression of an "informal culture?" Or was there something about our competency that was not adequate for their needs?

After a while I understood more. Employment had gone drastically down in the municipality - especially within coastal fisheries and small-boat production that had traditionally been combined with agriculture. Was it a pure commercial investment and not so much the multi-functional agriculture that they were actually interested in? A few weeks later I decided to head back there for another visit. This time I travelled around with our local contact person and visited professional groups and individual businesses related to agriculture and fishing. We met with the National Farmers' Union, the Small Farmers' Union, the Farm Womens' Union and the local agriculture research and extension group. A list of possibilities having to do with grazing, animal and plant production were touched upon as well as the potential for the local dairy. In addition, I had conversations with the head of fisheries in that area, some fishermen, fish-processing plants (fillet-production), smolt (young salmon) production and a fishing-net mending industry.

Back at the university I contacted some of our aquaculture researchers who subsequently travelled to Steigen. One of these introduced a joint project with several of the smolt and fishing-net mending companies. Later, the dean of the university joined in and spoke with the northern division of Tine (Norway's Dairy Cooperative) and the substantial fish-farming business Follalaks about a possible cooperation. An idea was finalized in the form of a food-processing centre working together with the dairy and a new salmon-processing plant in the municipality.

Now things were starting to happen in the aforementioned aquaculture businesses and the plans for food-processing were also set into motion. In an evaluation of the BNU-program, the contact people in Steigen were very pleased with the researchers who they had been in contact with. We were able to notice the beginnings of good communication and mutual trust. After a while an important criticism surfaced: the expectations were clearly greater than those that had been fulfilled. Partly to blame were the lack of financial interest from SND[2] and others, and a lack of follow-up from the research community at the Agricultural University of Norway. Despite all the activities set into motion and several professional, inspirational meetings, we agreed with this evaluation. All of us had higher expectations than those that had actually been fulfilled. I noted the following factors that had to do with the different participants in this case:

- The municipality had not formulated any strategic commercial plan of its own. In the BNU-program, we emphasize those local municipalities that want commercial development must take on the developer role themselves by drawing up such a plan. Moreover, there was an ongoing joint project in rural development that Steigen was not a part of. The county of Nordland, which Steigen is situated in, was more than willing to be represented in a local planning group within the BNU program.

- It was truly a boost for our research to have the university's research director and 2 professors make the aforementioned trip to Steigen. This was also true when the dean visited the area at a later date. Because of this there was a meaningful exchange at a higher level between leaders from the university and those in leadership positions in Steigen. The role of the individual researcher then was to disseminate information and put research into use rather than developing new research. During the visit the dean expressed the following:

[2] The Norwegian Industrial and Regional Development Fund.

"After working some time with rural and commercial development (BNU), many researchers will find that they have not had the chance to publish as many articles in recognized scientific journals as other colleagues, or should we say competitors, who adhere to the guidelines within discipline-oriented research. For younger researchers this will result in a weaker basis for merit in the research community."

Instrumental participant cooperation

Based on the experiences from the Steigen-case, the relationship between the participant's involved and local resources can be represented by figure 1.

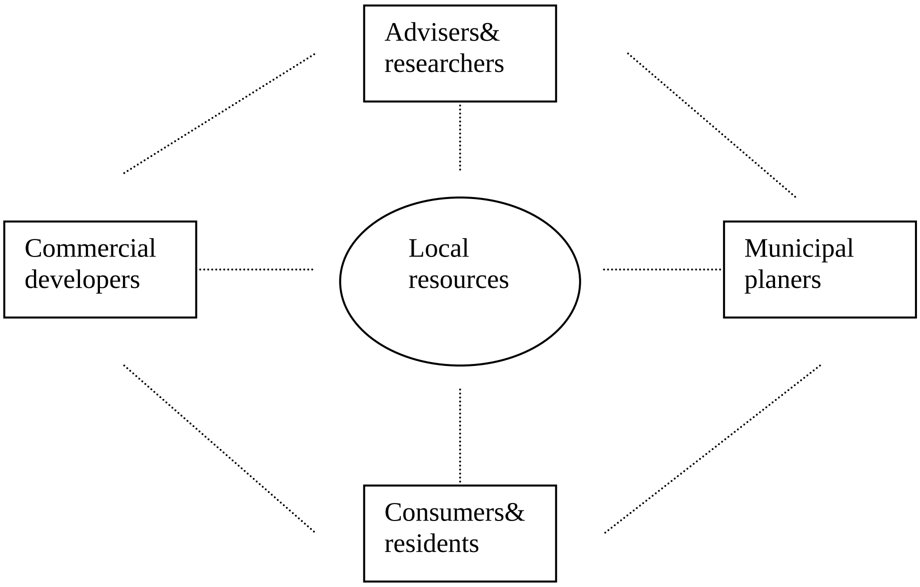

Figure 1: Local resources and instrumental participant cooperation

The figure illustrates that many participants are involved in the use and management of local resources. This challenge creates a contact and a flow of information between the participants involved. The contact has, however, an instrumental character to it. Within the context of BNU it was regarded as sufficient to establish an intentional agreement, a coordinator was hired centrally and locally, and that there were some capital resources to draw upon. One counts on that there is adequate incentive so that all the participants will respond to the initiative and begin the necessary activities. In the proper sense one would base this on well-rooted organizational theories; for example those discussed by Morgan (1997).

For a planned project that goes across traditional organizational borders, the aforementioned approach is insufficient. At the same time, though, the rural areas and in particular rural commercial interests are woven together into larger and nationally encompassing organizational systems. With that in mind, the institutional perspective becomes more relevant, something in practical terms has not gotten the attention it deserves in the BNU-program. Berger and Luckmann (1997) emphasize that there exists a collective reality in the sense that individuals, or groups of people, partially form and are formed by society's surroundings. Some systems are so efficient that even though they are the result of the activities of many individuals, appear as an "objective reality." An example of this is the dairy industry in Norway which has been a monopoly for 70 years. This fact was made clear to us as we discussed the dairy in Steigen which is being threatened to be shut down. Both locally and regionally it was felt that our chances here were almost zero.

Communicative participant cooperation

A one-sided focus on strong market stakeholders will, however, be a barrier that will prevent the individual or local society from being innovative. Even the most stream-lined organizations are not so rational that they are not susceptible to influence. Brunnson (1994) suggests, on the contrary, that it makes itself evident in a list of inconsistencies *internally* in organizations as well as *between* organizations and their surroundings. Many well-organized food distribution companies can, under certain conditions, see the value of cooperation between local producers and consumer groups, regional authorities and research (Murdoch, 2000).

Murdoch also states that rural development, in addition to finding its place in the *vertical* food chain that was touched upon above, is also dependent on building a *horizontal* network. This implies that a democratic, cohesive forum consists of active participants as well as a commitment and competency among local residents, as the basis of a joint effort. The experience from Steigen made us question whether the participants, especially those of us with a research background, had the insight to understand that it was clearly necessary to invest substantial amounts of time and resources.

In this context, I feel that the following illustration, figure 2, is more appropriate and effective than figure 1.

Local resources

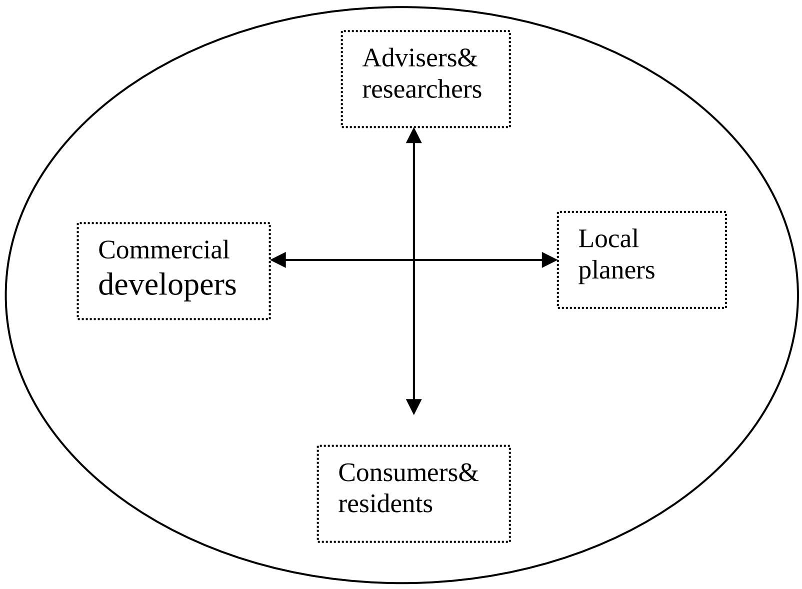

Figure 2 Local resources and a communicative participant cooperation

In figure 2, local resources take on the role as a common denominator for the different participants involved, not as a confined entity as seen in figure 1. The different participants, including advisers and researchers, have now managed to come ”inside” of the reality that rural communities find themselves in. In addition, the squares around the different participants are dotted and the arrows between are solid which is in contrast to what figure 1 shows. This figure illustrates a situation where *interactive cooperation has been achieved*.

Steigen wanted some participants that carried weight within the development process. At the same time, though, their “style” was direct communication, personal contact, mutual trust and action. This was in line with their informal and hospitable culture. There is a lesson to be learned here for both regional authorities and researchers. First closeness, respect and trust then formalized plans and binding cooperation agreements which are a result of this. Therefore such plans will be less likely to be ”dead” but instead more alive and action-oriented.

3. Rural communities are both complex and unique

The Varaldsøy Case

In the summer of 1998 I arrived in Øyarhamn on the island of Varaldsøy. With me on this trip were several researchers, politicians and rural developers. The island of Varaldsøy is in the Hardanger Fjord in western Norway. This visit was part of a follow-up to a cooperation we had with the municipality of Kvinnherad regarding a development plan for Varaldsøy.

We made one stop at a farm owned and runned by Haktor. In addition to being active in local politics he is also an enterprising farmer who has invested in cabin building for vacationers and tourism. Haktor was an example of a resident who was both an entrepreneur and willing to invest in the community. He could see what qualities and potential this island has. We viewed some very important environmental sites such as former pastureland rich in a flora of grass and herbs, stone walls, old abandoned barns and houses Haktor mentioned that agriculture in the area was on the decline and that second growth was a danger to the cultural landscape. He also informed us that the population in the area was also in decline but felt that this trend could be turned around. The first step, he felt, was to change the environmental authorities' philosophy of ”from the top on down” decisions which he meant reeks of mistrust of local democratic ideals and inhibits commercial development. In its place he saw the significance of a more environmentally based agriculture which could preserve the special environmental qualities of the island. He was engaged in continuing to develop agricultural tourism tailored to a public wanting to live and work on an actual farm.

During our visit to the island, we took part in some rather lively conversations with the local representatives and the researchers from the agricultural university. Spirits were very high! Those of us from the university returned to our departments and quickly decided to put together a project proposal. We narrowed the topic to ”alternative rural residences” and decided to concentrate on the following areas[3]:

- Rural residential planning that reflect the local building tradition (including traditional courtyards)
- Waste management and recycling programs
- Site planning and community planning
- Investigate residential and living preferences.

Our aim was to organize this in such a way that researchers from several different fields would be able to establish a cooperation with some selected rural development areas; in this case - Varaldsøy. We recommended doing this as a case study. Since we did not want to base the work on an already defined interdisciplinary model, it seemed natural to utilize an explorative approach. Local conditions would shape the terms of the research work.

The proposal was sent for approval to 3 institutes at the university. Two were positive to continue working on these ideas while the third institute was negative to the idea. The head of this institute wrote the following memo to us:

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[3] Lunde, E.M., 1999: (In Norwegian: Organizing alternative living situations in rural areas. BNU-report 2/99).

“The report provides a straight-forward review of several relevant topics with regard to rural residential planning. It is to some extent characterized by normative understandings that it is wonderful to live in the countryside, which ought to be played down a bit. Those asking and researching the questions could have expressed themselves more clearly by providing more precise ways of looking at the problem. The question arises whether the Agriculture University of Norway should use a significant part of its staff on development and consultant work as this report seems to suggest. The report, as it stands today, provides a weak basis for systematic research.”

This was not easy to decipher. To be able to more precise when “asking and researching the questions” harmonizes well with a case design. The same applies for the warning about too much “consultant work.” In reality, case research is more a building up of new knowledge rather than selling knowledge. On the other hand, ”normative understandings,” using more ”precise ways of looking at the problem” and ”systematic research” were being warned against. I had great difficulty in understanding that it was even possible to begin with very clear ways of looking at the problem at hand. Was not that in itself part of the research question to be answered? What is actually the problem to be addressed? Given the complex circumstances on the island of Varaldsøy, we were not able to define these in advance.

Objections were so strong that we decided to terminate the process already begun. However, another possibility arose when two researchers and 20 students took it upon themselves to create a ”plan for the coastal and outlying areas of Varaldsøy.” They carried out interviews, conversations and took part in local meetings and created a very professional report which included descriptions of resources, conflict areas, commercial development possibilities and planning needs.[4] This plan gave a much-needed basis for further work on the island.

Perspectiveness

The above account illustrates that when one is working in a rural and commercial development context, one can meet many different aspects, ideas, and research questions to be addressed. On Varaldsøy, one was concerned with the vast richness of resources on the island and the possibilities for a multi-functional agricultural development. The local residents and their spokespeople wanted external support, including that from the Agriculture University of Norway, to be able to have a firm grip on innovation and revitalization of the island.

The big question to ask would be “What would a sustainable agriculture and a sustainable development for Varaldsøy in its entirety consist of?” Based on discussions with different people in the area, it was not possible to form one clear understanding to this question. This corresponds to accounts made by Pretty (1995) who points out that there is no precise and absolute definition of the concept. It becomes necessary to put things into perspective, as much as possible, and be willing to adjust one’s understanding of what is sustainable through a continuous learning process (Ljung, 2001). Did the statement about alternative residential possibilities, for example, take this into consideration? Was one in this particular instance, adequately inquisitive and searching, as the head of the institute was interested in?

[4] Edvarsen, M., 1999: (In Norwegian: Coastal and outlying area plans for Varaldsøy. BNU-report 1/99).

Interdisciplinary approach

The 4 subtopics that were addressed in the report about alternative residence possibilities proved to be both exciting and relevant. At the same time, though, it became clear to us that we were dealing with 4 distinct topics. The topics were not to be addressed based on a stringent model of professional integration. I had a very clear understanding about this, but instead chose to emphasize that trying this out should occur in parallel with each other and in the same geographic areas.

It was hoped that the process would further develop professional integration. Experience shows, however, that an interdisciplinary approach must be more than just a cliché of words if there is to be any value in it. It is advantageous in this case to distinguish between two terms (MacNaill, undated)

1) Multi-disciplinary approach. This can occur in reality when one takes advantage of several professional areas to solve different problems. For example, this can be used in a business or in a municipality but in such a way that the professional disciplines operate autonomously.
2) Interdisciplinary approach. In this case, knowledge is generated with concise, discipline-dominating terminology and will affect and change existing disciplines and theoretical structures.

Will a case-design be a good route to follow to be able to develop a genuine interdisciplinary cooperation?

Case-design

The institute head, as mentioned earlier, warned against ”normative understandings.” He had every right to say this since so much research is done in the name of objectivity, but which is actually based on clear assumptions and understandings of real situations. The problem arises, however, when such assumptions and presumed understandings are not explicit. When this does not occur, it becomes difficult to carry out trials afterwards and be able to verify or repeat the research results.

With regard to Yin (1994) the challenges in a place like Varaldsøy do not allow, first and foremost, themselves to be solved by simply counting sheep, types of trees, types of landscapes etc. and study eventual connections between these (survey analysis). The challenges are neither solved alone by, for example, changing a property border, testing a new building construction or similar experiments. Since what is important here is the interplay between nature, technology and people, it is essential that researchers also have an insight in the unique local culture and its thought processes. Stonehouse (2003) points out the following:
“Substainability necessarily deals with a complex blend of issues from the hard sciences (biological and medical), semi-hard sciences (environmental and ecological) and the soft sciences (economic, sociological, political and animal welfare). The case-study approach allows for differences as it progresses toward compromise solutions. It is holistic and integrative in concept and scope. It permits more than one “right” answer.”

Through the BNU-program I have experienced completely the truth in the statement that ”communities have problems, universities have departments”[5]. The holistic approach which Varaldsøy attracts, is felt by agricultural research to be lacking the necessary tools to deal with it. Experience with the BNU-

[5] OECD, 1992.

program is not unique or different from experiences with other comparable programs. In an evaluation of a national program to improve the interplay between local commercial interests and R&D-institutions (also called SMB competency), it was revealed that experiences were rather mixed. In particular it was pointed out that a ”cultural gap exists between the business world, in particular small and medium-sized companies, and the institutions of higher learning” (Gammelsæter, 2000). Schön (1983) uses the term ”technical rationality” as an expression for the gap between research and reality that the positivistic technological research from the last century carried forth. He maintains that convergent knowledge which is not in harmony with a divergent reality is a highly, amputated knowledge. The Varaldsøy-case seems to confirm this opinion.

4. Regions and research that provide learning

The Mountain Region case

Towards the end of the BNU-program period, many of us at different levels, began to acknowledge that the work could not continue in its fragmented state. In the program’s third case study, the Mountain Region of Østerdalen, several exciting sub-projects were completed. In the final phase the Council for Mountain Regions made clear the interest in a:
”Pilot program for innovation in agriculture and food processing in the Mountain Region of Norway” and that “with the experience from the BNU-program we hope to have a deeper future cooperation with the agricultural university where we have joined the development projects into a more thorough program.”

The council further stated:
“It is difficult to put researchers’ individual interests into effect in a cohesive rural development. Fragmented contributions become weak without being able to take into consideration the deeper connections and the complex conditions that exist in the relationship between rural development and commercial development. From the point of view of the Mountain Region, we believe, therefore, that BNU should to a greater extent put individual professional interest in a more comprehensive context whereby a research program is directly linked to a development program for an area”[6]

In similar fashion, NLH - the Agriculture University of Norway – admitted the following:
“In the upcoming strategic planning period, the university will have as a priority to develop interdisciplinary cooperation as unique quality about our university” and there shall “be established organizational structures and systems for resource allocation that are adaptable to interdisciplinary forms of cooperation and programs”[7].

These admissions form a very good starting point for a new phase 2 - both “partners” now realized the need to address the issue in a deeper, more determined way. As many were expecting a new, positive resolution from the university’s board of directors, to their surprise came the following announcement: The BNU-program was to be permanently discontinued and in its place the board presented a rather cryptic message about adapting to a “thematic investment in added value.” Instead of intensifying and completing cooperation with the involved municipalities - as had been agreed upon, all contact was now

6 (In Norwegian: Regional council for the mountain region of Norway, 2000. Letter dated 20 June 2000 to the Agricultural University of Norway).

7 (In Norwegian: Strategic plan for the Agricultural University of Norway, 1999-2004. A strategy for changes and quality development.

to be terminated. Therefore, it was no longer possible to build upon what had thus far been learned and to further cooperation with all the current participants.[8]

Single-loop and double-loop learning

The change in focus from traditional agricultural practices to one of rural development and growth for small and medium-sized local businesses represented a substantial new change in orientation. This requires new competency and an even better understanding of what is, at several levels, of value and affects municipalities and agricultural organizations as well as the research communities.

Argyris and Schön (1996) point out that such changes in processes very often cause difficulties because the established partners have a tendency to want to keep the status quo. The author's use the term ”single-loop learning” about situations where one partner initiates a series of changes to better a situation that is felt is non-optimal. In reality this means an adjustment of profile or image in the activity, for example, project deadlines. This will usually not have any "disruptive" effect on the guiding values and on-going activities. In the event that the latter is true, then Argyris and Schön (1996) feel that double-loop learning i.e. one is open-minded towards new, often strange, ideas and that one is willing to orient central parts of one's business towards new goals and values.

Collective learning

Cooperation between rural areas and research where the goal is a lasting readjustment and renewal can only be a mutual learning process. Many projects and activities often can be put into effect, but will be fragmented and undynamic in form which is in line with the concept of single-loop learning. The request from the Mountain Region for collaboration with the research environments indicated openness for new impulses and new knowledge in a way not previously characteristic of Norwegian agricultural districts. The potential for double-loop learning, yes, "regional learning", was apparent.

The Agricultural University of Norway wanted to strengthen its competency in relation to the rural area's need for readjustment. The following question arises: can this exclusively occur through transfer of the already existing knowledge, or is it necessary for up-dated knowledge? The experience from the Mountain Region was clearly that the "individual researcher's interests" seemed to strongly steer the contribution from the research milieu. This must not be misunderstood, though. Individual researchers with drive are needed, but these should be given guidelines so that this "drive" is of use for the common good. Only then will the "silent knowledge" and the researcher's knowledge become supplementary to each other.

The exit of the BNU-program and the circumstances around it, indicate that the agricultural research community has a long way to go with regard to "learn to learn", or in other words, carry out "learning research".

[8] Ethical implications of such an approach is a different aspect that is not addressed here.

Closing comments

In Steigen, one was preoccupied with new employment possibilities. On the island of Varaldsøy, the focus was primarily on the area's residential qualities. In the mountain region one saw many new possibilities of developing good, regional institutional arrangements. Rural and commercial development (BNU) is a many-faceted field. It is necessary for time to allow for a greater integration between knowledge and reality, and between knowledge and taking action. The road to knowledge *about* BNU goes via knowledge *in* BNU.

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How to analyse technical adaptability of dairy farms involved in quality cheese production? Case study of non-pasteurized cheese production with Protected Geographical Indication label in the Pyrenean Mountains

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Abstract

In less favoured regions milk production is traditionally combined with cheese production to enhance the value of the products. In the Pyrenees producers wish to make a non-pasteurized cheese with a Protected Geographical Indication (PGI) label: “tomme des Pyrénées au lait cru”. The specifications define a three month grazing period and a quarter of the forage to be given as hay during the no-grazing period. We established for 423 farms how closely the feeding management conformed to the specifications. The greatest number of farms are characterised by two types of feeding management. To conform to the specifications the forage systems of these farms should be changed. We show the value of looking at the farm system operational processes to suggest different ways of modifying management. After interviewing 12 farmers, we identified 3 methods of livestock production management and five methods of grass area management. To understand the farmer’s capacity for change we analysed the convergence between livestock production management and grass use practices and as a result, described five management types. This analysis permitted us to propose different forms of technical advice to help farmers to meet the PGI label requirements. If we exclude one type, which is too far from the specifications, it is possible to propose four forms of advice that can be used for the different types of management.

I. Introduction

1. Context

Faced with changes in the CAP, there is uncertainty as to how dairy systems should evolve. In less-favoured, e.g. mountainous, regions, milk production is traditionally combined with cheese production (Brunschwig, 2000). To improve farm incomes in these regions, the dairy farms must enhance the value of the products and to the recognition of a quality cheese (Chatellier & Delattre, 2003). Generally certain criteria explain traditional production patterns. To develop relationships between milk production and quality cheese production many quality policies could be introduced, the most important being the European PDO (Protected Designation of Origin) and PGI (Protected Geographical Indication) quality labels (Sylvander, 1994). These policies are generally essential to the local development (Barjolle et al., 1998; Barham, 2003). Producers make specifications to guarantee livestock farming and cheese processing practices. These guarantees can concern flavour, smell and appearance characteristics, food safety, and relationships with the “terroir” and brand image of the product. In the important case of mountainous regions, the first stake is to specify more clearly the milk and cheese production for labelled products. This situation is very interesting for us researchers, because it raises the question of changing the farming system.

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2. From making specifications to changing feeding practices

In the specifications, milk production is generally defined by the feeding pattern which can be more or less precisely defined. For some products with Protected Geographical Indication (PGI), feeding only needs to conform with agricultural regulations (e.g. a ban on feeding animal proteins and hormones). This is the case for the PGI "Tomme des Pyrénées", a French cheese descended from an ancient cheese-making tradition but now a standardised product made by south-western dairy firms. Also this cheese is made with the milk produced by the largest and most modern and intensive farms, many using maize silage to feed the dairy cows. But traditional cheese production continues on the cheese-making farms and small firms. Today this production made with raw milk cannot be protected by the PGI label. So the producers of the supply chain wish to make a new PGI label "tomme des Pyrénées au lait cru" to protect these products. New specifications will state that cows are to be fed with hay during winter and with 3 months of pasture in spring and will limit this production to farms in the Piedmont plain and mountainous areas. But in this region, grass silage or maize silage use is very developed. So farmers who wish to produce in accordance with specifications will have to change their feeding patterns. We are interested in studying the feasibility of these modifications in the different types of farming system.

3. Creating research and development groups and the birth of a research project.

To study forage system evolution in the Pyrenees, workgroups have been formed with farmers, farming advisers and researchers. The main objective of these workgroups is to suggest a coaching method for changing dairy farming systems. We used our competence to model the dairy system management rules and tools within these workgroups and for training farmers on the changes needed in their forage systems.

In this workshop, we describe (i) a study of feeding systems for the region's farms and their conformity with specifications (ii) a running model for a few dairy farms with an analysis of links between the forage system and herd management which is important to explain the farm system operational processes (Thénard, 2002; Marey, 2003). The aims of this work are to have a better knowledge of the farmer's scope for action as regards the change in the forage system.

II Methods

To carry out this work we used a lot of data from different sources. We illustrate our methods using this type of data and we explain our methodological approach.

1. Technical data from a large sample of dairy farms

To analyse the range of regional feeding systems, we used technical data from agricultural advisers and survey data from almost all dairy farms in the region. We had data from 423 farms. First we have tried to describe different feeding systems. Hence we have defined the grazing period with or without supplements, the indoor feeding period and the forages used. Secondly we used this result and other variables to describe the diversity in regional dairy farming systems and their closeness to the specifications. We made a statistical correspondence analysis. All variables used are given in table 1. We used the PROC CORRESP and PROC CLUSTER with the Ward method of the SAS programs (SAS, 1989).

2. Technical data and survey of a dozen dairy farms using grassland

To describe with precision forage systems and herd management we have chosen to study a limited number of cases. The thirteen farms chosen are representative of the regional dairy farms. They use grassland for dairy cow feeding and they belong to the research and development groups.

Our objectives were to identify firstly the livestock production management, and secondly the grass area management, that we call grass use. Next we tried to make a synthesis of these two subjects to explain the different management types.

First we used technical data which had already been collected by farm advisers. These data concerned (i) milk production and herd management over 5 years to identify some of the livestock husbandry practices and to link them with the rate of milk production, (ii) the grass area management described from area use calendars that explain cutting and grazing management. But these area use calendars required a comparison of the localisation and timing of farmers' interventions. We transformed time into a degree-day scale as used for phenology studies (Theau & al., 1998). In order to analyse grass use practices with area use calendars and to identify decision rules we used 3 variables:

- Feeding in late winter and spring: 3 feeding types are used. 3 farms use maize silage throughout the year; grazing when used is always combined with maize silage. 5 farms use maize silage during winter and grazing during spring without feeding with another forage. 5 farms use hay during winter and grazing during spring.
- Turnout date and date of the end of the first grazing cycle allow us to characterise spring grazing management. For all of the farms, turnout occurs between 300 and 550°C.days. 8 farms have an early turnout date, before 380°C.days. 2 have a late turnout date between 400 and 500°C.days. 3 farms have a turnout after 500°C.days. To analyse the date of the end of the first grazing cycle we considered the farms that end the first grazing cycle before the threshold of reproductive apex ablation. 4 farms ended the first grazing cycle before this threshold; the other 9 did not.
- Grazing management on hay meadows and the hay quality allow cutting practices to be characterised. 4 farms have a majority of their meadows grazed before apex emergence; 4 have the majority of their meadows grazed after apex emergence and 5 farms have specialised meadows, the ones which are cut not being grazed.

We also made a survey using "semi-managerial interviews" concerning:

- livestock husbandry practices like feeding, breeding and herd replacement practices; and grassland management practices, in particular cutting and grazing management practices. After the interview, graphical methods (like Bertin's method, Bertin, 1977) were used to identify different management types. Bertin's method permits individuals be grouped together without using statistical methods but only with a visual comparison between the different variables that describe the individuals. We made a table with individuals (the farms) as rows and variables as columns, whose different forms are represented by different colours. Successive permutations of the order of rows and columns reveal the closeness between individual farms. We analysed data to describe farming system operational processes with "practice combining" (Landais & Desfontaines, 1988).
- decision rules of the herd management and fodder production. The aim was to produce a management scheme of the grass area allocation (Coleno & Duru, 1999). The combination of this point of view and the practice approach has led to the identification of different management types and their proximity to the "tome des pyrénées au lait cru" PGI specifications.

III Results

1. A wide diversity in the feeding system in the Piedmont plain area, but few farms based on a grassland system.

The study of the 423 farms give us a description of five different feeding systems:
Type1: Grazing without supplementation for 3 to 6 months; hay and aftermath for winter feeding.
Type2: Grazing for 3 to 6 months with a hay distribution; hay and aftermath for winter feeding.
Type3: Grazing for 3 months or more, often with another forage distribution (hay or maize silage); silage (grass or maize) and hay (4-5 kg per day) for winter feeding.
Type4: 3 months grazing, generally with a silage distribution; maize silage for winter feeding.
Type5: No grazing, maize silage fed every day

The new specifications of the PGI label require a 3-month grazing period and a quarter of the forage to be fed as hay during the no-grazing period. We established how close feeding management types were to the “tomme des pyrénées au lait cru” PGI specification (table2).

This result shows that the requirements for the change in the forage system change are different for type3 and type4, i.e. the majority of farms. They will be to confirm grass use in type3 and to develop it in type4 where farmers wish to join the PGI scheme. To change feeding practices it is not only necessary to transform the forage system organisation but farmers need to take stock of the herd management and the milk production objectives.

2. Different production objectives depending on farmers

2.1. Livestock production management

The livestock husbandry practices study distinguishes 4 combinations of practices that characterise: (i) the milk production level (see the columns of table 3). This level is mainly due to livestock feeding and animal breed; (ii) 3 combinations of practices that characterise milk production distribution throughout the year (see the rows of table 3), these combinations of practices depend on culling and calving.

Table 3 shows some proximity between level and timing of milk production. We therefore proposed three livestock management types:

- Winter production with productive animals (+5500 litres of milk per cow), mainly Holstein fed with maize silage in winter i.e. feeding type 3 and/or 4 described above.
- Spring production with less productive animals (4000 to 5400 litre of milk per cow) fed with grazing during spring and summer but with a high level of concentrates in some cases (feeding type 1 and 2).
- Milk production all through the year with animals producing from 4000 to 5000 litres of milk, mainly Montbéliardes ou Brune des Alpes. Feeding is based on grass and sometimes maize silage (feeding type 2 and 3).

2.2. Grass use practices

In a Bertin's table (table 4) we used 5 variables: (i) winter and spring feeding, (ii) beginning of spring grazing, (iii) type of cutting, (iv) hay quality, (v) date of ending of supplementation in spring. We could describe 5 grass use functions:

- For 3 farms, use of grass to feed the herd is not specific because maize silage is used all through the year.
- High quality grazing with maize silage (3 farms): maize silage is used for winter feeding and a high quality of grazing in spring with specialisation of the grass area to either grazing or cutting.
- High quality grazing and hay with maize silage (2 farms): nearly the same as the previous one, but grazing before apex emergence allows high quality hay to be made.
- High level of constraints on grazing (2 farms): These mountainous farms have a low use of grazing because of the steep slopes.
- High quality grazing (3 farms): the herd is only fed with grass (grazing and hay). An early turnout date results in high quality grazing in spring.

2.3. *Management types*

The convergence between livestock production management and grass use practices allows us to identify 5 management types.

Type 1 (3 farms): milk production during winter with a productive herd and use of maize silage all through the year and little use of grazing. These farms are technically very far from the PGI specification.

For two other types the lactation period is more important than the forage management system.

Type 2 (3 farms): Milk production in winter with a highly productive herd fed with maize silage and high quality hay in small quantities in winter and grazing in spring when the feeding needs of the herd are lower. These farms do not use enough hay in winter to meet the PGI specification.

Type 3 (2 farms): this is type is characterised by milk production all through the year, use of maize silage in winter, and grazing in spring. These farms are close to the PGI specification.

Type 4 (2 farms) is concerned with farms producing cheese which grazing in spring presented a high level of environment constraints, the herd is therefore fed with a high level of concentrates. These farms easily meet PGI specifications but there is a possibility of increasing the amount of feeding.

Type 5 (3 farms): milk production in spring with hardy breeds and a grassland situation. The herd is fed with hay in winter and with grazing during spring and summer. The grass area technical management permits high quality feeding with grass. These farms are already in the PGI scheme.

IV Discussion and reflections on the evolution of farm technical systems

The five management types that we identified are either near to or far from the "tomme des Pyrénées au lait cru" PGI specifications. Type 1 is not able to produce milk for this cheese. This production system does not aim to produce milk for a quality cheese but for industry, using highly productive animals. By contrast, types 4 and 5 do meet the PGI specifications. It is to be expected for type 4 because this type already produces milk for this cheese. But farmers of type 4 use large quantities of concentrates which are not reflected in the animal production level. This can be partially explained by environment constraints, these farms being mainly in the mountains. These constraints force farmers to make poor quality hay in insufficient quantity. They make up for this by using concentrates. Farmers of type 5 are not subject to these constraints; their farms are not in the mountainous zone and so can produce hay of good quantity and quality. This system is the one which fits best with the PGI specifications. Type 2 and 3 are intermediate. They do not meet PGI specifications because they mostly use maize silage for herd feeding. However they are not so far from the specifications because they use grazing as all or part of their feeding during spring and summer. To fit with the specifications these farmers should increase the amount of hay fed to the herd. The consequence of such an increase would be a decrease in animal productivity. We note that grazing is used with an other feed. This is specially the case of type 3, and partially case of type 2. The grazing management and feeding management using grazing could therefore be improved on these farms. An increased proportion of grazing in the feeding could have two consequences: modification of the area allocated and an increase in stock feeding management problems, such as an increase in stock or of feeding interruptions (Coléno & al, 2002).

Taking into account the 5 management types it is possible to propose different forms of technical advice to teach farmers how to meet or to keep within PGI specifications. If we exclude type 1, which is too far from specifications, it is possible to propose 3 forms of advice which can be used for the different management types:
-Identification of demonstration farms which may provide data on management systems that fit with PGI specifications and that show other farmers how to meet the specifications. These demonstration farms will come mainly from type 5. A specific piece of advice for farms of this type could be about co-ordinating grazing and cutting on the same areas. This advice could be made using tools that analyse area use over time taking account of grass quality (Theau & al, 2001).

- Technical advice for hay making. This concerns types 2, 3 and 4. The objective is to convince farmers that a late cut does not contribute to hay quantity because of senescence loss, but does contribute to poor hay quality (Theau & al, 1998).
- An advice for grazing management that mainly concerns farms of types 2 and 3. The objective in this case is to convince farmers (i) that it is possible to have an earlier turnout date using simulation models (Coléno & Duru, 1999), and (ii) that it is necessary to use areas where the grass does not grow too much. This allows the amount of rejected herbage to be decreased so as to prepare a high quality re-growth. The latter is better when residual herbage is low (Duru & al., 1999; Duru & al., 2000). Use of the “practice analyser tool” proposed by Theau & al. (2001) showing the effect of residual herbage and early grazing could be a useful tool when discussing these situations.

We should consider the PGI specifications when considering the advice to be given. In the specifications it is recommended to use hay for conserved feed. No other cutting and storage forms are considered. But the Pyrenees have a temperate climate and an early hay cut is difficult to make in such a humid climate (Charpenteau & Duru, 1983). Hence the use of other techniques that allow grass to be cut when wet, such as bale wrapping, should be given more attention. Negotiation between farmers and the cheese industry to mak common PGI specifications are moving in this direction.

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Table1: variables of the analysis

Name and description of the variables	Number of modality for the different variables	Using in analysis
Forages used and closeness of the PGI label	4	Principal
Use of a technical adviser	2	Principal
Cheese-making farms or milk producing	2	Principal
Quantity of milk produced	4	Principal
Number of dairy cows	3	Principal
Specialisation with Holstein breed	3	Principal
Agricultural area (AA)	4	Principal
Crop area	4	Principal
Part of the grassland in the AA	3	Principal
Part of the grassland in the main fodder area	3	Principal
Other production in the farm	5	supplementary
Sub-region	4	supplementary

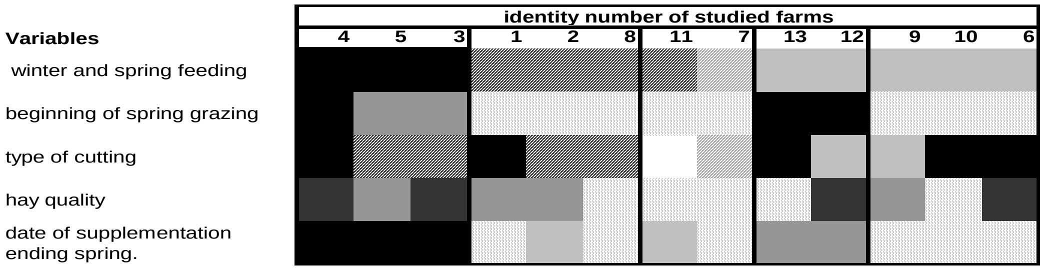
Table2: Feeding management and conformity to the "tomme des Pyrénes" PGI specifications

Feeding management	Number of farms	Conformity to the specifications	Milk production in comparison with milk production area
Type1	29	++	1.5 %
Type2	27	++	1.3 %
Type3	85	+	18.8 %
Type4	236	-	61.9 %
Type5	46	--	16.5 %

Table 3: management of milk farms

Milk production Livestock management	Low productivity with concentrates	Low productivity using grass	High productivity with hardy breed	High productivity with specialised breed
Management for a winter production			1 farm	5 farms
Management for production throughout the year	1 farm	1 farm	2 farms	
Management for spring production	1 farm	2 farms		

Table4: grass use practices described with Bertin's method



different colours are used to represent the modality of the best explanatory variables. Each groups of farms are made with the visual aspect. For each group we could described a grass use management defined with the homogenous modalities alone.

WORKSHOP 2

The sustainability of small scale farming

Are Social and Human Capital Important in Promoting Continuity of Farming? Evidence from Polish Farmers

Axel Wolz*, Jana Fritzsch and Klaus Reinsberg**

Abstract

Agricultural development in Central and Eastern Europe has not been that successful as anticipated at the start of the transformation process. New agricultural production entities emerged, but private farming does not play such an important role like in Western Europe with the exception of Poland and former Yugoslavia where agricultural production had not been collectivised. Nevertheless, these "private" farmers used to be closely linked to the state-owned upstream and downstream sectors. With the transformation, in these like in all transition countries the organisations in support of the agricultural producers had to be re-organised. The former socialist type of mass organisations had become obsolete, membership-oriented ones which are independent from any outside interference had to be established, in most cases, from scratch. As it could be observed during the last decade, quite a number of private farmers had been very successful. The reasons have to be analysed as most of the production factors have been more or less equal.

In this paper we want to analyse the role of formal organisations in promoting agricultural development in transition economies using primary data from Polish farmers. We assume that successful private farmers more eagerly join organisations in support of agricultural producers. Hence, our analysis is based on the central hypothesis that, besides the provision of physical, financial and human capital, social capital can be identified as a significant factor in promoting agricultural income and the continuity of farms. Our findings reveal that social capital is an important factor contributing to the material welfare of agricultural producers in Poland, but not as strong as anticipated. Our hypothesis is not fully supported by our analysis, but not rejected either. Similarly, the impact of human capital is not that significant as assumed. More in-depth research is needed.

1 Introduction

Economic development in the rural areas of the transition countries has not been that successful so far as expected in 1989/90. Although the transformation of former agricultural production co-operatives and state farms into production entities compatible with the market-economic system had been accomplished relatively quickly and the number of registered and, particularly unregistered, private farms increased rapidly, their share in agricultural production is in general much lower than in the EU-15. The major reasons why (private) farming did not materialise as expected had been analysed by various authors (see e.g. Bezemer: 1303-1304). The situation in two countries, i.e. Poland and former Yugoslavia, is somewhat exceptional as there had been no collectivisation of agricultural production during the socialist regime. But also in these countries the agricultural sector developed very slowly during the last decade. However, as could be observed during the last decade, quite a number of private farmers had been very successful. The reasons have to be analysed as most of the production factors have been more or less equal.

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But the transformation of the agricultural sector refers also to all those organisations in support of the newly-established agricultural producers to become competitive in a market-economic system. Those agricultural organisations integrated in the centrally managed mass organisations under the guidance of the socialist party had become obsolete. New organisations which are membership-oriented and independent from any outside interference had, in general, to be established from scratch. Basically, these supporting organisations can be differentiated into those with a major lobbying function like farmers' unions, economically-oriented ones like producer associations, supply and marketing co-operatives, credit unions, etc. and those specialised in information gathering and extension, like specialised agricultural associations. All these organisations have been set up in all CEEC, but they are still in an infant stage compared to EU-15 where an extensive network of supporting organisations is highly effective.

In this paper we want to analyse the role of formal organisations in promoting agricultural development in transition economies. We assume that successful private farmers more eagerly join organisations in support of agricultural producers. Hence, our analysis is based on the central hypothesis that, besides the provision of physical, financial and human capital, social capital can be identified as a significant factor in explaining economic development at the national, regional and, finally, at the local levels. This paper is structured as follows: In the next chapter the concept of social capital, its definition and options of its measurement are discussed. The major part will be made up by the analysis of data about Polish farmers whether membership in agricultural organisations and human capital indicators have an influence on their material welfare. A short concluding chapter follows.

2 Concept of Social Capital

While the term "social capital" has been applied for quite some time, the concept had been become more popular during the 1980s, particularly by the studies of sociologists like Bourdieu (1983) and Coleman (1988) and political scientists like Putnam (1993). Intuitively, its basic idea says that one's family, friends, associates, business partners, fellow-members in organisations and networks, etc. constitute an important asset for the individual; one that can be called upon in crisis, enjoyed for its own sake or leveraged for material gain. In economics, the concept gained prominence with the execution of 'social capital initiative' by the World Bank during the second half of the 1990s. When analysing economic performance the ambitious claim had been put forward that social capital might constitute an independent, and hitherto underappreciated, factor of production. The classical economists identified land, labour and physical capital (that is, tools and technology) as the three basic factors shaping economic growth. During the 1960s, the neoclassical economists introduced the notion of human capital, arguing that a society’s endowment of educated, trained and healthy workers determines how productively the orthodox factors can be utilised. Now, advocates of the social capital concept argue that the most innovative ideas will amount to little unless that person also has access to others to inform, correct, assist with and disseminate their work. In essence, where human capital resides in individuals, social capital resides in relationships (Woolcock 2002: 20-21).

The growing theoretical and empirical literature has helped to fuel a resurgence of interest in the social dimension of development. A range of new research has shown that communities endowed with a rich stock of social networks and civic associations are in a stronger position to resolve disputes, share useful information, set up informal insurance mechanisms, implement successful development projects, and confront poverty and vulnerability (Isham et al.: 6). However, there had been a lot of criticism about the vagueness of the concept. There are simply too many meanings associated with this concept and a consensus about a commonly acknowledged one is still missing. Therefore, some economists are very sceptical whether this concept should be applied in studying economic issues (e.g. Manski: 121-123).

Others argue that these differences and disagreements are a good measure of the intellectual excitement of the current social capital literature and urge to go on with the debate (e.g. Durlauf: 418).

The major reason for the large spread of different understandings of social capital can be seen in the fact that different authors focus on different dimensions which in reality are interdependent and overlapping. Since individual authors emphasise different aspects of the various dimensions, it is no surprise that the adopted definitions of social capital vary to a large extent. Some authors have tried to cover as many dimensions as possible, which means that the adopted definitions are very broad-ranged. It follows that it is almost impossible to quantify or to measure them. Therefore, voices became louder and called for a more tightly focused micro definition of social capital and advocated a 'lean and mean' conceptualisation focusing on the sources – that is, primarily social networks – rather than its consequences (which can be either positive or negative, depending on the circumstances), such as trust, tolerance and co-operation. The focus is on the micro level and the structural elements. The upside of this approach is that it is more or less clear about what is, and what is not, social capital, making for cleaner measurement and more parsimonious theory building; the downside is that it tends to overlook the broader institutional environment in which communities are inherently embedded (Woolcock: 22).

In our analysis we will follow this approach and rely on Rose who defines social capital as follows: "Social capital consists of informal social networks and formal organisations used by individuals and households to produce goods and services for their own consumption, exchange or sale" (Rose 2000: 1). In general, informal social networks comprise face-to-face relationships between a limited number of individuals who know each other and are bound together by kinship, friendship, or propinquity. Informal networks are 'institutions' in the sociological sense of having patterned and recurring interaction. However, they lack legal recognition, employed staff, written rules and own funds. Formal organisations are legally registered and, hence, have a legal personality. They are rule-bound and have to follow formal procedures in their management. In general, they have a secured annual budget which might be made up by their members, the market and/or the state. A formal organisation can have as its members both, individuals and/or other organisations (Rose 1999: 149).

Closely linked to the discussion about the definition of social capital is the question of how to quantify and measure it. Like human capital, social capital is difficult, if not impossible, to measure directly; for empirical purposes the use of proxy indicators is necessary. Depending on the definition adopted, the number of indicators varies which make any comparison of social capital studies almost impossible. In line with the call for a more tightly focused micro or more pragmatic definition of social capital the number of indicators can be reduced. This school of researchers focuses on one type of proxy indicators dealing with membership in associations. Other promising avenues to measurement are indicators of trust and adherence to norms and an indicator of collective action (Grootaert/van Bastelaer: 346) which cannot be discussed within the scope of this paper. The most easiest way to measure social capital is to record the number of organisations and informal networks of which one is a member. Under the label "Putnam's Instrument" the density of voluntary organisations at national, regional and local levels are assessed. How many such organisations does A belong to. It is a way to measure an aspect of people’s ability to work together (Hjollund et al.: 3).

3 Own Analysis

While the number of studies dealing with the social capital have increased rapidly during the last decade, not that many authors have adopted this approach when analysing agricultural development in transition economies, so far. Rose (1999 and Rose et al. 1998) and O'Brien (2000) have carried out first researches in rural areas, but their focus had been on the actual existence of social capital among the rural population and not agricultural development itself. Chloupkova and Bjornskov (2002) did a preliminary analysis of social capital among private farmers in Czech Republic. But, in general, it can be concluded that there is a lack of information regarding the economic effects of social capital on agricultural development in transition economies. In our study we want to focus on the organisational aspects of social capital as well as on human capital among agricultural producers in the CEEC. While in Poland agricultural production had not been collectivised during the socialist period, the "private" farmers were closely tight to the state-owned upstream and downstream sectors. Therefore, the organisational network supporting the newly established agricultural producers had to be re-build since 1989. We want to test our main hypothesis whether membership in agricultural organisations, i.e. social capital, has an influence on the level of farm income and hence promote the continuity of farming. In addition, we want to assess whether there is any impact of human capital indicators.

In 2000 IAMO executed a survey among Polish farmers about their access to viable financial services. It has to be admitted that the objective of this survey had not been the analysis of social and human capital. But there had been questions about membership in organisations and some human capital indicators. It can be assumed that the respondents have answered them truthfully. Therefore, it had been decided to use these data for a first test about our hypothesis. Nevertheless, the authors are aware of the objection that a secondary analysis of a survey designed for different purposes cannot be expected to cover the full set of relationship between social and human capital and material welfare. In our (secondary) analysis the focus is on the micro level and on the structural elements of social capital. At this stage, just the membership in organisations could be recorded but not the costs involved in becoming and remaining a member.

This survey consists of a random sample of 464 farms representing different legal forms in the former voivodships of Szczecin, Tarnów, and Rzeszów. It had been executed during 2000 and refers to the budget year of 1999. The respondents had been farm managers and household heads (see for more detailed description of the survey: Petrick). For the analysis of our hypothesis we are concentrating on private farmers only. The total number of valid cases comes up to 410. The farms were differentiated according to the major farming systems. Those farms with more than 70 percent of their gross farm revenue derived from crops (including the value of subsistence products) were classified as crop production farms, those farms with more than 70 percent of their gross farm revenue derived from animal production as animal husbandry farms while the remaining ones were grouped together as mixed farms. In addition, these three dominant farming systems were divided into those farms smaller than 10 hectares and those equal and bigger than 10 hectares. This border line has been set deliberately as we assume that those farms cultivating less than 10 ha will be among the first ones to give up farming once more other sources of income will become available.

In the original survey the focus had been on the following aspects: the farm household, agricultural production, off-farm employment, assets, investment, access to and opinions about financial services, farm management issues and plans about the future. One question dealt with their membership in various types of organisations. Respondents had been asked, whether they were member of a co-operative bank, a credit union, any other type of co-operative, a farmers' union, and/or a political party. The answers were combined into a simple unweighted index of Social Capital I, amounting from 0 to 1, i.e. member in no organisation comes up to zero, member in one to 0.2, etc. In addition, respondents had been asked whether they were elected leaders in various organisations. They were asked whether they were an elected member of the supervisory board of a co-operative bank, a delegate to the Chamber of Agriculture and/or an elected member of regional authoritative bodies. Those who have been elected can be seen as leaders of the farming population and we assume that they are somewhat better-off than the others. The answers were combined with those of membership to a second simple unweighted index of Social Capital II, amounting again from 0 to 1. Those farmers being a member in no organisations and no elected representative were valued at zero while those being member in all 5 organisations and elected representatives to all three options got one.

In addition, it had been looked at the major human capital indicators. The variable "education" has been defined as an index and comes up from 0 to 1, i.e. not completed primary school is set at zero, completed primary school at 0.25, completed vocational school at 0.5, completed secondary or technical school at 0.75, and completed university at 1. As a second variable we have defined "job experience" as the number of working years given by the respondents. On average, respondents worked for about 22.1 years. As a third variable we looked at the "manager experience" whereby it had been asked for the actual number of years managing the private farm as the decision-making agricultural household head (excluding the years as helping family member). On average, respondents were managing their farms for about 16.4 years. Finally, the age of the respective farm household heads had been recorded as well. With an average age of 43.8 years this variable is rather low in the survey.

We will analyse the data in two steps: Due to space limitation we will concentrate on the most important ones based on our analysis. First, we discuss the importance of the major factors characterising the farms, i.e. the age of the household heads, the relevance of subsistence production in relation to the gross agricultural farm revenue, the educational level and job experience of the household head as human capital indicators and finally the significance of social capital. The discussion is based on the comparison of the average values adopting (a) the Kruskal-Wallis-Test when comparing the three farming systems and (b) the Mann-Whitney-Test when comparing the two different farm size groups within the respective farming system. This analysis is followed by a correlation analysis in order to test whether we can support or have to reject our basic hypothesis.

First round of analysis: Comparison of means

At first, we want to investigate, how human capital, social capital and the rate of subsistence production differ between three dominant farming systems. As it is shown in Table 1, we compare the variables on the level of all farms.

Table 1: Comparison of Major Farming Systems with respect to Human Capital, Social Capital and the Rate of Subsistence Production for All Farms (N=410)

	N	Average	Median	Mean Range
Education				
Crop Production Farms	89	.65	.75	244.28*
Mixed Farming	145	.59	.50	204.10*
Animal Husbandry Farms	176	.55	.50	187.05*
Job Experience				
Crop Production Farms	89	18.2	20.0	163.34*
Mixed Farming	145	22.7	20.0	209.04*
Animal Husbandry Farms	176	23.6	23.5	223.90*
Age of Farm Head				
Crop Production Farms	87	42.7	43.0	190.76
Mixed Farming	142	44.4	43.0	204.89
Animal Husbandry Farms	174	43.9	43.0	205.26
Social Capital I				
Crop Production Farms	89	.20	.20	197.29
Mixed Farming	145	.20	.20	199.45
Animal Husbandry Farms	176	.23	.20	214.64
Social Capital II				
Crop Production Farms	89	.16	.13	201.24
Mixed Farming	145	.14	.13	198.71
Animal Husbandry Farms	176	.17	.13	213.25
Rate of Subsistence Production				
Crop Production Farms	89	12.05	.00	130.85*
Mixed Farming	145	26.33	22.26	253.68*
Animal Husbandry Farms	176	16.74	13.07	203.56*

* Significance at 0.05 level.

Source: Own calculation with data from the IAMO Poland farm survey 2000 (Petrick 2001).

The Kruskall-Wallis-Test shows significant differences between the farming systems for the educational level, the job experience and the rate of subsistence production. Looking at the mean ranges, we conclude that the educational level is highest among the heads of crop production farms and lowest among those of animal husbandry farms. The job experience is lowest among crop production farms and highest among animal husbandry farms. The rate of subsistence production is highest among mixed farms and lowest among crop production farms.

With respect to the two farms size groups the picture looks as follows: On the level of small scale farms (see Table 2), we can show significant differences for the educational level, both social capital variables and the rate of subsistence production. According to the mean ranges, the educational level is highest among crop production farms and lowest among animal husbandry farms whereas social capital is highest among animal husbandry farms and lowest among crop production farms. The rate of subsistence production is highest among mixed farms and lowest among crop production farms. For the large scale farms (not shown in a table), we found significant differences in the educational level, the job experience and the rate of subsistence production. The educational level is highest among crop production farms and lowest among animal husbandry farms whereas with respect to job experience it is the opposite. The rate of subsistence production is highest among mixed farms and lowest among crop production farms.

Table 2: Comparison of Major Farming Systems with respect to Human Capital, Social Capital and the Rate of Subsistence Production for Small Scale Farms (N=231)

	N	Average	Median	Mean Range
Education				
Crop Production Farms	34	.67	.75	143.71*
Mixed Farming	88	.58	.50	115.14*
Animal Husbandry Farms	109	.55	.50	108.06*
Job Experience				
Crop Production Farms	34	20.0	20.0	95.78
Mixed Farming	88	24.4	25.0	117.61
Animal Husbandry Farms	109	24.3	25.0	121.01
Age of Farm Head				
Crop Production Farms	34	46.2	46.0	120.44
Mixed Farming	86	46.6	44.0	116.46
Animal Husbandry Farms	108	44.9	44.0	111.07
Social Capital I				
Crop Production Farms	34	.12	.00	94.40*
Mixed Farming	88	.16	.20	108.35*
Animal Husbandry Farms	109	.22	.20	128.92*
Social Capital II				
Crop Production Farms	34	.11	.13	98.96*
Mixed Farming	88	.12	.13	107.36*
Animal Husbandry Farms	109	.16	.13	128.29*
Rate of Subsistence Production				
Crop Production Farms	34	27.17	12.36	96.88*
Mixed Farming	88	36.26	34.51	145.53*
Animal Husbandry Farms	109	21.07	17.28	98.12*

*Significance at 0.05 level.

Source: Own calculation with data from the IAMO Poland farm survey 2000 (Petrick 2001)

The analysis shows, that the heads of crop production farms are more educated but not so experienced in their job whereas the heads of animal husbandry farms are more experienced but not so educated. We could not prove differences in the age between the three farming systems but we are aware that more experienced farmers are also older farmers and a higher level of education means less years working in the job. Therefore we conclude that younger, more educated farmers specialise in crop production than in animal husbandry. Older more experienced farmers are not ready to give up their traditional production structure. The results found with respect to the rate of subsistence production are not surprising. Subsistence farms are, in general, mixed farms in order to provide the family with a wide range of food. More interesting is the result for the social capital variables. The analysis proves that on the level of small scale farms social capital is more accumulated in animal husbandry farms than in crop production farms. We did not find the same result for large scale farms where social capital is on the same level for all farm types.

In a second step, we looked more closely at the effects of both variables, i.e. farm size and farming system, together, i.e. small and large scale farms and the three types of farming systems separately. Due to limits of space, these figures are not shown in a table. With respect to farms specialised in **crop production**, we found significant differences between small and large scale farms for the age of the farm household head, both social capital variables and the rate of subsistence production. Farmers of smaller farms are older than farmers of larger farms. Social capital is higher among larger farms than in smaller farms. The rate of subsistence production is higher among smaller farms than in larger farms. With respect to **mixed farms**, the job experience, the age of the farm household head, both social capital variables and the rate of the subsistence production differ significantly between small and large scale farms. The heads of smaller farms are more experienced and older than the managers of larger farms. Social capital is higher in larger farms than in smaller farms. Similar to crop production farms, the rate of subsistence production is higher in smaller farms than in larger farms. With respect to the **animal husbandry farms**, we found only differences between small and large scale farms for the rate of subsistence production in the way that among smaller farms a higher percentage of the production is used for own consumption.

Summarising the findings of the comparisons of means it can be concluded as follows: The impact of the human capital and social capital variables differ between farming systems and farm size. Older and more experienced farmers manage smaller farms with a higher share of animal husbandry. Younger and more educated farmers prefer larger farms with a higher share of crop production. Subsistence farms are small mixed farms whereas subsistence production losses importance in larger more specialised farms. It can be argued that the main objective among smaller farms is the provision of a wide range of food for the farm family and surplus production only will be sold. Social capital is higher in larger farms than in smaller farms. Obviously, membership in (formal) organisations does not seem to be an important issue in raising farm income in smaller farms. With respect to larger farms it can be assumed that membership in organisations will have a more important impact on farm income.

One aspect which is not shown in the tables is the fact that regardless of farm size and farming system there seems to be almost no problem in finding a successor for the farm. Contrary to expectations also small farmers have no problems in handing over their farms. This might reflect the high unemployment rates in Poland as it is highly difficult to find non-farm jobs. Under that scenario, it seems to be more rational to continue farm production, ensure the subsistence of the farm family and "survive" in the rural setting instead of being unemployed elsewhere. But we doubt whether these farms will be managed in the long run.

Second round of analysis: Correlation analysis

How these social and human capital indicators had an influence on the level of agricultural income had been calculated in a correlation analysis with Kendall's tau (τ) as correlation coefficient. Due to a high degree of inconsistency with respect to the recorded variables of agricultural production, it had not been possible to come up with reliable cost figures and, hence, of the net farm income. Therefore, this analysis had to be restricted to gross agricultural farm revenue, only. Several rounds of correlation analyses had been executed with respect to the two distinguished farm size groups. In a first step, the impact of social capital and human capital variables on the total gross agricultural farm revenue had been analysed. Since it can be argued that the farm size does have an effect on farm revenue, i.e. the bigger the farm size the higher the gross agricultural farm revenue, it had been looked in a second step whether social and human capital indicators had an effect on farm efficiency, i.e. the gross agricultural farm revenue per hectare. The results of this correlation analysis are summarised in Table 3.

Table 3: Correlation of human and social capital with gross agricultural farm revenue (total and per hectare) among small and large scale farms of the sample of Polish farmers

	Gross agricultural farm revenue	
	total	**per hectare**
All Farms (N=410)		
Social Capital I	.193**	.014
Social Capital II	.187**	.016
Education	.055	-.050
Job Experience	-.132**	.091**
Manager Experience	-.099**	.042
Small Scale Farms (< 10 ha, N=231)		
Social Capital I	.128*	.061
Social Capital II	.106*	.043
Education	-.013	-.054
Job Experience	-.102*	-.017
Manager Experience	-.147**	-.063
Large Scale Farms (≥ 10 ha, N=179)		
Social Capital I	.161**	.077
Social Capital II	.200**	.094
Education	.103	-.013
Job Experience	-.015	.209**
Manager Experience	.041	.179**

* Correlation is significant at 0.05 level (2-tailed).
** Correlation is significant at 0.01 level (2-tailed).
Source: Own calculation with data from the IAMO Poland farm survey 2000 (Petrick 2001).

When looking at the impact of social capital on the gross agricultural farm revenue, the findings reveal that it is highly significant with respect to the large-scale farms and all farms. It is also significant with respect to the small scale farms. This lower degree of significance might be expected as smaller farms concentrate more on subsistence production and do not depend that much on selling their products. However, the coefficients are relatively small. In this respect, it can be concluded that social capital has a certain degree of influence on the gross agricultural farm revenue of private farms. When looking at the effects of social capital on the gross agricultural farm revenue per hectare no significant impact - regardless of the farm size - could be measured. Therefore, it can be concluded that there is a significant influence of social capital on farm revenue, but the correlation is not as strong as anticipated. The coefficients are too small to confirm our hypothesis fully. But it cannot be rejected either.

A number of reasons for these (at the first sight unexpected) findings can be given. We assume that not all organisations representing social capital had been ascertained by the survey, i.e. our variables "Social Capital I" as well as "Social Capital II" do not represent social capital fully. With respect to elaborating a special survey on social capital among agricultural producers, it shows that not only membership of all relevant formal organisations has to be thoroughly assessed, but also all types of costs in joining and remaining member of the respective organisations. In addition, the relevance of informal networks has to be analysed more closely, as it can be assumed that they are of high relevance for small scale farmers. Similarly, more in-depth thought has to be given to calibrate the idea to come up with a 'lean and mean' concept of social capital; i.e. whether there is a direct and relatively simple relationship between membership in organisations and material welfare.

When taking the human capital variables into account, there is also no clear-cut evidence. The effects of the variable "education" are - regardless of the farm size - not significant, the coefficients are small and when analysed in relation to gross revenue per hectare even negative. This might be explained that up to now the successor takes over the farm in line with the inheritance rules without any regard to the educational level. The other two variables, i.e. "job experience" and "manager experience", clarify the picture a bit. With respect to the total gross agricultural farm revenue both variables are negative and highly significant among all farms and particularly among the smaller farms. This means that those farmers with a longer job and management experience record lower farm revenues. At the first sight, this result is surprising but can be explained as follows: Older farmers cultivate smaller farms which might be due to the fact that they are not that energetic anymore. Younger farmers cultivate larger areas which reflects their intention to earn an adequate farm income. However, they are more specialised in crop production, while the older farmers rely more on animal husbandry as a source of income. Concerning the larger farms both variables are not significant at all. On the other side, both variables are highly significant among the large scale farms when testing their influence on the farm revenue on a per hectare basis. This shows that both variables have an effect on the farm efficiency. Surprisingly, all our three human capital variables show a negative sign when assessing their impact on farm efficiency among small-scale farms. This might reflect the fact that the continuity of these farms depends on other factors, e.g. provision of off-farm jobs. But all these parameters are not significant. In total, it can be concluded that the human capital variables exert a certain level of influence on the farm revenue but, again, not as strong as anticipated.

4 Conclusions

The findings reveal that social as well as human capital are important factors contributing to the material welfare of agricultural producers in Poland, but not as strong as anticipated. Our hypothesis is not fully supported by our analysis, but not rejected either. However, the presented case study has not been executed in analysing these factors but was planned with other objectives in mind. Therefore, more detailed studies explicitly focusing on the impact of social capital on the wellbeing of agricultural producers are urgently needed. Nevertheless, the question comes up how social capital among agricultural producers might be built up or strengthened, e.g. by the national or regional governments. There is almost common agreement that social capital is hard to construct through external intervention, or that these institutions can "invest" in social capital. But there is evidence that support can be provided indirectly in creating a legal and economic environment conducive to building social capital from the bottom. Such efforts amount, for example, to creating a proper legal framework in which small groups are accepted as legal entities, thus enabling them to execute business activities. In general, governments should assure that the barriers to informal co-operation and the formation of voluntary organisations are minimised. In case business networks are already operational governments might strengthen them through facilitating the exchange of information and/or providing limited financial support in making them more competitive, like e.g. the establishment of agricultural producer associations in the EU over the first few years (see e.g.: Chloupkova/Bjornskov: 248).

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Farming Systems Research and Consumer Behaviour Theory

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Abstract

Farming systems research has underpinned much of the successful development and dissemination of new farming practices in both the developed and developing world. The farming systems approach is founded on the idea that new agricultural practices must be capable of being integrated into, and so consistent with, the biophysical, economic, and social environments within which the farm enterprise is embedded. A key element in the farming systems approach is participation of farmers to ensure these environments are properly described and the implications for the design of new agricultural practices is correctly understood. However, in attempting to develop practices for farmers across a range of heterogeneous environments the identification of relevant heterogeneity and the recruitment of an appropriate sample of farmers become key questions.

We believe that part of the solution to the difficulty for farming systems research of coping with variety in farming contexts can be found in the integration of farming systems approaches with approaches to understanding adoption behaviour based on consumer behaviour theory. We believe the consumer behaviour approach to understanding adoption provides a conceptually sound and systematic procedure for classifying producers into segments based on the criteria they use to evaluate an innovation. We believe this approach is conceptually consistent with, and complementary to, the foundations of farming systems research and adaptive research.

Introduction

Farming systems research has underpinned much of the successful development and dissemination of new farming practices in both the developed and developing world. The farming systems approach is founded on the idea that new agricultural practices must be capable of being integrated into, and so consistent with, the biophysical, economic, and social environments within which the farm enterprise is embedded. A key element in the farming systems approach is participation of farmers to ensure these environments are properly described and the implications for the design of new agricultural practices is correctly understood. However, in attempting to develop practices for farmers across a range of heterogeneous environments the identification of relevant heterogeneity and the recruitment of an appropriate sample of farmers become key questions. We shall argue in this paper that procedures founded on marketing theories such as consumer behaviour theory can contribute solutions to these questions. In doing so we believe that the ideas in this paper have the potential to contribute significantly to the identification of innovations that will improve the sustainability of small scale farming systems.

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The farming systems approach

Norman (2002) describes how the farming systems research was developed in response to the failure of traditional scientific reductionism to develop technologies for small scale, resource-poor farmers in less favourable, heterogeneous production environments. The farming systems approach was based on the notion that researchers had to begin with understanding the problems of farmers from the perspectives of farmers; and that solutions had to be based on a proper understanding of farmers' objectives and their environments, including both biophysical and socioeconomic (Norman 2002, Collinson 2000). This notion meant farmers' inputs were essential in the technology development and evaluation process. Key features of farming systems research were a whole system approach to the analysis of farming contexts, collaborative research involving scientists from a range of biophysical and social disciplines, and partnerships between farmers and scientists (Collinson 2000).

According to Norman (2000) and Collinson (2001) the application of farming systems research has resulted in the development of flexible technological options rather than standardized packages for farmers. However, Collinson (2001), Norman (2002), Kobrich et al (2003) and others have expressed a concern that the application of the farming systems approach has been limited by the difficulty of coping with diversity in farming contexts. Diversity in farming contexts means that the results of field work can be highly location specific thereby decreasing the potential multiplier effects of developmental efforts (Norman 2002). In other words, the set of criteria used to define a typology of farming systems are only a sub-set, at best, of the set of criteria that determine adoption (Dorward et al 2003).

The diversity in farming contexts creates pressure to classify farms into typologies which can be used to help set priorities and directions for research. The question of coping with variety in farm contexts becomes, at least in part, a matter of finding meaningful ways of classifying farms into typologies (Gibon et al 1999, Kobrich et al 2003). Diversity in farming contexts also creates pressure to develop appropriately flexible technological solutions (Collinson 2001).

Expressed another way, diversity in farming contexts creates a need for procedures to recruit farmers from a relevant range of contexts to participate in adaptive research activities (Dorward et al 2003). Such recruitment is essential to ensuring that the adaptive research process yields a sufficiently rich variety of adaptations of the initial prototypical technology. While a range of techniques and procedures have been developed to facilitate farmer participation in 'adaptive' research (see Dorward et al 2003 for examples) few, if any, techniques or procedures appear to have been developed that allow researchers to systematically identify in collaboration with farmers the diversity in contexts relevant to the development of a technology (Dorward et al 2003).

The resolution of these issues lies in constructing a conceptually sound procedure for classifying farms within a farming system into categories that are meaningful with respect to the adoption of an innovation. Farms are classified into farming systems to facilitate identification of a constraint that is shared by most farms in that system. The next step is to classify farms within a farming system into groups based on the variety of contexts into which a proposed solution to that constraint must 'fit' or be adapted. This needs to be done bearing in mind the possibility that the solution to a constraint in one farming system may also offer a solution to a different constraint in another farming system. As Dorward et al (2003) note, the criteria used to correctly diagnose constraints on farmers and possible solutions do not ensure the adoption of innovations by farmers.

We believe that part of the solution to finding meaningful ways of classifying farms within a farming system with respect to variety in farming contexts can be found in the application of marketing theories, particularly consumer behaviour theory, to adoption behaviour in agriculture. In the next section we briefly describe the use of consumer behaviour theory as a model for understanding the adoption of agricultural innovations. We then discuss the implications of this application for defining typologies of farms for farming systems research.

Consumer behaviour theory

The approach we take to understanding the adoption of new agricultural technologies draws on the conceptual foundations of Consumer Behaviour Theory (Assael 1998). This theory proposes that consumers use a variety of decision processes when purchasing products. The type of decision process they actually follow depends partly on the importance of the purchase to the consumer, partly on how routine the purchase decision is and partly on how familiar the consumer is with the products and brands available. In this section we describe the different types of decision processes used by consumers, the circumstances in which they are used, and the implications of these for understanding adoption decisions.

Consumers make purchase decisions in a variety of ways depending on circumstances (see table one). The way in which a purchase decision is made is determined by two key factors. These are the level of consumer involvement in the product and the degree of effort the consumer is willing to invest in making a purchase decision. When involvement is high consumers tend to engage in complex decision making process or brand loyalty depending on the degree of effort they invest in the purchase decision (Assael 1998). When involvement is low consumers tend to engage in variety seeking behaviour or habit depending on the degree of effort they invest in the purchase decision (Assael 1998).

Consumer involvement depends on how important the purchase is to the consumer (Arora 1982, Kapferer and Laurent 1986, Celuch and Evans 1989, Assael 1998, O'Cass 2000). High involvement purchases are purchases that are important to the consumer. High involvement products are generally expensive, rarely or infrequently purchased and closely tied to self-image and ego. High involvement purchases usually involve some form of risk - financial, social or psychological. Where this is the case the consumer is more likely to devote time and effort to careful consideration of alternatives before making a purchase. Typical high involvement purchases are homes, motor vehicles, white goods, clothing and perfumes (Kapferer and Laurent 1986).

Low involvement purchases are purchases that are unimportant to the consumer (Assael 1998, O'Cass 2000). These purchases are commonly inexpensive products that are routinely purchased and involve little risk. The consumer is unlikely to devote much, if any, time and effort to consideration of alternatives for low involvement purchases before making a decision. Typical low involvement purchases are groceries, toiletries, and laundry products (Kapferer and Laurent 1986).

We believe that the adoption of most agricultural innovations can be characterised as a form of high involvement purchase for primary producers. Usually the adoption of a new agricultural practice or technique has significant consequences for the future financial performance of the farm enterprise. The new technology or practice must be integrated into the existing mix of technologies, practices and resources that exist on the farm (Crouch 1981; Kaine and Lees 1994). This means, generally speaking, the likely outcomes of adopting a particular technology or practice are difficult to predict as the compatibility of the technology or practice with the existing farm system, and the resulting benefits, depends on a range contextual factors that are specific to the circumstances of each farm enterprise. Consequently, the decision to adopt an agricultural innovation is often financially risky. As such they entail social risks and psychological risks for the individual in that the outcomes affect the wellbeing of family members and can influence producers' feelings of achievement and self-fulfilment.

Complex decision making

Consumer behaviour theory suggests that consumers follow a complex decision-making process with high involvement purchases (Assael 1998). Complex decision-making is a systematic, often iterative process in which the consumer learns about the attributes of products and develops a set of purchase criteria for choosing the most suitable product.

Complex decision making is a decision making process consistent with explanation based decision theory (Pennington and Hastie 1989). Complex decision making is facilitated when there is adequate time for extensive information search and processing (Beatty and Smith 1987), adequate information is available on product characteristics and the consumer has the ability to process the available information (Greenleaf and Lehmann 1995). These conditions seem likely to be reasonably well satisfied in the case of family farms in developed economies.

Table One: Consumer purchase behaviour

	High involvement purchase decision	**Low involvement purchase decision**
Decision making (More effort)	Complex decision making (e.g. cars) • High motivation to search for information • High effort into learning and discovery • Evaluation both prior to and after purchase •	Variety seeking (e.g. snack foods) • Low motivation to search for information • Some effort into learning and discovery • Evaluation after purchase
Habit (Less effort)	Brand loyalty (e.g. athletic shoes) • Less effort into learning and discovery as consumer already has a product they are satisfied with • Evaluation based on experience with the product	Inertia (e.g. laundry detergent) • No motivation to search for information • No effort put into learning and discovery • Evaluation after purchase

Among traditional small scale farms the condition of adequate product information may be less likely to be satisfied. In such circumstances individuals will endeavour to follow a complex decision making process as closely as possible. The absence of information on the product is likely to at first prompt the consumer to devote greater efforts to searching for product information. If the consumer is unable to satisfy their information needs then they are likely to postpone purchase of the product. In a farming context this means postponing adoption of an innovation and continuing with existing technologies and practices.

The benefit or purchase criteria represent the key benefits sought by the consumer and generally reflect their usage situation. In the case of consumer goods the usage situation is often a function of the consumer’s past experiences, their lifestyle and their personality (Assael, Reed and Patton 1995). For example, economy, dependability and safety are key purchase criteria for many consumers with families that are buying motor vehicles that will be used daily to transport family members, especially children. Having settled on a set of purchase criteria for deciding between products, the consumer then evaluates the products against the criteria and makes a choice.

Consumers can be grouped into market segments on the basis of similarities and differences in the key purchase criteria that they use to evaluate a product. Knowledge of the key purchase criteria that will be used by consumers in a segment can be employed to tailor products to meet the specific needs of consumers in that segment and promote products accordingly.

In the case of agriculture the purchase criteria that producers use to evaluate new technologies should reflect the key benefits the technology offers given producers' usage situations. In this instance the usage situation is likely to be a function of the farm context into which a new technology must be integrated. Broadly speaking, the farm context is the mix of practices and techniques used on the farm, and the biophysical and financial resources available to the farm business that influence the benefits and costs of adopting an innovation (Crouch 1981; Kaine and Lees 1994). Similarities and differences among farm contexts for an agricultural innovation will translate into similarities and differences in the key purchase criteria that producers will use to evaluate that innovation.

Given that the usage situation for agricultural innovations is defined by farm contexts, differences in farm contexts will result in different market segments for an innovation. Logically, the market for an innovation will be defined by the set of farm contexts for which the innovation generates a net benefit (see Kaine and Bewsell (2000); Bewsell and Kaine (2002); Kaine and Niall (2001) and Kaine and Niall (2003) for examples).

As is the case with consumer products, knowledge of similarities and differences in the key purchase criteria that will be used by producers to evaluate an innovation can be used to classify producers into segments, to tailor the innovation to meet the specific needs of producers in a segment, and to promote the innovation accordingly.

To the degree that the mix of farm practices, technologies and resources that influence the benefits and costs of adopting an innovation are different for different innovations, the purchase criteria used to evaluate innovations will change accordingly. This means purchase criteria are frequently innovation specific and often cannot be generalised across innovations. Gibon (1999), Dorward et al (2003) and other farming system researchers have also observed that the adoption of an innovation within a farming system often depends on a set of technical, economic and social characteristics that tend to be highly specific to the innovation.

Identifying purchase criteria

The use of complex decision making in high involvement purchasing implies that the purchaser develops explicit chains of reasoning to guide their decision making. This is consistent with explanation based decision theory, where the focus is on "reasoning about the evidence and how it links together" (Pennington and Hastie 1989). The idea is that farmers gather 'evidence' on the attributes of the technological alternatives available to them. This evidence is processed into a coherent causal model, or explanation, which is used to evaluate the extent to which the alternatives will meet their farming needs and upon which a decision is finally made (Cooksey 1996).

If the purchase criteria that producers use to evaluate innovations are defined by farm contexts, and if producers do base their evaluations of innovations on explicit chains of reasoning, then there should be shared and complementary patterns of reasoning among producers that adopt a technology and those that do not, and there should be an accompanying consistency in the decisions they reach. In other words, producers with similar farming contexts will offer similar explanations for the decision making, and these explanations will differ from those of producers whose farm contexts are dissimilar. Consequently, we interview producers that have adopted the technology of interest, those that have not, and (if they exist) producers that have tried and abandoned the technology. We seek to interview producers with different demographic characteristics and with agricultural enterprises that vary in terms of scale and location. Where necessary a ‘snowballing’ sampling technique (Cooper and Emory 1995) is employed to ensure we interview producers that differ on characteristics that emerge during the interviews to be influential factors in adoption decisions.

To identify the factors influencing producers’ decisions we follow a convergent interviewing process (Dick 1998). Convergent interviewing is unstructured in terms the content of the interview. The interviewer employs standard laddering techniques (Grunert and Grunert 1995) to systematically explore the reasoning underlying the decisions and actions of the interviewee. Similar techniques are employed with groups to construct a shared understanding of an issue (see Parminter and Perkins 1996). In addition, we also interview researchers, extension and advisory staff to test our interpretation of interview outcomes against their particular perspectives.

Having identified the factors (purchase criteria) producers use to evaluate a technology we then distribute a mail questionnaire to gather statistical information on these criteria from a representative sample of producers. The survey provides data to statistically test hypotheses about relationships between purchase criteria and incidence of adoption, and to quantify the size of segments.

The results of the statistical analysis are used in workshops with researchers and extension or advisory staff to formulate priorities to guide research and extension strategies, often on a segment by segment basis. These priorities and strategies are then validated by interviewing producers from each of the target segments.

We have successfully applied these techniques to identify segments for technologies such as irrigation systems in the horticultural, viticultural, vegetable and dairy industries in Australia, breeding practices and animal health practices in sheep and cattle in Australia and New Zealand, and pest and disease management practises in horticulture and viticulture in Australia and New Zealand among others (see Kaine and Bewsell (2002); Burrows et al (2000); Bewsell and Kaine (2002); Kaine and Bewsell (2000); Kaine and Niall (2003); Kaine, Tarbotton and Bewsell (2003); Kaine and Bewsell (2003) and Bewsell, Kaine and Westbrooke (2003) respectively).

Note that in Australia and New Zealand these industries are mostly composed of family farms of varying scales together with a relatively small proportion of corporate farms. We have observed that the decision making principles described here apply with regard to the adoption of agricultural innovations with both types of enterprises. See, in particular, Kaine and Bewsell (2003) and Bewsell, Kaine and Westbrooke (2003).

Discussion

To summarise, the use of consumer behaviour theory as a model describing the adoption of agricultural practices suggests that family farmers can be classified into segments based on differences in the purchase criteria they employ to evaluate an innovation. These criteria reflect differences in their farming situation (or farm context).

Typically, in farming systems research farms are classified into systems or domains using a mix of biophysical, financial and physical criteria (Gibon et al 1999; Kobrich et al 2003). The objective is to classify farms into categories in such a way that the farms in a category are similar in that they are likely to face a common constraint. As the farms in a farming system are, in some sense, in similar circumstances then the same solution should apply to all farms in that system, more or less (Byerlee et al 1980). However, variety in farming contexts occurs within a farming system. In other words, the set of criteria that determine the commonality of a constraint are only a sub-set of the set of criteria that determine the fit of the prototypical solution to that constraint. This means that solutions are not universal and need to be adapted to different contexts within a farming system.

Consider, for example, laser graded, flood irrigated dairy enterprises in northern Victoria. These enterprises represent a major farming system in the Australian dairy industry. Automatic irrigation is feasible to implement on most, probably all farms in this system. However, the adoption of this technology is governed by farm layout in terms of paddock and channel layout (these determine the period of time that must be devoted to irrigation each day) and the extent to which irrigation must be undertaken outside daylight hours (Kaine and Bewsell 2000).

The procedure we have described in this paper to identify segments provides a conceptually sound and systematic means for identifying the broader set of criteria that influence the 'fit' of a solution within a farming system. This is done by identifying the diversity in farmers' conceptions of their farming system. The application of this process provides information to better understand the degree of flexibility required of a prototype technology and a basis for recruiting farmer participants from a relevant range of contexts to participate in the adaptive research process (see Collinson 2001). For example, some irrigated fruit producers in northern Victorian have adopted micro-irrigation systems to save water; others have adopted this technology to improve their flexibility in timing orchard activities; while another group of producers in the same region have adopted this technology to save labour effort in their orchards (Kaine and Bewsell 2002).

The application of the process we have described is consistent with the philosophies underpinning farming systems research and participatory rural research in that the process for classifying farms into segments draws on the perceptions of the farmers themselves. Importantly, the consumer behaviour model explicitly acknowledges the widely recognised observation that resource poor farmers are rational-decision makers and effective managers of their resources (Chambers and Ghildyal 1985). Furthermore, the process we have described complements the application of many of the participatory techniques described by Dorward et al (2003) that have been developed in the conduct of farming systems research. Indeed, many of these techniques could be valuably employed in conducting the segmentation process itself.

Importantly, the principals underlying the process we have described should apply to decision making about the adoption of agricultural innovations by both commercial and non-commercial or traditional family farms, and corporate farms. While the set of factors that are used to evaluate an innovation might differ across these types of farm enterprises, the same principles will govern the decision making process that each follows. We have certainly found this to be the case for family farms and corporate farms across a range of industries and innovations in Australia and New Zealand.

Finally, the approach we have outlined also highlights the care that must be taken in interpreting the outcomes of group activities with farmers from a farming systems perspective. If the farmer participants in a group are drawn from a variety of farm contexts from within a farming system then the factors influencing the adoption of a prototype technology designed for that farming system will differ among members of the group. This may result in apparently conflicting claims among farmers regarding appropriate directions for adapting the prototype. In the absence of a clear understanding of the differences between segments the researchers, and the farmers themselves, may have difficulties reconciling the apparent conflict.

Conclusion

We believe that part of the solution to the difficulty for farming systems research of coping with variety in farming contexts can be found in the integration of farming systems approaches with approaches to understanding adoption behaviour based on consumer behaviour theory.

We believe the consumer behaviour approach to understanding adoption provides a conceptually sound and systematic procedure for classifying producers into segments based on the criteria they use to evaluate an innovation. We believe this approach is conceptually consistent with, and complementary to, the foundations of farming systems research and adaptive research and that the principles of this approach apply equally to corporate and family farming enterprises.

We believe that our approach provides farming systems research with a conceptually sounder and more systematic procedure for explaining and predicting the adoption of agricultural innovations. Consequently, the application of this approach has the potential to contribute significantly to the identification of innovations that will improve the sustainability of small scale farming systems.

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The influence of agritourism on the human and social environment: The cases of Trikala and Ikaria in Greece

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Abstract

The aim of the present study was to examine the role of agritourism as a part of livelihood rural system in two areas of Trikala and Ikaria. Trikala is a mountainous area of central Greece and Ikaria is a mountainous island in Aegean Sea in Greece. The economy of both areas is characterised by the lack of an industrial sector and their dependence on crop and livestock farming as well as tourism. Agricultural production is the most important economical activity, where more than 24% of the active population is occupied. On the other hand, agritourism started to grow significantly during the 90s providing another source for income for the local population

Sample data on demographic characteristics, education, employment status, and income of farmers were collected. In addition, the study explores the wiliness of the farmers to participate in agritourism programs financed by E.U. and the success of these programs.

It was found that the younger and more educated farmers are involved with agritourism. Also, it was found that agritourism increases farmers' income. On the basis of these results it is proposed that agritourism can contribute to family income and provide a better life for the young generation in order to settle in rural areas and therefore moderate the danger of desertion of disadvantaged mountainous or island areas.

Keywords: Agritourism, Livelihood, Rural, Development

Introduction

The agricultural sector of Greece is an important economical activity occupying 12% of the active population (National Statistical Service of Greece, 2003). On the other hand, people employed in the agricultural sector in Greece have to face difficult conditions since the land is mainly very mountainous. In most of those rural areas, where the welfare and food security cannot just be assessed in terms of local crop and livestock production systems, the existence of non-farm income sources and assets is of a great importance for a successful local development. In this case, policies diversifying income sources can help to reduce the risks associated with bad weather and unfriendly ecological conditions. This process is an important livelihood strategy by which families in rural areas are involved into different farm and non-farm activities in order to survive and to improve their standards of living. Therefore, rural livelihood systems particularly in Greek mountainous or island disadvantaged areas are often complex and flexible and most of them are continuously in search of new opportunities for economic development. Agritourism, as a part of livelihood system within the rural sector, can be an appropriate 'tool' for integrated local development in socioeconomicaly mountainous or island disadvantaged areas (Corbett, 1996; Goodball &Ashworth, 1985).

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In addition, agritourism provides the flexibility to engage in parallel activities, in cases where the possibilities for occupation in farms are limited, thus in this manner, agritourism can contribute to the preservation of small farms and prevent them from being supplanted. Agritourism started to grow significantly during the 90s owing to the increased demand for soft tourism by the visitors who at that time preferred a quite inexpensive vacation close to the nature in comparison to the previous decades. In addition, it contributes to the preservation of an acceptable population level in rural areas, since it offers the possibility to earn a family income comparable to that of urban incomes. Moreover, it can play a significant role in the preservation of the ecological and social balance of disadvantaged and under - populated areas, thus moderating the danger of desertion. In particular, the last decades have seen the growth of intense local and state interest in the development of agritourism, in an attempt to function as a supplementary economic activity and not as a rival to agricultural occupations. Indeed, a small percentage of farmers in mountainous areas is turning to agritourism, which they use as a secondary seasonal occupation, in order to supplement their income from agricultural activities (Theodoropoulou et all, 2003; Apostolopoulos et all, 2001; Ellis, 1998; Alexopoulos, 1997; Apostolopoulos & Giagou 1996; Corbett, 1996; Kloeze 1995; Giagou, 1994; Chiotis &Coccossis, 1992; Damianos, 1991; Logothetis 1988).

More specifically, the present study examined on one hand the region of Trikala in central Greece, which is mainly a rural area where the income of the local population is generated only from agricultural activities. Eighty percent of the region of Trikala is a mountainous landscape, where there is ecotourism and agritourism because the surrounding area is physically attractive with a lot of historical monuments such as old churches and buildings. The population in this area is 134.000 people. The active population is 52,379 people (39%), of which 14.869 are occupied in the agricultural sector (28%), and the unemployment rate is 4,17% when the country's unemployment rate is 10%. Agricultural activities such as farming and agritourism are the main source of income for the people in the rural region of Trikala, Greece. Agritourism and ecotourism activities started in the region of Trikala mainly to contribute to the family income, otherwise most of the people had to abandon the area because of the lack of employment. On the other hand, in the island of Ikaria in Greece, the employment in the goat livestock and agritourism sectors are considered the most important activities for its rural development. Ikaria is a mountainous island in Aegean Sea, where there is ecotourism and agritourism because the climate is mild and the nature very attractive. The active population in the island is 2.478 people, which are the 32,8% of the local total population. In the agricultural sector is occupied 24,3% of the active population, and the unemployment rate is 6,3%. Agritourism and ecotourism activities started in both areas mainly to contribute to the family income, otherwise most of the people had to abandon their places because of the lack of employment.

Previous studies have examined the influence of agritourism on the differentiation of the rural system in disadvantaged areas in Greece. Results from those studies showed that agriculture and tourism are two sectors that influence each other by means of agritourism. Agritourism provides the flexibility to engage in parallel activities, in the cases where the possibilities for occupation in farms are limited, thus in this manner, agritourism can contribute to the preservation of smaller farms and prevent them from being supplanted. In addition, it contributes to the preservation of an acceptable population level in rural areas, since it offers the possibility to earn a family income comparable to that of urban incomes. Moreover, it can play a significant role in the preservation of the ecological and social balance of disadvantaged and under - populated areas, thus moderating the danger of desertion (Alexopoulos, 1997; Konsolas &Zacharatos, 1992; Keane & Quinn, 1990).

This influence of agritourism, largely positive, is strengthened to a much greater extent through the operation of activities parallel to agritourism, such as rural home crafts and small industry, as well as traditional folk art. These extra activities offer to rural households more capabilities to improve their livelihood security and to raise their living of standards (Apostolopoulos & Giagou, 1996). Income from agriculture in disadvantaged areas is continually shrinking and for this reason agritourism, as an additional economic activity, contributes positively to the income of the farmers in these areas. The supplementary income from agritourism helps families in the mountainous areas and the islands to remain in their communities and preserve the traditional way of life of their region (Papakonstantinidis, 1993).

In light of the above, another study sowed that, agritourism must include all services for accommodation, facilitation, service and entertainment of visitors, as well as services pertaining to the preservation and protection of the environment and the cultural wealth of the country. Creation and organisation of all these services calls for the co-operation of the residents of the community, the local services and the state, in order to successfully achieve offering high quality services and products at affordable prices, linked directly with Greek tradition (Apostolopoulos & Giagou 1996).

Also, in a previous study it was shown how agritourism and its parallel activities could contribute to the development of rural systems and therefore moderate the danger of desertion of disadvantaged mountainous areas (Theodoropoulou et all 2003; Theodoropoulou and Apostolopoulos, 2000). The objective of the present study was to present the profile of the farmers and their involvement in agritourism in the mountainous region of Trikala, located in central Greece and the island of Ikaria, located in Aegean Sea in Greece. In addition, the study explores the wiliness of the farmers to participate in agritouristic programs financed by E.U. and the success of these programs. Also, another issue was whether the two activities can remain complementary. For that to be accomplished, income from tourism must not suffice, therefore, the farmer will have to continue his rural employment and visa - versus. If agritourism requires more and more contributors, then it could be possible to develop at the expense of agriculture, and runs the risk of converting agriculture to a part - time occupation or even wiping it out completely. Finally, There was a question if the wife and the children undertake the largest portion of the agritourism enterprise, while the husband’s primary occupation remains rural activity. In this case, it could be possible for the youth to consider that the agritourism enterprise is that which will ensure the future, since that is the activity they know, and they may abandon rural exploitation.

Materials and Methods

The statistical frame of the study was based on 124 farmers living in the mountainous region of Trikala. Thirty-five of those farmers were not involved with agritourism. Sixty-two of the farmers were involved with agritourism related Bed and Breakfast small hotels (B&B). And 27 were involved with other agritourism related enterprises such as taverns (traditional restaurants, where they serve local traditional food), bakeries (traditional bakeries, where they sell local made bread, sweets, pastries and pies) and folklore art (local hand made clothes and accessories). The size of the sample used in the study covered 50% of agritourism B&B and other enterprises and 7% of the total population of registered farmers in the mountainous region of Trikala.

Also, a random sampling of 24 agritourism enterprises and 76 goat livestock’ farmers in the island of Ikaria was used. The size of the sample used in the study covered 38% of agritourism enterprises and 11% of the total population of registered goat farmers in Ikaria.

Data on the demographic characteristics, education, employment status, and income of the farmers were collected through a questionnaire survey. Investigators on location completed the questionnaires. The data collected were analysed by using descriptive statistics for calculating the means and standard deviations of continuous variables and the frequencies and percentages of discrete variables.

Results

A. Results for the mountainous region of Trikala in Greece:

According to the data analysis the majority of the 35 farmers who are not involved with agritourism (FNA) (74%) were men. Most of the individuals were married (69%) and the average number of children per responder was two. The educational level of the FNA farmers was mostly middle school (35%), while for 25% was high school (Diagram 1, 1st column). The age of responders ranged from 30 to 44 (31%) and 45 to 64 (26%) years old (Diagram 2, 1st column). Thirty four percent of the FNA farmers had monthly family income between €501 and €1000 (Diagram 3, 1st column).

Furthermore, 86 percent of the 35 FNA farmers would like to attend vocational courses about agritourism and soft tourism and to participate in agritourism programs financed by E.U. Seventy six percent of the FNA farmers receive subsidies for farming up to € 5800 per year (€483 per month) and they replied that subsidies are important to boost their family income.

According to the data analysis for the 62 farmers involved with agritourism related B&B small hotels (FB&B) was found out that most of them (66%) were men. Also, most of the FB&B farmers were married (81%). The educational level of the FB&B farmers was mostly high school (39%)(Diagram 1, 2nd column). Most of the FB&B farmers (36%) were 30-44 years old (Diagram 2, 2nd column). Thirty six percent of the responders had monthly family income between €1001 and €1300 (Diagram 3, 2nd column).

According to the data analysis for the 27 farmers involved with other agritourism-related enterprises (Fent), such as taverns, bakeries, and folklore art was found out that half of them were women and most of them were married (83%). Their educational level was mostly middle school (44%) and high school (33%) (Diagram 1, 3rd column). The age of the Fent farmers was from 30 to 44 (40%) (Diagram 2, 3rd column), and their monthly income was between €1001 and €1300 (44%) (Diagram 3, 3rd column). Also, Table 1 shows the educational, age and income percentages for all the farmers.

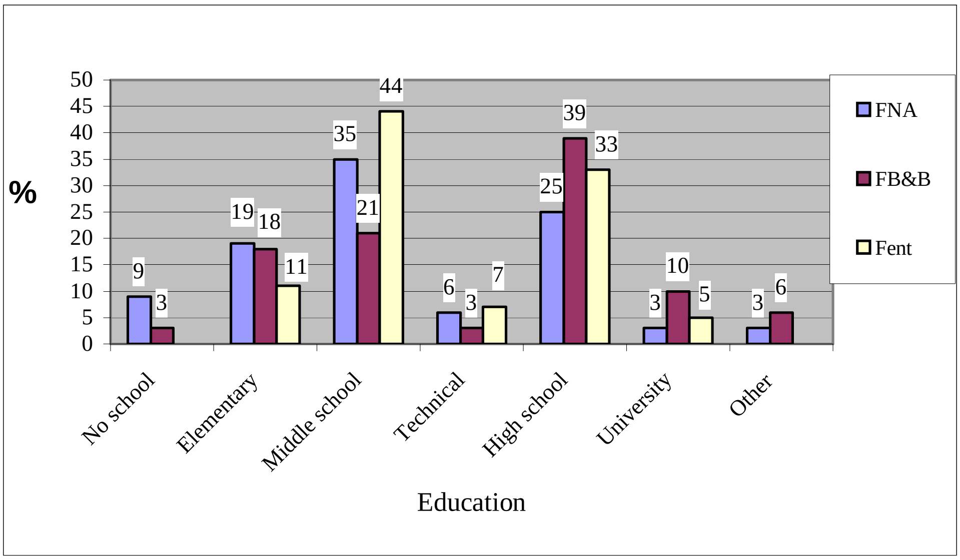

Diagram 1: **Percent of Educational level. Where FNA: farmers, who were not involved with agritourism. FB&B: farmers who were involved with agritourism related Bed and breakfast small hotels and Fent: farmers who were involved with agritourism enterprises except B&Bs such as taverns, bakeries and folklore art**

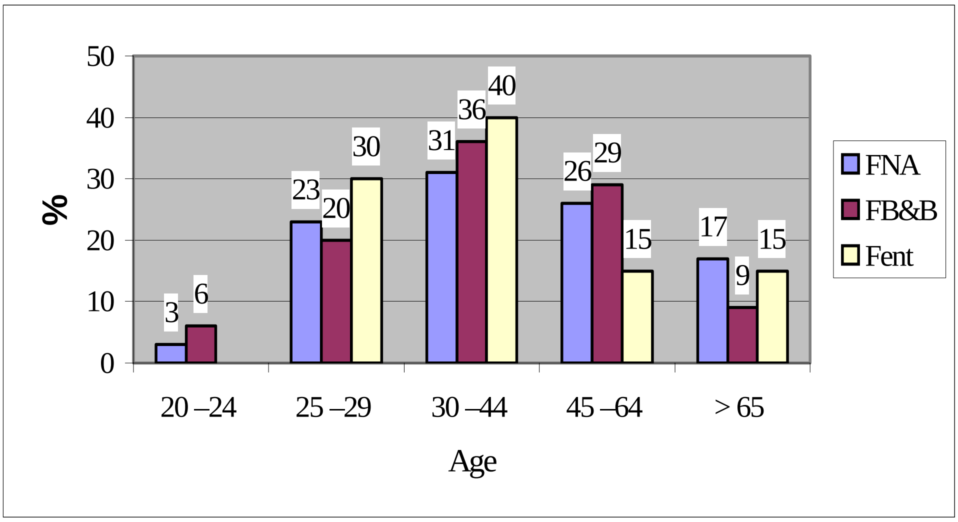

Diagram 2: **Percent of farmers' age. Where FNA: farmers, who were not involved with agritourism. FB&B: farmers who were involved with agritourism related Bed and breakfast small hotels and Fent: farmers who were involved with agritourism enterprises except B&Bs such as taverns, bakeries and folklore art.**

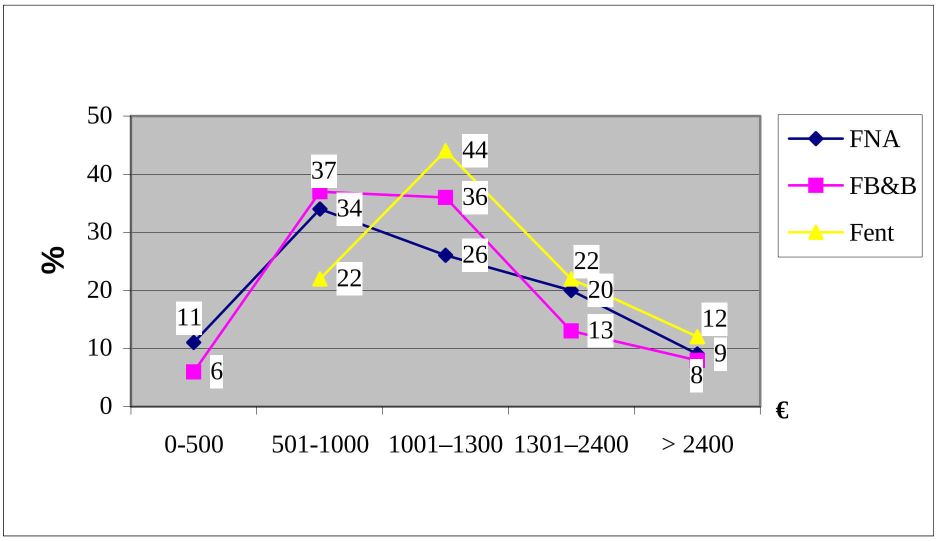

Diagram 3: Percent of farmers' income. Where FNA: farmers, who were not involved with agritourism. FB&B: farmers who were involved with agritourism related Bed and breakfast small hotels and Fent: farmers who were involved with agritourism enterprises except B&Bs such as taverns, bakeries and folklore art.

In addition, on average the agritourism enterprises had gross earnings up to €130000 and their expenses were up to €73000 per year. Most of those B&B (53%) have employed on average 13 employees of which 3 as administrative personnel. All of the employees are living in the specific area, fifty two percent were women, and they were 30 to 44 years old (35%). The educational level of the employees was mostly elementary school (24%) or high school (21%) and their average monthly income was €1100.

Furthermore, the agritourism enterprises in the region of Trikala were family operated and were funded by the E.U. LEADER II program.

Fifty five percent of those farmers, who are involved with agritourism and receive subsidies, will continue to be involved with agritourism activities even without subsidies. In addition, 62% of those farmers who are involved with agritourism would like to cease farming and confine their activities only with agritourism activities.

Table 1. Demographic characteristics of farmers not involved (n=35) and involved (n=62) with agritourism lodge facilities (B&B small hotels) and (n=27) with enterprises such as taverns, bakeries, and folklore art, except B&B hotels

Characteristic		Farmers not involved with agritourism (n=35)		Farmers involved with agritourism lodge facilities (B&B) (n=62)		Farmers involved with agritourism ent/ses (except B&B) (n=27)	
		No.	(%)	No.	(%)	No.	(%)
Education							
	No school	3	(9)	2	(3)	-	-
	Elementary school	7	(19)	11	(18)	3	(11)
	Middle school	12	(35)	13	(21)	12	(44)
	Technical school	2	(6)	2	(3)	2	(7)
	High school	9	(25)	24	(39)	9	(33)
	University	1	(3)	6	(10)	1	(5)
	Other	1	(3)	4	(6)	-	-
	Total	35	(100)	62	(100)	27	(100)
Age (years)							
	20 –24	1	(3)	4	(6)	-	-
	25 –29	8	(23)	12	(20)	8	(30)
	30 –44	11	(31)	22	(36)	11	(40)
	45 –64	9	(26)	18	(29)	4	(15)
	> 65	6	(17)	6	(9)	4	(15)
	Total	35	(100)	62	(100)	27	(100)
Monthly income (€)							
	0-500	4	(11)	4	(6)	-	-
	501-1000	12	(34)	23	(37)	6	(22)
	1001 – 1300	9	(26)	22	(36)	12	(44)
	1301 – 2400	7	(20)	8	(13)	6	(22)
	> 2400	3	(9)	5	(8)	3	(12)
	Total	35	(100)	62	(100)	27	(100)

B. Results for the island of Ikaria in Greece:

According to the data analysis the majority of the farmers involved with agritourism and goat farming were men (66%). Most of the owners of agritourism establishments (39%) were 45-64 years old. Also, most of the farmers were married (81%) and only 7%. The educational level of the farmers was mostly elementary or no school (51%). Thirty five percent of the responders had monthly family income between €733 and €978 (Table 2). Ninety seven percent replied that their income from agritourism or goat farming is not enough to cover their family needs. Ninety five percent of the farmers are subsidised. Diagrams 4,5 and 6 show the farmers educational, age and income level in Ikaria (Fik) in comparison with the FNA, FB&B and Fent farmers in Trikala.

The parents of 81% of the farmers in Ikaria were farmers also. Only 41% of these farmers were satisfied with their occupation. Seventy four percent of the farmers would not like their kids to follow the same occupation. Farmers had on average 2.4 children, but only 0.2 children were involved with their parents' enterprise and only 0.2 children plan to get involved with their parents' enterprise when they grow up. Seventy percent of the farmers replied that better infrastructure and health services would improve their life conditions in the island. Fifty four percent of the farmers would like to attend vocational courses about agritourism and soft tourism. Fifty five percent of the farmers have employed one worker to help them with their jobs.

Table 2. Characteristics of the farmers in Ikaria involved with goat livestock and agritourism (n=100)

Characteristic			**(%)**
Age	25-29		(3)
	30-44		(31)
	45-64		(39)
	> 65		(27)
		Total	(100)
Education	No school		(15)
	Elementary school		(36)
	Middle School		(22)
	High School		(22)
	Technical school		(3)
	University		(2)
		Total	(100)
Monthly income (€)	0-488		(21)
	489- 732		(33)
	733-978		(35)
	979-1,467		(10)
	> 1,468		(1)
		Total	(100)

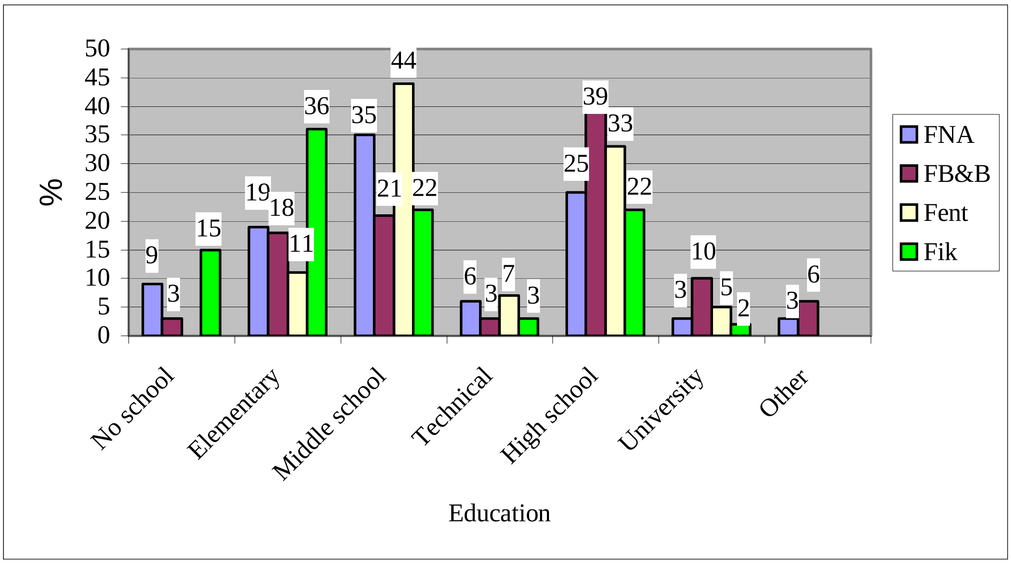

Diagram 4: Percent of Educational level. Where FNA: farmers, who were not involved with agritourism. FB&B: farmers who were involved with agritourism related Bed and breakfast small hotels. Fent: farmers who were involved with agritourism enterprises except B&Bs such as taverns, bakeries and folklore art. Fik: farmers who were involved with agrotourism and goat keeping

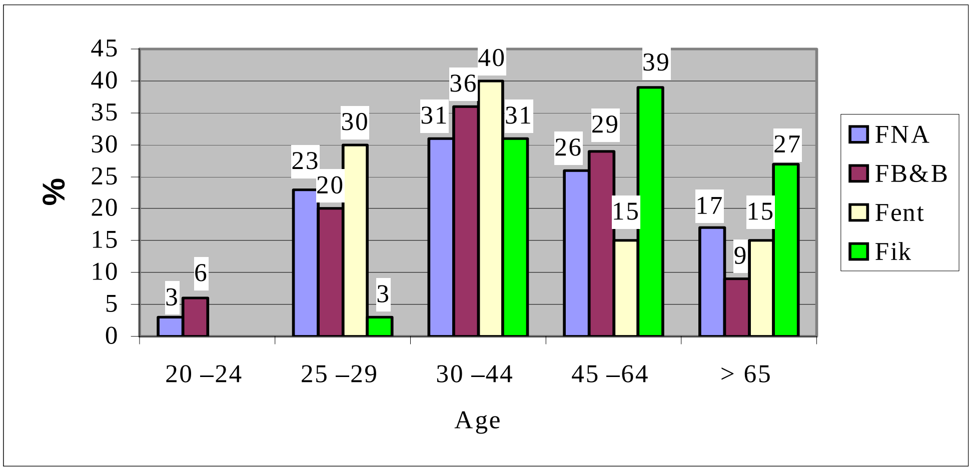

Diagram 5: Percent of farmers' age. Where FNA: farmers, who were not involved with agritourism. FB&B: farmers who were involved with agritourism related Bed and breakfast small hotels. Fent: farmers who were involved with agritourism enterprises except B&Bs such as taverns, bakeries and folklore art. Fik: farmers who were involved with agrotourism and goat keeping

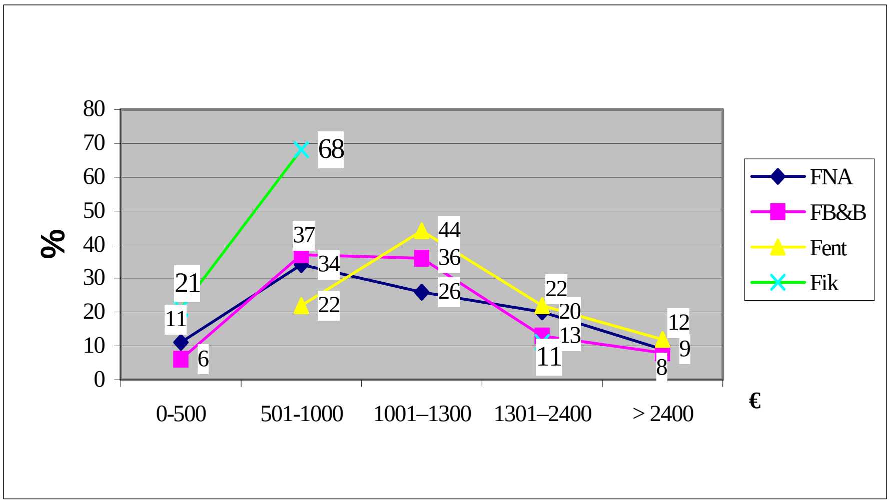

Diagram 6: Percent of farmers' age. Where FNA: farmers, who were not involved with agritourism. FB&B: farmers who were involved with agritourism related Bed and breakfast small hotels. Fent: farmers who were involved with agritourism enterprises except B&Bs such as taverns, bakeries and folklore art. Fik: farmers who were involved with agrotourism and goat keeping in the island of Ikaria.

Farmers in the island of Ikaria have lower educational and income levels and they are older in comparison with the farmers in the mountainous area of Trikala. This difference maybe due to the fact that farmers in Ikaria are involved with goat farming while farmers in Trikala are involved with crop farming.

More specifically the statistical analysis for the goat farmers showed that 74% of them have goat livestock as their primary occupation. Their mean monthly income from this activity was €500. Twenty three percent of the owners of agritourism settlements were farmers in their primary occupation and their mean monthly income from this activity was €500. Fifty-four of the farmers started agritourism because they received E.U. funding in order to have a supplement in their monthly income.

Conclusions

The region of Trikala is a rural mountainous area where farming is the main activity. Because of the harsh ecological conditions of the area, many of the habitants are searching for new employment opportunities in order to increase their income. Also, there is a tendency for the younger generation to abandon the land and immigrate in urban areas, where there are more opportunities for employment and a better life. During the last decade mainly, the above area is experiencing the influence of agritourism, as well as that of parallel agritouristic activities. In this way the system is being diversified, since these new activities bring about conditions conducive to multiple activities and increase rural family income. Also, the rural family is changing, its members are becoming individuals with multiple activities, and they are becoming involved in the manufacture of agricultural products, as well as in the provision of services. These new conditions result in young people becoming more interested in staying in the village, a satisfactory tendency to avoid deserting these areas is being created, and these areas are even being revitalised.

On the other hand, the prospects for goat farming in the island of Ikaria are not optimistic. The agricultural labour force occupied with goat farming is ageing and the new generation is not encouraged by their parents to take over. On the other hand, farmers who opted to continue goat farming did so due to limited job opportunities. The main reason farmers wish to get involved with agritourism is to supplement their income. Since the economic and societal life of the island depends on the agricultural sector, wise investments should be directed for an infrastructure that will ensure the growth of goat farming and the attraction of tourists with an eye for sustainable development.Two other important observations made in the present study were first that overall, most of the farmers were of old age and low educational level and second that their children were not involved or plan to get involved with their parents' enterprise. These two factors are ominous for the future of the island, since farmers of old age and low educational level will not be able or have the time to adapt their enterprises to the future demands of globalisation in the market, while the people of the new generation are not willing to become the entrepreneurs of the future.

Based on the results of this study it was found that combining farming with agritourism is beneficial to the farmers due to the expansion of the market for their products, which increases their incomes. Off course, for agritourism to be established in an area there are some restrictions such as nice environment, mild weather and an infrastructure that will ensure the growth of agritourism.

Farmers involved with agritourism consider the earnings from this activity as significant contribution to their income to the point that most of them would like to cease farming and confine their activities only with agritourism. This view, if it becomes a trend, may jeopardise rural diversification. It is wise to combine agritourism with the primary sector, in order to give the rural family the ability to become financially stronger and to become socially reinstated, without the risk of degenerating the rural environment. Since the economic and societal life of the area depends on the agricultural sector, wise investments should be directed for an infrastructure that will ensure the growth of agritourism and the attraction of tourists with an eye for sustainable development.

Furthermore, agritourism contributes to the employment of women by the establishment of agricultural enterrprises. In addition, local young people get fulfilment and respect by finding employment in the agritourism sector. Therefore, agritourism is a desirable policy objective, which can be one of the profitable alternatives to improve livelihood security and to raise living standards in rural areas.

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Work and income patterns of men and women of Norwegian family farms: Masculinisation, feminization, or professionalisation of farm work?

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Abstract

The traditional way of organizing agricultural production in Norway is through "family farming". A family farm is defined by a principle of ownership of the farm through kinship in generations. The focus of our paper is directed towards changes *within* family farms, not *between* family farms and other ways of organizing farm production. A strategy on Norwegian family farms, in order to meet increased competition and falling prizes and subsidies, has been to increase total household income on the farm through working off-farm. In this paper we a) map changes in income allocation and work strategies on Norwegian family farms over time, b) map changes in income allocation and work strategies among men and women on family farms over time, and c) show income allocation and work strategies among men and women as farmers and as farmers' spouses "today". Through quantitative analyses of data on Norwegian farmers from 1987 until 2001, we show that there are continuing changes in work and income allocation on Norwegian farms, towards a higher dependency on off-farm income to the farm households. However, this development is not only explained by more off-farm work by farmers which is an indication of lower value of farm work itself, but to a large degree this is a result of women's increasing off-farm work. One implication of this is a higher amount of one-man farms in Norway. Despite the fact that more women enter agriculture as farmers, we also find clear evidence of differences in the organization of farms operated by men and women. When male farmers are "professionalising" as one-man farmers, female farmers to a larger degree depend (voluntary or not) on their partners "assistance" in the farm work.

Introduction

Traditionally, Norway has had one of the worlds most comprehensive systems of agricultural subsidies. It has been a goal to uphold agricultural production not just to maintain agricultural areas and food supply, but also to sustain population and employment in rural areas. Due to external pressure from the EU, WTO, and internal pressure due to a growing influence of liberal political parties and increasing consumer demands towards food quality and lower prices, Norwegian agriculture is facing new realities. One strategy employed on Norwegian family farms in order to meet these challenges is to increase total household income on the farms through working off the farms.

In this paper we are using an inclusive definition of family farms, which rest on a principle of ownership and kinship. In our Norwegian sample we treat all farms with agricultural production as family farms. The focus of our analysis is directed towards changes *within* family farms, not *between* family farms and other ways of organizing farm production. The aim of the paper is to a) map changes in income allocation and work strategies on Norwegian family farms over time, b) map changes in income allocation and work strategies among men and women on family farms over time, and c) show income allocation and work strategies among men and women as farmers and as farmers' spouses "today".

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Family farming in Norway

Family farming is the dominant way of organizing farming in Norway (Blekesaune and Almås 2002). Agricultural production in family farming can be distinguished to other forms of industries because as an institution it has survived even though capitalization and rationalization has captured the industry in general.

How a family farms and to what extent family farming exists, is set by definition. Traditionally, researchers have focused on the farm rather than the household as the unit of investigation (Buttel, Gilbert and Gillespie 1984). From the eighties and hereafter the focus of family farming studies has been changed towards looking at the *relation* between the farm as an enterprise *and* the family farm household. Increased attention to the changed role of women in agriculture is one of the important reasons for this (Almås, Vik and Ødegård 1983; Gasson 1989; Haugen 1990; Pfeffer 1989; Ravn and Bak 1982; Whatmore 1991), and the documentation of the increasing amounts of farm women working outside the farm (Blekesaune 1994, 1996; Buttel et.al. 1984; Jervell and Løyland 1998; Jervel 1999; Rognstad 1991).

Even though “family farming” as a concept represents many qualitative aspects of agriculture, the concept usually covers a farm owned and operated by a family (Blekesaune 1996:7). One popular definition is the “farm family business” of Gasson and Errington (1993). Their definition consists of following six elements: 1) Business ownership is combined with managerial control in the hands of business principals, 2) these principals are related by kinship or marriage, 3) family members (including these business principals) provide capital to the business, 4) family members including business principals do farm work, 5) business ownership and managerial control are transferred between the generations with the passage of time and 6) the family lives on the farm (Gasson and Errington 1993:18). Gasson and Errington (1993) still emphasize that a claim of ownership and control of the farm is more important than work time spent on the farm (fourth claim). Due to rationalization and mechanization the amount of labour input has decreased and the work claim is therefore of less importance in the definition of a family farm. Work outside the farm is of growing importance of Norwegian agricultural sustainability, but does that mean family farming as a concept or business is over? A mechanized one-man farm (Baily 1973), should fit into the definition of Gasson and Errington’s (1993) farm family business when the combination of ownership and control of the farm is situated in the family. In this way, Gasson and Errington (1993) state that family farming is economically sustainable within a farm structure dominated by part-time and one-man farms.

A key critique of using this definition is put forward by Djurfeld (1995). Djurfeldt criticizes the use of this definition or ideal-type of family farming because it is too contextually bound to contemporary British farming, to be useful when the purpose is to compare farm structure development, and the likely future of family farming over time or between countries.

Studies of family farming can be entered at two main levels, qualitative and quantitative. Each gives valuable contributions to the understanding of position of family farming. An entry to the field is the study of family farming’s position compared to other ways of organizing farming. As an advocate for this entry point, Djurfeldt has developed a definition of family farming which to a large extent draws on family labour for its operations and reproduction: the “notional family farm” which 1) - is characterized by an overlapping between three functional units: a) the unit of production (i.e. the farm), b) the unit of consumption (i.e. the household, and c) the unit of kinship (i.e. the family). 2) For its reproduction the notional family farm requires family labour, i.e. labour performed by members of the family/household (not referring only to managerial work) (Djurfeldt 1995:2). Use of this definition maps Swedish family farm structure with 14 percent notional family farms (fulltime by family members), 20 percent dependent family farms (fulltime by family members, but additional income from off-farm work) and 15 percent one-person farms, which totally adds up to 49 percent farms, “which would be the estimate of the family farm” (Djurfeldt and Waldenström 1999:335). Part-time or pluriactive farm strategies are excluded from Djurfeldts definition of family farms because of lack of labour input on farm compared to off-farm income by farm family.

Djurfeldts (1995) definitions and operationalisations of *farming* can be of great value when the aim is to map differences between places and countries and within places historically. However, what is lacking in usefulness, is his aim to challenge or replace different understandings of *family* farming, as the concept itself is contextually bounded to nations and in history. Mainly, this is summed up to be an argument about the content of “family farm” and we do disagree in Djurfeldts (1995) narrowing of the family farming concept. Such a tightening of the concept of family farming does imply, according to Blekesaune (1996:9) “... a lack of analytical separation between the farm and the family” and Blekesaune argues that “it is necessary to operate with an analytical distinction between family as a social decision making unit and the farm as a production unit in order to see the interdependency between these structures”. By this analytical distinction between the farm as a production unit and the household as an interrelated decision-making unit, we can uncover how the household allocates resources among farm and non-farm activities in order to satisfy their consumption needs, and the needs for labour input on the farm.

With a broad and inclusive definition we will treat all farms with agricultural production in our Norwegian sample as family farm businesses. Such a definition is also supported in studies of changed patterns of family farming in Norway conducted by Jervell (1999).

Work and income in Norwegian family farming

Other sources of income (than from farming) are of increasing importance for the welfare of farm households in most European countries (Jervell and Løyland 1998) and through the last decades income from work outside the farm is also of growing importance in Norwegian farm family households.

According to Blekesaune and Almås (2002), a traditional way is to explain the increase in work outside the farm as a compensation of the steady decrease in farm incomes. Most Norwegian farms are small and an essential amount of income now comes from wage labour outside farming (Blekesaune and Almås 2002; Løwe 1998; Rognstad 1991; Rye 2002). By 1980, wage income from off-farm work exceeded farm income on an average Norwegian farm (Jervell and Løyland 1998). As a result, other strategies than full-time farming have become more important in family farming households in Norway. Several labels have been developed to describe these strategies: Pluriactivity, part-time farming, one-person or combination farms and hobby farms among others. The different labels could be understood as if farms are too small to supply full time employment and full family income or as a symptom of lower incomes in agriculture (Jervell 1999), but as Jervell (op.cit) discusses, this is not always the case. There might be many reasons for choosing these strategies like a continuation of an already established career before taking over the farm. Further, combinations of on- and off-farm work, or pluriactivity, are not new in Norwegian agriculture. Traditional farming in combination with forestry, fishing and/or hunting has historically been a common strategy among many farmers, especially in areas of low production (Hetland 1986; Flø 1998; Flø and Bjørkhaug 2001).

Changes in work and income allocation create changes in traditional gender patterns of the farm families. According to Blekesaune (1996) and Jervell (1999), the changing patterns of family farming are to a large degree, related to changes in the employment of farm women.

Until the middle of the nineteenth century, agrarian production in Norway was female dominated to a much greater extent than it is today (Berggren 1982 in Brandth 2002). In many rural districts, women ran the farms while men where out fishing, hunting and/or doing forestry in combination with farming (Brandth 2002). Two major shifts in agrarian production altered the gender roles in the production. Almås and Haugen (1991) describe the first phase starting when livestock products increased in importance as a source of income, where economic viability wrested control of women. The second shift came with the introduction of milking machines, when milking shifted to become men's work (Brandth 2002).

Different work on farms has been and is still gendered. Women are responsible for housework and care, while men's responsibility is the farm work. Lately, women have also combined this with work on the paid non-agricultural labour market (Blekesaune 1996; Brandth 2001; Haugen 1998; Jervell 1999). Still, when working outside the farm, women tend not to reduce their housework but their farm work. Blekesaune and Haugen (2002) found that farm women spent more hours on housework than other women, while farm men on the other hand did less housework than other men. Women farmers spent 3 times more time on housework than male farmers did (Blekesaune and Haugen 1998, cited in Blekesaune and Haugen 2002). Unpaid work in farm family households is of crucial importance of the livelihood of the family household (Blekesaune and Haugen 2002).

Women's exit from farm work has started a process of masculinisation of agriculture and agricultural work in Norway (Almås 1983:7). Almås (1983) describes how Norwegian farm women left agriculture through three phases after the Second World War. In the first phase that lasted until 1950s, paid female labour left agriculture due to mechanisation and rationalisation. In the second phase, female kinfolk like aunts and unmarried sisters left the farms. This happened during the 1960s, a period also known as "the rural exodus" (Almås 1983:6). The last phase Almås describes is when the wife also leaves farm work, a process which started in the 1960s due to rationalization within agriculture. Later a fourth phase has been identified, where daughters are also leaving the farm and the rural community, leaving the boys behind (O'Hara 1998 cited in Brandth 2002). Among women left on the farm the role has changed to a role of "the male's assistant"(Almås 1983:22).

Almås and Haugen (1991) argue that mechanization of agriculture was the most important factor in pushing out superfluous labour in the first phases, while new labour market opportunities emerge as important pull factors from the seventies. An important implication of this is that women achieve new positions outside farming (Brandth 2002), and achieve a professional identity within that (Almås and Haugen 1991).

Not all women are leaving Norwegian agriculture. Norwegian farms are handed over to new generations on allodial rights. In 1974 (given retrospective force to 1964), women and men gained equal rights to become successors. From being in a position of marrying to the farm, female farmers now have the opportunity to choose to become farmers in their own right (Haugen 1998).

Analyses of work and income allocation on Norwegian family farms

Our analyses are concentrated in two parts. In an analysis of income and working hours on Norwegian farms over time, we have used published data from Statistics Norway from different periods between 1987 and 1999. We have also used data from a survey of a representative sample of Norwegian farmers to complete time series data with more information about from where income is allocated and how working hours are spent on farm work and off-farm work by Norwegian farmers and their spouses in 2001. These data are called "Trend-data" and were collected by the Centre for Rural Research in 2002. Trend-data contains questionnaire data from 1678 Norwegian farmers (Rye, Storstad and Flø 2002).

Analysis of data from Statistics Norway between 1987 and 1997 show a decrease in the share of income to agricultural households coming *from* agricultural work.

Table 1. Share of net income of farmer and spouse allocated on farm 1987 and 1997. Percent

	1987	1997
At least 90 percent	27.7	22.0
50 – 89.9 percent	17.8	21.2
Less than 50 percent	54.6	56.9
Sum	100.0	100.0
(N=)	(97 415)	(78 907)

Source: Statistics Norway 2003a

This is a continuation of an ongoing process found in analyses of agricultural statistics from before 1989 (Rognstad 1991). Trend-data from 2002 also showed that this development has continued, 64 percent reported that more than half of their income from 2001 was achieved outside the farm (Rye et.al. 2002). Correspondingly is there an increase in amount of farmers working off-farm. Even in the early eighties over half of Norwegian farmers got less than half of their income from farm work (Jervell and Løyland 1998).

An assumption would be that working hours outside the farm was increasing correspondingly in the same period. In table 2 we show working hours on- and off-farm for male farmers and male spouses in three different surveys in the 1990s. A reason for separating men and women is the interest in knowing whether the changes in working hours on Norwegian farms can be explained by spouses, mainly women's, working hours outside the farm.

Table 2. Working hours on and off the farm by male farmers and male spouses in three periods of the 1990s. Hours and percentages

	1989/90		1994/95		1998/99	
	Hours	Percent	Hours	Percent	Hours	Percent
Work on farm	1 271	60.9	1 294	61.8	1 428	64.2
Work off-farm	816	39.1	801	38.2	792	35.8
Sum	2087	100.0	2095	100.0	2225	100.0

Source: Statistics Norway 2003b

There have not been substantial changes in the working hours of male farmers and spouses on and off the farm in the nineties. A weak tendency might be that male farmers worked a little bit more on farms by the end of the decade than at the beginning. At the same time men did work less outside the farms by the end of the decade. Changes in income from outside the farm can then not be explained by increasing working hours off-farm by *men*. Several explanations can be forwarded. It can be a result of farms increasing size of production corresponding to a general decline in farm profitability (NILF 2003) and better wages outside farming. An additional explanation is the increasing number of women entering a non-agricultural labour market, which is shown in table 3.

Table 3. Working hours on and off the farm by female farmers and female spouses in three periods of the nineties. Hours and percentages

	1989/90		1994/95		1998/99	
	Hours	Percent	Hours	Percent	Hours	Percent
Work on farm	712	59.8	672	51.8	692	47.2
Work off-farm	478	40.2	625	48.2	774	52.8
Sum	1190	100.0	1297	100.0	1466	100.0

Source: Statistics Norway 2003c

Women's general participation on Norwegian farms is declining with 13 percent in the 1990s. Working hours outside the farm is increasing and adds up to an increased total of working hours in income generating work for women in the period. The results show a continuation of the development described in earlier studies (see i.e. Almås 1983; Blekesaune 1996; Blekesaune and Haugen 2002; Jervell 1999; Rognstad 1991). The tendency could be a generation phenomenon implicating a new generation who are bringing new working strategies into agriculture. Further analyses of Statistic Norway's (Statistics Norway 2003b, 2003c) data of the agricultural population shows that the changes in the disposition of working hours are valid in all age groups (not analysing pensioners) both among women and men. Is this an indication of an ongoing masculinisation process in agriculture? To provide a better insight in the process we will continue the analyses of farmers' labour using the Centre for Rural Research's Trend-data from 2002.

In our further analyses of Trend-data we use a 'technical' definition of male and female farmers. When respondents received inquiry about completing the survey, *main user of the farm* was encouraged to respond on the questionnaire. We do trust the greater part of the respondents followed the instructions. Men answered 88 percent of the received questionnaires. We treat them as *male farmers*, 12 percent were women, and we call them *female farmers* in the following analyses. Further, when we use the notion *male farm* or *female farm*, it is only related to the gender of the main user of the farm, not to a specific quality of the farm itself.

Farmers also reported data of their spouses (husband/wife/partner). Therefore, spouses who perceive themselves as equal farmers, do not have an independent say in this analysis.

Table 4 shows results of analysis of time spent on income generating work outside the farms in 2001.

Table 4. Share of time spent on work outside farm by male and female farmer and spouses

	Share of time spent on work outside farm	Standard error	(N=)	t-value	p-value
Male farmer	36.7	0.945	(1362)		
Female farmer	37.0	2.841	(168)		
Difference (Male – Female)	-0.3	2.994		-0.118	0.906
Male spouse	60.0	1.220	(995)		
Female spouse	52.4	2.779	(141)		
Difference (Male – Female)	7.6	7.676		2.253	0.024

Source: Trend-data

Table 4 shows that there is no significant difference between male and female *farmers* in the average share of their time spent on work outside the farm. However, we do find a significant difference between male and female spouse's share of work off the farm. On average, male spouses have a higher share of their work time tied up to work outside the farm compared to female spouses. An interpretation of the results in Table 4 could be that male spouses are more independent in relation to farm work than are female spouses. According to Blekesaune and Haugen (2002), findings of major gender differences between farm-women and -men in time spent on housework, a better explanation would be that male spouses are less committed to housework than female spouses.

In a discussion of masculinisation processes and/or gender differences in Norwegian agriculture, our findings could indicate that there is no difference between male and female farmers in time allocation of work on farms because the numbers indicate equal dispositions of on- and off-farm work among farmers. Instead of a talking about masculinisation we could talk about professionalisation of the farmer independent of his or her gender and of spouses independent of the farm work, especially male spouses.

We will step back to our introductory analyses of share of household income coming from off-farm work and go beyond the numbers through our Trend-data. In 2001, 64 percent of farm households got more than 50 percent of their income from work outside the farm. The difference between male and female farmers is significant. While 62 percent of male farmers got more than 50 percent of their income from off-farm work, the percentage among female farmers is 76. The amount of income from on-farm and off-farm work correlates significantly with time spent on work on and off farm both by farmer and spouse on farms run by male and female farmers. Corresponding analysis of household income from the farm and total household income, showed that farms operated by female farmers had significant lower farm income than male farms, but when total income was calculated there was no longer gender differences. In our further analyses we will explain how female and male farmers have a different adaptation together with their spouses to the farm work and to off-farm work.

Table 5. Working hours on and off farm by farmer and spouse analysed by gender. Average hours

	Work on farm by farmer		Work on farm by spouse		Work off-farm by farmer		Work off-farm by spouse	
	Hours	(N=)	Hours	(N=)	Hours	(N=)	Hours	(N=)
Male farmers	1459	(1392)	484	(1089)	904	(1388)	899	(1125)
Female farmers	1045	(172)	979	(149)	661	(177)	1258	(150)

Independent Samples t-test for Equality of Means: Work on farm by farmer: t = 5.835, df = 1562, sig. (2 tailed) < 0.001, Work on farm by spouse: t = –8.823, df = 1236, sig. (2 tailed) < 0.001, Work off-farm by farmer: t = 3.503, df = 1563, sig. (2 tailed) < 0.001, Work off-farm by spouse: t = –5.555, df = 1273, sig. (2 tailed) < 0.001.
Source: Trend-data

Even though the share of time spent on farm work is equal between male and female farmers, the time spent in hours are quite different. However, the total number of average working hours spent on farms run by male or female farmers are distributed in a way that they end up equal using averages. Further, male spouses work more than female spouses do on-farm. Added to the female farmers it gives a total amount of work hours equal to a farm where the farmer is male and the spouse works on farm. The same but differently distributed pattern is off-farm work on male and female farms. On male farms, the farmer himself works more off the farm than the case is on farms run by women. Correspondingly, a spouse of a female farmer works more off-farm than a spouse of a male farmer do, but the numbers could indicate that average work hours off the farm are equal on male and female farms.

A general explanation has been that a woman leaves farm work for the benefit of work outside the farm (Almås 1983; Blekesaune 1996; Jervell 1999; Haugen 1998). Our results support that this development is continuing. On the other hand, our results do not show any evidence of equal adjustments between male and female farmers. It does on the contrary look like female farmers are very much “dependent” on spouse’s assistance on farm.

According to Trend-data, the majority of the Norwegian farmers worked between 200 and 2550 hours in 2001, 12 percent did hardly any farm work, 43 percent worked between 200 and 1700 hours and 45 percent worked more than 1700 hours on their farm in 2001. Based on the same data. Table 6 shows how different work strategies on Norwegian farms are distributed among female and male farms.[1]

Table 6. Work on farm by farmer and spouse, analysed by gender. Percentages

Spouse	Male farmer				Female farmer			
	0-200 hours	200-1700 hours	1700 + hours	Total	0-200 hours	200-1700 hours	1700 + hours	Total
0-200 hours	100.0	65.8	41.9	57.2	38.2	12.7	11.1	18.4
200-1700 hours		3.6	46.4	36.7	58.8	69.0	52.8	62.4
1700 + hours		0.7	11.7	60	2.9	18.3	36.1	19.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
(N=)	(100)	(450)	(528)	(1078)	(34)	(71)	(36)	(141)

Pearson Chi-Square, 2-sided: Men: Chi-Square = 166.986, df = 4, sig < 0.001, Women: Chi-Square = 20.754, df = 4, sig < 0.001
Source: Trend-data 2002.

Men work more hours on the farm, both as farmer and as spouse. The pattern of work strategies of farmer and spouse are different on farms operated by male and female farmers. Our analysis shows that

[1] 1391, or 84 percent of the farmers in our material reports to be married or have spouse. In these analysis 12 percent of these are missing because of missing values on one or more of variables used in analysis. The total share of fulltime farmers then counts 46 percent in this multivariable analysis.

male farmers work more independently of their spouse than female farmers do. On farms where male farmers do little or no work (9 percent), nobody has reported on the spouse's work. These farms can be regarded as non-operative farms, leisure or hobby projects or just a place to live. A higher amount of female farmers are in the category of working 0-200 hours, almost one out of four. The difference though is the working hours provided by spouses. On 62 percent of these farms spouses do work. The share of no-work farms is then equal, 9 percent.

The second most popular strategy among men is the category of working 200-1700 hours, 42 percent of the male farmers are in this situation while 50 percent of the female farmers. Again we can see that male operated farms are different from female farms. 66 percent of male farmers in this category work alone, whereas only 13 percent of the female farmers do the same.

50 percent of the male farmers and 25 percent female farmers are fulltime farmers. While 42 percent of men are fulltime farmers alone, 11 percent of the female farmers do the same. The majority of female fulltime farmers have a partner working on the farm, 36 percent a fulltime-working spouse. 11 percent of male fulltime farmers have their spouse working fulltime on the farm.

Even though our previous analyses showed that women work fewer hours on Norwegian farms, they are still providing a substantial portion of farm work as spouses on 43 percent of male farms. 47 percent of the farms can be categorized as one-man farms, only 9 percent can be regarded as one-woman farms. Spouses, then, provide labour on 81 percent of the female farms, evidence of very different strategies and with that, different work prospects, on male and female farms. Additional analysis controlling for age-differences showed that spouses worked less the younger the age group of the male farmer. On the other hand, on female farms we found no generational differences. We know that, on average, men work more hours outside the farm than women, both as farmers and as spouses. 60 percent of male farmers work off-farm, 46 percent of these fulltime. 54 percent of female farmers work outside the farm, 76 percent of these are in some way occupied in part time work. Table 7 shows further distribution of work off-farm by farmer and spouse, analysed by gender.

Table 7. Work off-farm by farmer and spouse. Percentages

Spouse	Male farmer				Female farmer			
	0-200 hours	200-1700 hours	1700 + hours	Total	0-200 hours	200-1700 hours	1700 + hours	Total
0-200 hours	42.9	21.5	18.3	29.3	33.3	15.5	16.7	23.9
200-1700 hours	47.4	67.2	55.8	56.1	33.3	31.0	33.3	32.4
1700 + hours	9.7	11.3	25.9	14.6	33.3	53.4	50.0	43.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
(N=)	(445)	(354)	(301)	(1110)	(66)	(58)	(18)	(142)

Pearson Chi-Square, 2-sided, Men: Chi-Square = 98.302, df = 4, sig < 0.001, Women: Chi-Square = 7.655, df = 4, sig = 0.105
Source: Trend-data 2002.

Analyses provided in table 7 shows a positive correlation between farmer's work off- farm and spouse's work habits off-farm on male farms. The pattern is most evident in the categories of little or no work outside the farm and on fulltime farms. Still, spouses of male farmers are most often found in part-time work strategies like female farmers. Spouses on female farms do not follow a specific work pattern related to the farmers work situation outside the farm.

Why are these findings interesting in a discussion of changed patterns of family farming in Norway? Men make up the major group of farmers, 88 percent according to this data. The number is decreasing, but slowly, and in a period it was shown in analyses that there was a consolidation in the number of full-time female farmers (Blekesaune 1996). Before further discussions of the possible implications of these results, it is of value to look at the development in recruitment of male and female farmers in Norway. Taking the decline in number of farms into consideration, the share of new farmers coming into agriculture is relatively stable (Statistics Norway 2003d). Table 8 shows changes in amounts of men and women coming into farming in different time periods, based on Trend-data.

Table 8. Year taking over the farm by gender. Percent

	1970 and before	1971-1975	1976-1980	1981-1985	1986-1990	1991-1995	1996-2002	Total
Men	97.6	95.3	90.0	92.3	88.3	86.4	77.0	88.6
Women	2.4	4.7	10.0	7.7	11.7	13.6	23.0	11.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
(N)	(166)	(171)	(251)	(233)	(273)	(221)	(282)	(1597)

Pearson Chi-Square = 63.534, df = 6, sig < 0.001
Source: Trend-data.

The share of women taking over the farm has risen over time. Rogstads (2002) analyses of agricultural data also showed that the amount of women taking over a farm on allodial right increased from 9 percent in 1969 to 22 percent in 1999. According to our data, which reports on farmers still in agriculture, a large proportion of women coming into agriculture in 1969 have now leaved. An explanation of this is the fact that women inherit the farm as widowers late in life. They rarely keep the farm very long and they do not become *farmers* (Rogstad 2002:15). Analysis of Trend-data show that 6 percent of the "new" female farmers (taking over the farm after 1995) are over 60 years compared to 4 percent of the male farmers. 55 percent women are under 40 as arte 61 percent of men. We do recognize that a substantial proportion of women are coming into Norwegian agriculture, and we believe that this number is rising. With that, female farmers will contribute to a diversification of the working strategies in Norwegian family farming.

Realities of work and income on Norwegian family farms

The source of income on many Norwegian farms has changed from being the profit of farm work to the profit of non-agricultural work. Off-farm income is growing its share of household income. Average working hours on Norwegian farms is rising probably due to larger farms and more intensive productions. But a higher share of income is coming from off-farm work does not correspond to increasing average hours of off-farm work among farmers in general. Lower value of farm work due to changes in official subsidies and prices on farm products in general can explain much of this. These results can look rather depressing on their own, and they are easily and frequently used in negotiations of the agricultural policy. Why continue farming if it does not pay off? Is the farm first and foremost a place to work, or is the farm and the farming a life or leisure project?

Our analyses showed a great variety in work strategies among Norwegian farmers. Still, many would like to work more on their farm (Rye 2002). There is a correlation between off- and on-farm work. Full time off-farm work will necessarily prevent the farmer to farm full time. On the other hand, there are many farmers who never would give up off-farm work (Rye 2002). Several explanations can be proposed. Many farmers might have educational skills and experience from other work before taking over the farm and their occupational identity might be strongly connected to that work (Jervell 1999; Rye 2002). Other aspects are connected to quality of life, the need for social relations and social feedback in business and private. With the reduction of farms and rural population there has been an increase in reports of "lonely farmers", farmers lacking colleagues and friends, especially in intensive productions (Fjeldavli and Bjørkhaug 2000). In addition, part-time farmers have been reported to be more satisfied with their every day life than full time farmers (Rye 1999)

The reasons for keeping the farm despite poor economic results can be based in farmers bonds or traditions on the farm. They want to farm because their identity is strongly connected to that specific farm through kinship. These farms can be regarded as hobby or leisure projects, but we should not label them all that way. As a farmer put it: "you play football, build your model plain or go to your cabin in your leisure or spare time. Leisure is when you don't do neither off nor on farm work".

With the growing amount of farms not dependent upon a family workforce we do also see an increase in the amount of "one-person" farms, referring to the number of persons *working* on the farm. A more accurate notion would be one-man farms since this development mainly is connected to male farms. This process can be understood not only as a process of masculinisation, but also as a process of professionalisation of the farmer when the farm is more of a workplace for one man than a family project. In their analysis of mobility patterns of Swedish farming households, Djurfeldt and Waldenström says: "*One-person farms are an interesting phenomenon, since their existence goes to show that modern farming to some extent has broken the age-old link between family and farm*" (Djurfeldt and Waldenström 1999:335). As discussed earlier in this paper, such a labour-attached definition will not provide an insight to relations within the family farm household. We will therefore argue that keeping the definition of family farming to kinship, not to labour input in the farming itself gives us a more proper understanding of the Norwegian family farm system. This understanding is of no less importance when we return to our findings of work habits of women, both as farmers and as farmers' spouses.

Conclusion: Continuing gender differences on Norwegian family farms

Analyses of changes in proportion of time used on work by men and women in agriculture showed that

1. Men's work-time on farms has risen over a period while women tend to work less on the Norwegian farms.
2. At the same time men do work less outside the farm, yet their total working hours has risen
3. Women do work more outside the farm and their total working hours have also risen
4. Analyses also showed equal share of time used on farm and non-farm work by female and male farmers. Still, this was not a proof of gender equalities on Norwegian farms because a) spouses spend their work time differently on male and female farms: male spouses work more hours outside agriculture than female spouses and b) male spouses work a lot more on farms than female spouses.

In our final discussion we will focus on two parallel processes in Norwegian family farming: The exit of female spouses as farm labour and the entry of new female farmers.

We can undoubtedly support the process of "masculinisation" (Almås 1983) on male driven farms in Norway. If women attend farm work on male farms they never work more than the farmer himself. Using the label "assistant" on those women who are still contributing to the work on the farm might not always suit their own comprehension of their position, but might work as an analytical category. Our analyses have been concentrated on working hours in farming. Because of a lack of data, we have not been able to add additional working hours in the farm household like housework, childcare and looking after elderly kin. We know from other studies (Blekesaune and Haugen 2002) that this work has been, and most probably is, women's main responsibility. According to Blekesaune and Haugen's (2002) analysis did women in farm households work more hours of housework than other women did, and their spouses contributed to this work less than other men did, an evidence of a delay in a development of equality of status among men and women in Norwegian farming households.

In this "masculinity discourse" farming has turned into a male occupation, a development also connected to a "crisis in masculinity" where men are pictured as "backward, lonely, vulnerable and marginalised" (Brandth 2002:191). Nevertheless, women are with their entry into the non-agricultural labour market building their work careers and do with their contribution of income to the farm household economy gain independence.

When we shift focus to women farmers, we can in a way say that female farmers are spouse-dependent, an opposite situation of what is happening on male farms. It would then not suit the reality to describe this as a process of feminisation, still it is not fitting into the masculinisation debate above. The work pattern of men and women on female farms uncovered in our analyses indicates that the traditional role interpretation of male and female work is still applied. “Women may own and operate the farm in practice but remain positioned according to the traditional script” (Silvasti 1999 cited in Brandth 2002:196). Women can do the “soft” farm-work while their partner handles the machinery and drives the tractors (Brandth 2001). Such interpretations are handed over to new generations putting pressure on the need for lawful female successors to take both their own qualities as farmers, like the need for high educational skills in agriculture and possible prospects of partners, into consideration before being able, or advised, to take over the farm.

Nevertheless, the amount of female farmers is rising in Norwegian agriculture. With that the structure of farming might again change if the growing amount of female farmers are able to make or create an equal position as farmers. It is possible that changing agricultural policy, shifting its focus onto other values of farming than sole agricultural production like the multifunctional role of agriculture, landscape care, “green care” and organic farming, might attract more women.

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Pluriactivity and succession in small family farms: The case of two less favoured areas in Greece

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Abstract

The aim of this work is to examine the role of pluriactivity in the intergenerational continuity of family farms. By using questionnaire data it attempts to identify trends and differences among pluriactive and exclusive in farming households in relation to their production systems, farm structures and characteristics of their permanent household members. The work also focuses on the importance of pluriactivity for the reproduction family farm enterprise and the preservation of local social fabric and economy. Research findings show that part-time farming has a local specific character in these small scale agriculture areas. The majority of the farms in the next generation will be engaged in farming in a pluriactive way while a growing number of them will develop a commuting type of agriculture by choosing its permanent residency in the nearby urban centres. Household reproduction and stay within the community has more to do with farm diversification and the development of local labour market opportunities.

Introduction

The model of multifunctional agriculture is made obvious through the introduction of the pillar of rural development in the CAP. According to this model, development is conceived of as a process including a competitive, sustainable and quality oriented agriculture and farmers who would also have other income earning activities besides agriculture; such activities is expected to be able to support the reproduction of rural households and the social web of small and medium size population centres (Kinsella et al. 2000). In this context, pluriactivity and reproduction emerge as two all-important dimensions with reference to the development of Less Favoured Areas (LFAs).

The European policy turn, in the mid 80's, towards 'endogenous' development approaches and the diversification of the farm family activities was followed by the structural funds reform and marked, in Greece, through the implementation of a number of Regulations (797/85 through to 1257/99) and the LEADER Community Initiative. Their implementation as far as diversification is concerned targeted almost exclusively the semi-mountainous and the mountainous zone as well as the so-defined LFAs, which, since the 70s, manifested symptoms of a disrupted social structure.

Pluriactivity is considered as a permanent structural feature of agriculture as well as a spreading phenomenon in the rural space of the developed world. Since the 70s, a large number of research projects have been devoted, directly or indirectly, to the exploration of its multiple roles (Cavazzani and Fuller 1982, Zurek 1986, Shortall 2002, etc.).

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Nevertheless, the information available for such a complex issue is still inadequate. With reference to the debate on local development, a still open question is whether pluriactivity of the farming households is sustained due to its significance as a survival and continuity strategy or the fact that in the process of the gradual shrinking of the farming population there is always a category of farms who abandon farming through their engagement in pluriactivity (Gasson, 1986, Kinsella et al. 2000). Furthermore, even if pluriactivity supports the reproduction of farms, it is not known to what degree it also relates to the continuation of inhabitancy of the rural family in the LFAs or if a number of such families moves into larger centres in which both the conditions of living and the opportunities for off-farm employment are better and more attractive, especially for the younger family members. Since the likelihood of the conversion of a full time farming activity to a part-time one increases through succession (Gasson 1986, Gidarakou, 1990, Jervel 1999) a number of questions arise such as: what is the number of the successors' families who will continue to inhabit the small, local communities and, under what type of farming activities this might occur.

In Greece, census data indicate that the rural space continues suffering a population shrinkage; this is also made obvious through the shrinking of the category 'primary schooling children' and the closing down of schools[1]. Nevertheless, in this context a positive indication is that migration is not directed any more to the big urban centres but to rural and semi-urban ones (NSSG 1981 & 1991, Goussios 2001).

Within such a problematique the current work intends to investigate, on the one hand, the phenomenon of pluriactivity, taking into account the local context and its spatial dimension and, on the other, its relation with the continuity of farming activities, in two areas where small-scale, multi-crop and fragile farming structures prevail[2]. In this respect, the aim of this presentation is more to contribute to the problematisation on phenomena that relate to rural development and less to provide results that may be considered as being representative of the rural space since the sample upon which the present analysis is based upon is a rather small one.

The research context

The problem of the inter-generational continuity of family farming is common in the European space (Fennell 1981, Gasson and Errington 1993, Kazakopoulos 1996, Gidarakou et al. 2002). Research findings lead to diverse conclusions, even when such findings refer to the same country (Potter and Lobley 1996). The size of the farm holding has been found to relate with succession prospects (Symes 1990, etc.). Findings also point to the fact that structural characteristics of the farm, such as its size, are not the sole explanatory factors as far as exodus from farming is concerned; instead such structural characteristics function within a complex of push and pull factors stemming from in and out-of-the-family environment (Arkleton Trust 1992). The location and the production system of the farm have been shown to play a role in succession. Farmers in less favoured, mountainous areas with extensive livestock systems have a lower likelihood for succession as compared to farmers in plains with arable systems or in peri-urban areas (Gidarakou at al. 2002). However, it has also been ascertained that a lower likelihood for succession in poor agricultural areas should not be necessarily expected, relating thus succession to the lack of employment opportunities in an area (Fennell 1981, Potter and Lobley 1996).

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1 For example, in two of the communities included in the research presented here the numbers of school-age children were 19 and 7 in 2000 as compared to 59 and 32 respectively in 1980.

2 The current presentation utilises data made available within a larger-scale research programme; the latter extends to more areas than the ones presented here, where research is still going on.

The existence or not of a successor has been shown to influence the options pursued by the farming family as far as its farming practices are concerned (intensive vs. extensive production systems). Also, farms where a successor is not secured tend to be more static and less dynamic (Symes 1973, Crow 1986).

As far as pluriactivity is concerned, it has been perceived as a long-term strategy of adapting the family resources and skills to the changes occurring in both the rural and the wider economic spaces. Such an understanding, led to the re-design of policies in order to support an 'integrated development' approach (Jervel 1999, Kinsella et al. 2000). It is maintained that the level of pluriactivity of the farming households depends on the type and extent of the farming activities, the farm size, the personal characteristics of the household members, gender, as well as on off-farm factors. However, there are findings also indicating that the organisation and functioning of pluriactive households and the characteristics of pluriactive farmers do not differ substantially from those of the full-time[3] ones (Fuller 1988, Gidarakou 1990). Moreover, pluriactive farmers have frequently been seen as a category who are more prone to abandon agriculture (Bryden et al. 1993). Nevertheless, others argue that there is not sufficient evidence that part-time farming accelerates or supports such an exodus (Mage 1976, Bollman and Steeves 1980).

As far as the relation between pluriactivity and succession is concerned, research findings indicate that the percentage of reproduction is lower in areas with well developed off-farm labour markets as compared to areas with poorer conditions (Arkleton Trust 1992). However, contradictory findings exist as well. It has also been shown that the off-farm employment of the successor indicates the transformation from full-time to part-time farming when farms are inherited (Gasson 1984, Djurfeldt and Waldenstrom 1999). Especially in peri-urban communities, where access to off-farm employment and social services is better, the conditions for succession on a part-time basis are better than in the rest of the rural areas (Gidarakou et al. 2002).

Despite the fact that, after a peak in the 80s, the engagement of the research community with the issue of pluricativity has declined, it seems that there is a need for research into pluriactivity to understand the, so far, non-clarified dimensions of such a complex phenomenon, which is, furthermore, heavily dependent on local conditions. Many questions, such as its role in inter-generational survival of the farm, are still open despite the fact that the policy has based many expectations concerning the renewal of the rural society through an effort to create/secure the conditions that will allow for the members of the farming households to become pluriactive. If the 'common sense' that, on the one hand, pluriactivity paves the way to the abandonment of farming and, on the other, moving towards part-time agriculture relates to an increased move of households from small rural to semi-urban and urban centres, will be supported through research, then the principles on which rural development is based will need to be critically reconsidered. Then, it will be possible to create policy measures that will address, in an integrated way, issues of local employment generation, infrastructure and environmental improvement. Within such a context, topics such as the diversification of activities and its relationship with farm succession should attract an increased attention on the part of the research community.

3 In the present paper the term "full-time farmers" is used to define the farmers and households with no additional income from an off-farm job.

Methodology

Research was conducted in two Prefectures of the country: Evritania in Central Greece and Messinia in the South. The two Prefectures differ in a number of socio-economic indicators owed to their divert agro-ecology and, consequently, production systems (CEPR, 1986). Furthermore, the two Prefectures differ in terms of development interventions in the last 15 years. In the first one, the presence of a development agency since the late 80s, whose role was gradually enhanced through an integrated development plan expanded the supply of off-farm employment, especially in the Prefecture capital Karpenisi, the only urban centre of the area. In the second one, the development process followed a much more ‘autonomous’ and fragmented trajectory, i.e. without any kind of ‘integrated’ interventions.

In each area, two proximate communities comprised the research field. The first area, in Evritania, is a mountainous, peri-urban one in which forestry predominates while the second one, in Messinia, is a semi-mountainous area where agriculture dominates. The choice of peri-urban communities in Evritania was dictated by the insignificant levels of pluriactivity in the more remote communities of the Prefecture as well as by the focus of the research on the role of peri-urbanity on pluriactivity and the relation of the latter with the sustainability of family farming. In the second Prefecture the communities are somewhat at a distance from the capital and thus show a clearer rural character as well as a lesser degree of dependence as far as employment is concerned from the capital. The second area is a rather typical example of the semi-mountainous Greek rural areas, with one of the villages having developed an endogenous off-farm labour market.

Primary data were collected through a survey based on a questionnaire addressing farm heads theoretically being in the process of handing the farm over to a successor or close to it. Each family had at least one child over 18 years old (i.e. an already established successor or a child that might – or not - constitute a potential successor). These households in each village were listed and categorised as pluriactive or not. Households were included in the pluriactive category if at least one of their permanent members (father, mother and/or children) had incomes earned outside the family farm irrespectively of the amount of money earned. The questionnaire was administered to all such households; thus, 60 questionnaires were taken from the first area and 78 from the second one.

Pluriactivity and production systems

Pluriactivity characterises both research areas but its scale and dimensions differ markedly as shown in Table 1. It is an almost generalised phenomenon in Evritania and a much lesser one in Messinia[4]. In both cases a non-negligible number of households are engaged in farming while permanently living in the urban centre. Such households are more common in Evritania (25%) where as mentioned the development interventions have widened employment opportunities (Efstratoglou and Psaltopoulos 1999). In Messinia, their number is lower (13%); furthermore, such households are only found among the pluriactive ones thus reducing the percentage of pluriactive households living in the research area to 30% of the pluriactive households. Pluriactivity in Messinia owes to a substantial degree to the closeness of one of the settlements to the seaside; (tourism activities at local level and fishing). On the contrary, in

[4] It should be stressed that the level of pluriactivity provided by the research does not illustrate the average levels in each area since the interviewed households are the ones at or near the succession process.

Evritania pluriactivity is favoured due to the proximity of the communities and thus easy access to the Prefecture capital.

The production system differs substantially between the two areas but not between the two household categories (i.e. between pluriactive and full-time farming ones) in each of them. In Evritania extensive livestock (sheep and goat farming) dominates with all households raising small ruminants. In Messinia, the production system is dominated by olive orchards (90.6% of the area). In the first case, the total cultivated area per farm is small (2.9 ha) devoted to mixed arboriculture and, to a marginal degree, arable farming predominantly fodder crops; in the second one, the average size of farms is bigger (5.3 ha) and small ruminants are of marginal importance. Contrary to previous research findings (Kassimis 1986, Efstratoglou-Todoulou 1988), the size of the cultivated land (owned or total) is not related to household pluriactivity in both areas, despite the trend that averages are slightly higher for the full-time farming households, thus verifying previous findings referring to mountainous areas of the country (Gidarakou, 1990). However, the size and economic importance of livestock differs substantially between full-time farming and pluriactive households in the mountainous area (60 vs. 25 heads respectively) where small ruminants make up the predominant production system.

It has also to be mentioned that pluriactivity in Evritania mainly refers to children's (permanent members of the household) pluriactivity; only 25% of the farm heads and 18% of spouses are pluriactive vis-à-vis 83% of the households. In Messinia, despite the lower level of pluriactivity, farm heads' pluriactivity is as high as 32% (Table 1). The weaker farming structure of the mountainous agriculture and the proximity of the communities to the urban centre favour pluriactivity, especially of the younger household members.

Pluriactivity predominantly refers to off-farm activities and tends to provide more than half of the total household incomes, a general phenomenon in the mountainous area. Taking into account the inter-generational evolution of pluriactivity an intensified trend of disengagement from full-time farming of rural households in both areas is ascertained, which is accompanied by a transfer of the residence of the next generation households in space in order to be more convenient for off-farm employment. For households who already have a successor living in an urban centre the prospect of his/her return to the communities is negligible. All current farm heads believe that their successors will be involved in farming by commuting to the villages.

The general educational level and the age of both farm heads and their spouses do not differ significantly between the two types of households in both areas with the exception of farm heads in Messinia where farm heads of pluriactive households are younger and better educated. Contradicting findings referring to the relationship between education and pluriactivity are not rare (Fuller 1988, Efstratoglou-Todoulou 1988, Gidarakou 1990, etc.). As far as successors (actual and potential) are concerned, a trend indicating that successors have higher educational attainments in pluriactive households was found, esp. in Evritania. The low requirement, as far as education is concerned, of the off-farm jobs[5] may explain such a weak relationship.

The examination of land transactions reveals an almost identical behaviour of farm heads of both types of household in both areas. An average of 65-70% of farms did not buy land while more than 70% did not sell either, the latter indicating that there is no intention for the intensification of farming activities

5 An analysis of the off-farm jobs of farm heads and, to a lesser degree, of their successors in both research areas reveals that such jobs refer to traditional activities in villages such as: cafes, bakeries, groceries, handicrafts, restaurants etc. Furthermore, there are very few farmers who rent rooms in both areas.

but rather an attitude towards land as an economic security item than as a business asset. The low probability of securing succession, which it will be shown in the next session, explains to a large degree such a kind of attitude towards farming.

Succession aspects

According to the findings, succession prospects are adverse. Around 40% of the farm heads in each area do not expect to have a successor. In the mountainous area, only 16.7% claim that they have secured a successor with another 43% being rather sure. In the semi-mountainous area, succession is secured in 36% of the farms. Therefore, in the mountainous area, despite the fact that pluriactivity is generalised a phenomenon, succession is more problematic. The fact that the problem of succession is more acute in mountainous areas as compared to other areas in Greece is supported by recent research data, too[6].

Comparing the prospects for succession of the two types of households in the mountainous area, reveals that a significant part of the pluriactive households (42%) are in an exodus process while only 8% have secured succession; for the rest (50%) succession is uncertain. A more detailed analysis of the relationship between pluriactivity and succession in the two communities of the semi-mountainous area reveals that the place where a second (i.e. besides farming) job is located differentiates the role and significance of pluriactivity as it relates to farm succession. In one of the two communities, where pluriactivity is higher and takes place within its boundaries (rural tourism and fishing) the succession prospects are more favourable for pluriactive households as compared with the second one. Such findings underlie the complexity of factors entering into the relationship between pluriactivity and farm succession.

The succession prospects do not differ significantly (in statistical terms) between the two categories of households in both areas; full-time farming household heads tend to claim a successor a bit more often. This is explained by the fact that among full-time farms a larger number of successors is occupied in farming and lives permanently in the village (see below). For Greece, Gidarakou et al. (2002) have also found better succession prospects among households in which farming is the main income source.

In a number of farms succession has already taken place; in both areas the percentage of such farms is both low and identical (18%). The picture is differentiated when the two types of households are taken into account (Table 1); a higher percentage of established successors is found in the full-time farming households.

Finally, the attitude of parents towards succession differs in the two areas. The majority of farm heads holds a negative attitude in the mountainous area[7] that is inverted in the semi-mountainous one (Table 1). A more negative attitude is expressed on the part of spouses (wives) in both areas thus verifying previous findings (Gasson and Errington, 1993). Whether the successor stays in the farm is found to be more a personal choice of the children than dependent on the parents' wishes which, in turn, do not translate in an active prompting of children. Indeed, many less farm heads than those holding a favourable attitude towards succession prompt their children towards succession.

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6 The fact that mountainous areas in Greece face a much more serious problem as far as their reproduction is concerned, has also been recently shown in the case of Karditsa Prefecture, Central Greece (Gidarakou et al., 1999).

7 I.e. farmers would not like one of their children to stay in agriculture.

Successors: characteristics and future plans

The educational level of successors (actual and potential) is undoubtedly higher than that of the current farm heads. While there is a trend that successors with lower education are concentrated in full-time farming households, no statistical significant differentiation was found in both areas.

Most of the successors hold an off-farm job and this is more often in Evritania (71% vs. 60% in Messinia). Moreover, the main occupation of the already established or expected successors differs between the two types of households; in the full-time farming households the rate of successors occupied in agriculture is double as compared to the pluriactive ones[8]. Agriculture dominates among those pluriactive successors who also hold a second job.

Engagement in agriculture, as either the main or the secondary job, on the part of the successors is not related to the farm size (owned or total cultivated land) in both areas[9]. In addition, in the case of Evritania no connection between education and main occupation was found, while in Messinia pluriactive successors were found to have higher education in comparison to the exclusively farming ones. In Evritania, the fact that 71% of the successors hold a non-farm job probably obscures such a relationship.

In the case of Messinia, all successors who are primarily engaged in agriculture stay in the villages as compared to 50% of those who hold an off-farm job as their main occupation; moreover, residence relates significantly (in statistical terms) to the place where the primary occupation is located (Table 1). Such findings do not hold for Evritania, probably due to the peri-urbanity of the villages. However, in both areas the percentage of successors living away from the villages is as high as 30%; farm heads are unanimous in their prediction that these successors will stay in the urban centre and will commute in order to continue farming.

According to the data, it seems that in the next generation part-time farming will predominate; in Evritania, according to current farm heads' opinions, successors are expected to be pluriactive at an 88% level vs. 25% of the current heads while in Messinia at an 83% level vs. 13%.[10] Especially in Evritania, where the prospects for succession are poorer and the communities are peri-urban, farm heads believe that the next generation will marginally hold agriculture as their main occupation (12.2% exclusive; 7.3% main; and, 80.5% secondary). In Messinia a more positive estimation is made (16.7%; 6.4%, and, 76.9% respectively).

Conclusion

Pluriactivity is a basic feature of farming. It has a spatial dimension, depending on the supply of off-farm employment and its location vis-à-vis the communities. Relevant findings confirm the spatial dimension of the phenomenon (Arkleton Trust 1992, Damianos et al. 1994). Pluriactivity is encountered more often in the peri-urban communities of Evritania.

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8 The fact that there are pluriactive successors in households characterized as exclusively engaged in agriculture is not a contradiction since there are successors who are not permanent members of the household.

9 Other research data suggest that, for Greece, the relationship between farm size and succession is not significant (Gidarakou 2002).

10 The same holds true for other Greek areas as well (Gidarakou, 1990).

Production systems differ spatially (i.e. between the two Prefectures) but not between the two types of households (full-time farming vs. pluriactive) in each area; full-time farming households own only marginally more land than the pluriactive ones. However, an orientation to livestock production, due to its labour intensive nature, restricts the potential for engaging in an off-farm job (Kazakopoulos, 2000).

A large number of farm holdings (around 40%) will not be reproduced. Pluriactivity while not supporting succession in the framework of the fragile agricultural structures under consideration it does not prove to be a step towards exodus either. There is nevertheless a slight advantage of the full-time farming households in terms of succession. The relationship between pluriactivity and succession depends on the location of the off-farm labour market.

The running of a farm holding (by the farm owner) in a community does not always coincide with residence in the community. The loss of farming households from the communities through the inter-generational change will be higher than the loss of farms. An important number of households are occupied with farming while being established in an urban centre and such a phenomenon is expected to grow in the next generation. A number of successors are already residents of an urban centre and, according to current farm heads, do not intend to return to the villages. The proximity to the urban centre plays an important role in selecting such an option with the closest to the urban centre communities having a greater potential to retain their households in place.

Significant changes occur in the succession process. Agriculture will become a non-exclusive or secondary job for the big majority of the next generation households. The disengagement of rural households from full-time farming will be intensified in both areas. The renewal of farming will go hand in hand with an increasing shift to part-time farming (Gasson 1986, Gidarakou 1990).

The jobs held by both farm heads and their successors are low-profile in terms of social status/profile and do not depend on either age or education; therefore, no relationship was found in terms of education since almost everyone can hold such a job.

The development interventions in the mountainous area widened the employment opportunities in the prefecture capital and attracted the younger members of the rural households. Pluriactivity on the part of the farm head is rather low.

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Table 1: Basic characteristics of households and successors in the research areas

	Evritania		Messinia	
Pluriactivity of farm households	83%		40%	
Residence outside the village	25%		13%	
Pluriactive farm heads	25%		32%	
Pluriactive spouses	18%		17.9%	
Pluriactive grandfathers	5%		6.4%	
Estimated (by the farm head) pluriactivity in the next generation	88%		83%	
Income from pluriactivity = or > farming income (for pluriactive households)	92%		81.1%	
	Full time	*Part-time*	*Full time*	*Part-time*
Average farm size (ha.)	2,9		5,3	
	3.6	2.8	5.5	5.0
No of animals (sheep & goats)	60	25	26	20
Farm head's education < or = primary	80%	88%	57.7%	76.2%
Successor's (actual and potential) education > primary	16.7%	55.2%	57.7%	76.2%
Positive succession prospects	16.7%		35.9%	
Rather positive succession prospects	41.7%		24.4%	
Negative succession prospects	41.7%		39.7%	
Farm heads' negative desire for succession	55%		15.4%	
Spouse's negative desire for succession	61.1%		54.7%	
Encouragement/prompting for succession (by the farm head)	25%		52.6%	
	40%	22%	56.1%	48.6%
Successor's main job location at village (according to main occupation)	*farmer*	*other*	*farmer*	*other*
	66.7%	36%	100%	39.3%*
Successor's education > primary (according to main occupation)	*farmer*	*other*	*farmer*	*Other*
	40%	52%	42.1%	82.1%

(*) statistically significant (at 5% level)

Early Experiences of Participatory Learning and Action Research with Organic Farmers in Sweden

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Abstract

This paper seeks to trace some new developments in Swedish agricultural research: in the approach and methods of conducting research and within the growing organic farming research community. The basis of these developments has been the recognition that a change in form, substance and method was needed; from a rather narrow, researcher-driven, reductionist approach to problem solving, towards a farmer-participatory, systemic approach *which seeks* to improve farming systems and livelihoods of organic farmers. Farmers, extensionists and researchers are all partners in this process. This new approach is illustrated with an account of the experiences of a number of farmer-driven researcher groups. These have evolved over the past 4 years together with the facilitated changes in institutional research and donor support which have enabled this to happen. The key elements in the approach have been: the participation of many stakeholders in the research, a systemic learning and action process and the willingness of both an institution and research donors to support these initiatives.

Introduction

The organic movement recognises that each and every farm has a unique, productive system that involves highly complex, and partly unknown or poorly understood, interactions. It follows that a conventional, reductionistic scientific approach alone will not solve the problems that farmers experience in practice (Röling and Wagemakers, 1998).. Until very recently, much research into organic farming systems followed a conventional research approach, dominated by a positivist-reductionist scientific paradigm, and a transfer of technology process in which farmers are recipients of technologies primarily devised by researchers (Biggs, 1989). While this might have been appropriate for a range of specific problem areas, it was inadequate in dealing with the real complexities of organic farming systems which rely heavily on interaction, diversity, managed ecosystems and the emergent properties of these systems.

The need for a new understanding of systems

In order to understand and research these complex situations, there is a need for an holistic approach, in which research is conducted within a farming systems context. These systems, in turn, sit within livelihood, community, water catchment and regional systems. These approaches are now very common in different developing and developed country research systems and have been evolving over the past 40 years within what is widely known as farming and livelihood systems research (Collinson, 2000). These ideas have been firmly based on ideas of hard and soft systems thinking, first developed by Checkland

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(Checkland, 1981; Checkland and Scholes, 1990) and later developed and applied by many others (eg. Bawden, 2003).

One initial aim of agricultural and development research is to describe and understand the world in a way that contributes to both practical changes and long-term theories of development, (Svensson, 2002). Research that has started with an holistic approach within a system may then generate research questions that can be studied in other environments, but initially such research is designed to address the situation within the system itself.

Today the Swedish farmer is subjected to many different pressures which derive from policy directives and from farmer organisations. These are often designed to meet political goals and involve rules and regulations from local, national and European agencies. These directives are intended to create change towards a more sustainable agriculture. For the farmers to implement these goals fully often involves an adaptation of the whole system with adjustments to family or hired labour use and responses to changing, economic, climate, soils and environmental conditions. Developing a relevant research programme in such a context calls for new skills from researchers, extensionists and farmers.

Changes in agriculture and food production worldwide (over-production and food quality and health scares in the West and North, and poverty and food shortages in the developing countries) have prompted a significant change in the focus and manner of conducting research towards a more sustainable approach to resource management and rural livelihood systems. In this process, much experience from years of working in the developing economies with farming systems development, interdisciplinarity and farmer-participatory research, has been recognised as being relevant to the developed economies. Many of the principles behind these approaches are relevant to the organic movement but few have been adopted so far. (Gibbon, 2002).

The approach described here starts from very different assumptions about the nature of the world and about the nature of farming systems. Essentially, it accepts that all the stakeholders in the process have valid perceptions and ideas about how farm systems work and how they might be “improved”. The key to the approach is that farmers, and resource users generally, have an equal voice in the process of understanding the nature of the “problem” and the development of ways of either “solving the problem” or in developing ways of improving the situation to create more sustainable systems. (Röling and Wagemakers, 1998).

Bringing farmers into the process

This research focuses, both on the subsystems within farm systems, and on the wider community or area-based systems in which farm systems are embedded. An effective research process cannot evolve without the intimate knowledge of these systems and the skills and experience of farmers or the farming community. Their participation in the process is crucial for a sustainable development of agriculture and connected systems not only to identify and work with relevant questions but also to initiate action and learning, which will bring about practical change. The key problem that we face in developing more sustainable development is to not only to understand the nature of the problems but how to implement new knowledge effectively in society. For people to make new choices that will create sustainable development they require knowledge based on power of insight, experience and comprehension (Jönsson, 1996) as well as self-confidence. This may be gained in participatory projects based on the participants’ own creativity, experiences and participation and use of abductive logic. (Scoones and Thompson, 1994)

In Sweden, farmer participation in research has normally been limited to a contractual or consultative mode or by contributing with resources such as land and labour at the most. (Biggs, 1991). Introducing a form of participatory research in which farmers are regarded as partners is a part of meeting Swedish agriculture's need for new knowledge and competence and is an example of the multi-scientific and developmental research proposed by Tydén (2002).

An initiative at the Centre for Sustainable Agriculture, SLU

In 1998, the Center of Sustainable Agriculture (CUL) at the Swedish University of Agricultural Sciences (SLU) initiated a participatory research programme with organic farmers in Sweden. The aims of this initiative were to:

- begin a dialogue on what participatory research might contribute to Swedish agriculture
- initiate participatory systems research with Swedish farmers
- contribute to the ongoing process of building up knowledge and organisation and introducing participatory learning and action research at SLU
- facilitate the work of several farmers' groups and monitor the varied and distinctive development of them
- explore the interests and roles of different stakeholders within the participatory research groups

The rest of this paper will be an account of the progress so far in the achievement of these aims.

The Development of organisation and knowledge

Getting started 1998 & 1999

In spring 1998 the first participatory group started through the project "Participatory research on ecological farms in Sweden – systems analysis, priority settings and research development in the field of legumes/leys/green manuring." (**the Cereal group**) led by one of the authors[1] . After having worked with this group for a year a workshop on participatory methods, two days long, was given for interested advisers, farmers and researchers. The participants were introduced to the ideas and goals of participatory research, worked with different tools and methods and discussed the pros and con's of this way of working. During the course, five new groups were initiated: - 1. Organic **Greenhouse tomato** production, 2. **Poultry** production, 3. **Vegetable** production, 4. **Energy** production and 5. **Pork** production. Of these, the first four began and most included farmers, advisors and researchers, except for the energy group that did not include a researcher. In the organic greenhouse tomato production group, one person[2], who had more formal education in participatory research, joined in order to get further practical experience and to contribute to the process. She was given the role of facilitator in that group.

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Progress from 1999 to 2002

All the initial groups had some financial support from the Center of Sustainable Agriculture. This support was used to either pay a researchers salary, pay for participants travel costs or for needed analysis. This money was not enough to support the groups' work fully so the groups, with active advisors or a researcher that had the know-how to find and apply for money are the ones that are still working together. These advisors and the researchers have also been crucial for the groups in supporting them in administrative matters and writing up reports.

The facilitation of the **Greenhouse tomato** group turned out to be a key success story. This group has analysed their situation and worked with their priorities (Eksvärd, 2001). The group began with a group contract, discussing why there were different opinions and the reasons for group participation. In 2000 CUL asked the facilitator of the group to write a report about the learning, results and experiences from their work. This report focused on describing the process in the group and the results of their work to other farmers, advisers and researchers. After this, resources were found to write a description of participatory learning and action in Sweden. Resources were also found to support the facilitation of the working groups. Two other groups, the **Cereal** group and the **Vegetable** group, invited the facilitator to assist with planning, evaluation and group dynamics. The **Energy** group did at not show much interest and were difficult to contact. This group used the financial support for study tours and waited for one of their members to build a biogas digester. They never got a research process started and did not experience any need for facilitation. The **Poultry** group was based on an experience exchange group that added a conventional researcher that had not taken part of the original training workshop. There was some confusion in the group about how to work and who was in charge. The extensionist that had been part of the workshop worked less than halftime.

During 1999 a new program for ecological and organic agricultural research was used by the Swedish Research Council for Environment, Agricultural Sciences and Spatial planning. The Deputy Director of CUL at the time had the task of putting the programme together and managed to add one line in the end of the program saying that projects including participatory research were of extra interest. Some time after the programme started, CUL arranged a seminar at the University describing how participatory research had been evolving. These two events, in part, raised interest and resulted in four research applications that included ideas for participatory groups connected to the research. Only one of these was granted. This resulted in the **Cultivation system ecology** group which started work in 2002.

Funding for the groups has been found from different sources. The **Cultivation system ecology** group has been financed through a larger research grant. The **cereal** group started out on a one year research grant and has after that had a smaller grants on yearly basis and the **Greenhouse** group and the **Poultry** group has repeatedly applied for KULM-support i.e. money given for raising competence of ecological farmers by the Swedish Board of Agriculture (JBV). During the years an advisor in the **Greenhouse** group and the deputy director at CUL has repeatedly talked with enthusiasm about this way of working with people working at JBV.

At the beginning of 2002 CUL employed the facilitator half time, for a period of three years to enable a stabilisation of participatory research in Sweden and to develop an organisation and academic base for this kind of work within the University. When the facilitator started, all the groups connected and with financial support from CUL were asked for a short description of what they had done once a year. The

Energy group never progressed further than a study tour and ended their connection with CUL and the **Poultry** group began documenting some of their work.

Getting closer during 2002 & 2003

In 2002 it became clear that to be able to start new groups this work needed to be more attractive to researchers and creditable to the researchers involved. Even though this kind of work can very well be seen as the task of spreading the findings and results from research to society which is officially an important part of the University’s assignment it is not something that is seen as giving credit points or merits for a University career[3]. At this point attention was given to begin scientific writing that would include the group process of both how the questions had been raised and dealt with as well as the results of the work.

In 2002 and 2003 the participatory research work was presented in a poster session at a conference, advertised on CUL:s website and in the Ecological farmers weekly mail information. Parts of the work of the **Greenhouse** group and the **Cereal** group were also given attention in magazines for farmers.

During 2003 CUL had decided that their aim for the future was to support participatory research by giving institutional support, training facilitators, arranging meetings for group members and facilitators to share information and experiences, inform about funding possibilities and help spreading information. To do this, money was requested from the Swedish board of agriculture to hold a training course for facilitators.

During 2003, the programme for ecological and organic agricultural research, which is the guide for government and private funding bodies, was rewritten. In this programme participatory research was not only mentioned but described as one of the major approaches requested for future research.

Cases

Activities of the Greenhouse group

The group with organic **Greenhouse tomato growers** was formed in February 1999. Since then, new members have joined and a few have left, but several growers active today have been present since the beginning. From the start this group contained 9 tomato growers, 2 advisers, 1 researcher and a facilitator. The greenhouse group has been productive and its members have achieved much during these years. The reasons for this group’s success are: - interested and active growers, active advisers willing to adopt to the approach and active in finding finance, good communications, regular written reports and the access to facilitation. When the group first met they all had one urgent problem in common, that of the corky root disease *(Phyrenochaeta lycopersici)*, that needed addressing. This work began immediately and went on in parallel to the building up of group confidence, understanding participation, drawing the larger picture, finding questions, problems and possibilities to work on in the future. The documentation of every meeting from the start has also been important, the reports showing progress every year, the practical changes by the growers and the practical “hour” of every meeting spent in the greenhouse of the host – grower.

3 Like many Universities, SLU recognises publication in key academic journals as the primary measure of achievement.

The group has worked with corky root disease and compared yields and development of grafted tomato plants on wild tomato roots resistant to root disease and not grafted plants as means to deal with cork root disease. As using grafted plants is not a final solution to this problem the group decided to go on with the question and they obtained a research grant covering 4 years of experimentation to find ways to live with the disease. This is the first research grant that has been awarded to a group primarily made up of farmers.

The group has also worked systematically for 3 years with plant nutrition questions. Their results have drastically changed the view on how to fertilize organically grown tomatoes, and this was presented in an article in "Ekologiskt lantbruk", the paper of the organic farmers. This work has led to discussions with the KRAV, the Swedish member organization of IFOAM, about their rules for fertilizer use as the group's work shows that the current recommendations results in an overuse of phosphorous. A report presenting this work was used as part of the background material by the in preparing new rules for organic greenhouse production in the EU. The final report is written in Swedish (Ögren et.al. 2003)

Another question raised by the group is "what is organic/ecological tomato production?". This question has followed the group from the initial feeling unease about heating greenhouses with oil, but it was not until spring 2002 that the group was ready to formulate their questions around the subject and starting to work with them. At this time the question had been brought up again, through the work with plant nutrition, which drastically challenges the conventional view on what are to be considered organically sound production methods. In this work a researcher working in sustainability questions and with experience of organic tomato growing joined the group. This work will be presented in a coming report.

The group has also carried out a comparison of energy consumption, compared taste of tomatoes with different treatments, taken courses, taken part in conferences, analyzed their business situations, checked their water quality and conducted several smaller informal experiments such as growing tomatoes in sacks and the use of silage as a fertilizer source.

The Vegetable group

The vegetable group started in 1999 after the workshop that one of the growers attended. Members of this group were five growers, one researcher and one advisor. The group's first meeting was facilitated and began with mapping members' farms and production systems. This group had problems from the start as there was no financial support for the advisor, the growers were few and the group lacked facilitation and support. There were plenty of ideas but they needed prioritization and a structure. During 1999 the group visited two of the growers' farms and in 2000 there were three pieces of work done by three different growers. At the end of 2000 an evaluation and replanning was carried out with facilitation. This revealed that the growers liked to meet fellow growers, enjoyed the sharing of experiences, enjoyed getting away from everyday labour and had an interest in the fieldtrips that had taken place. But the group was still confused about what they were actually doing, what was expected from each of them, how to get started and some farmers found it stressful to be away from work on the farm. During this meeting the group decided that their main goal was to exchange experiences, develop their enterprises and to share time and intellectual fellowship together. They decided to divide their meeting into two parts, one "specialised" and one common. The specialised time was to be used for a theme to be worked on for a longer period of time and the common time for regular exchange of experiences, inviting people with interesting information or ideas. They agreed on trying to finance the advisor through making the group a "farmers' circle", to extend the group and to meet 3-4 times a year. They also decided to divide and share tasks such as; applying for money, documentation, arranging meetings and developing meeting agendas. After this they decided to work with plant nutrition and began four field trials. However, they were not successful in finding financial support, nor in extending the group, partly due to being keen on finding someone with experience. Before the 2002 season one grower and the researcher left the group. The farmer, due to too much work, and the researcher got involved in another group. The group has not met since.

Cultivation system ecology group

This group began with a researcher designed idea which was based on expressed problems from farmers. An application was made for the funding of five work packages and four were granted. These were: - plant nutrition, plant protection, food quality and participatory research, an they were all joined together in the project "The ecology of the cultivation system: green manure as a multifunctional tool in ecological vegetable production." As this group started off knowing they were a part of a research programme with defined goals they were clearer on what the group was to be about. Most of the farmers (from 6 farms) expressed that their goals where to "get rid of Binadan". (Binadan is an organic fertilizer imported from Denmark). One of the two researchers wanted to develop an optimal system, but did not specify in what way it would be optimal. The goals were well adjusted to the hard systems plan of the research project. Neither of the two researchers had taken part in any participatory training but one had been part of the **Vegetable group.**

In the first two meetings there was some unease within the group about doing participatory exercises such as a "team contract" and "rope square". Some members wished to "get on with the real work" and the facilitator deliberately used some of her power to enable the group think about their goals, expectations, responsibilities and questions about decision-making. With the variety of people involved there have been surprisingly few conflicts, although a few disagreements have occurred. The extensionist was also part of the greenhouse group and was responsible for the participatory work package in this project. The facilitator and the extensionist had to remind themselves that this group was developing in a different way from the greenhouse group and that the form of participation was different from the start.

At the group's third meeting things began to be more relaxed. This meeting was held at one of the farmer's farms. As the group members come from over the country, most meetings have to be in Stockholm due to practical travelling reasons. On the farm, the farmers began to talk more openly. The shift in engagement and ideas was very clear. After having watched and talked about the farm enterprises, fields, machinery and buildings the group joined to do a participatory exercise moving from the farmers goals to what questions they would like the project to answer. A large table was constructed with the questions and how, if and by who they would be answered. The exercise went very well and revealed to the whole group the potential and understandings held by farmers as well as the potential value of participatory tools. This group is working on questions connected to the defined research program and shows little intention so far to discuss any other matters.

Discussion

Differences in group and process development

The **Greenhouse** group has clearly stated that they are "…working with organic tomato production, using everybody's experiences to reach a higher level of competence through experiments, systematic work and analysis." They are driven by wanting to improve their own situation by finding better ways of production and reducing the immense lack of knowledge suitable for organic growing they experience. This is different from the **Cultivation system ecology** group that focuses on a project which searches for more technically sustainable plant nutrition solutions that also should work practically. The **Vegetable** group started out not knowing what they where working for and attended for the intellectual fellowship to begin with. These differences show in rates of development of the groups.

The **Greenhouse** group has clearly moved through to new experiences and knowledge which has raised new questions. The group started out with a focus on finding solutions to their corky root problem which the academic world knew little about. Knowing that they by themselves could not describe the fungus, or show the control spots, they aimed to find ways of living with the disease. The first idea of using grafted plants revealed difficulties in the nutrition balances, followed by new experiments which showed that some analysis levels used were not compatible for organic production. This led to new analyses to find suitable levels, which revealed the extremely high phosphorous levels (about 10x the lower limit of the highest classification level) that had developed in the greenhouse soils over the years. This called for the need for new strategies for manuring, including the use of easily soluble fertilizers and bringing into question the basis of organic production. The process this group has gone through is also clearly a product of social learning and dynamics within in the group. At first the group began with "secure" questions within production, but after having worked together for a year the rough financial situation for growers led into questions of economic cooperation and common homepage advertisements. Differences in interest and long distances between farms made the group settle for discussing the pros and cons of their production systems. This could not have been done without the open atmosphere created by the group. Also the question of "what is actually organic" had its roots from the very first methods used which looked at what interfered with organic tomato production. The levels of oil consumption became a question everybody agreed on as important but saw as a more or less indisputable. They agreed to compare consumption levels but never really wanted to look at the fact that this did not make their production sustainable. After three years the question had matured and developed for the group to decide to look into how they define what is organic, which choices they need to take and what they make those choices from. This group is working within an ongoing process raising questions which have relevance for several different projects.

The **Cultivation system ecology** group is more or less working within a technically defined project. Learning continues to adjust the project to the experience. When the farmers decide on how to deal with the questions the project is fitted into live systems. It is interesting how differently the farmers choose to work depending on what solutions fit their production and interest. The farmers have also clearly shown the low value of calculating financial costs at this time as was first planned in the research application. The initial set project framework and the given time frame does not give rise to a flowing process as in the **Greenhouse group**. Farmers in this project are paid by the University to do research. The group has not worked for more than two years and it could be that when the project is finished that new ideas will emerge for the future. The group has managed to become participatory to a high degree with the farmers deciding on how to do field trials. They are also affecting the larger project through the seminars that the whole project has together and meetings between the people responsible for the different work packages.

The **Vegetable** group carried out smaller individual projects, sharing experiences but never got into a learning cycle process. This group would have probably benefited from more facilitation from the start, particularly as neither the researcher nor the advisor had attended the workshop in 1998.

Starting a participatory group or project does not necessarily guarantee a process that will develop and raise new questions. Under the circumstances here this has not been the case when effort was not put into early group development and when restrictions on the aims of the group were decided on in beforehand.

Some key lessons and outputs from the different group activities are summarised in Table 1 in Appendix 1.

Participatory research as part of Swedish agriculture

Participatory Learning and Action is a complementary approach to "conventional" research approaches and a way to meet agricultural society's need for new knowledge and competence. It creates space for bottom-up development and a possibility to adopt solutions to place and situation. For sustainable agricultural development in Sweden it would seem to be essential that the actors are able to observe and predict changes, take in and use new knowledge and learn from their experiences.

Learning from:

1. The Farmers' perspective

The farmers taking part in the groups are all eager to learn and work with their situation, even though they at times have difficulties in finding time to do the tasks they have decided upon. The approach is appreciated as described by a producer saying: "*It is the wholeness of it that is the most important. That we are a very broad group working together to find what's best for organic tomato production*". The group meetings are important for sharing experiences and socialising with fellow growers but there is a need for the development of the research questions to keep the engagement going. After 4 years of PLA a producer states "*It is better now, but it was easier before*" referring to all the new knowledge that he now takes in when deciding on measurements in his production process.

2. The Extensionists' perspective

"*To meet people and the group in a more focused way than before has been important and raised new questions*". The extensionists in the **Greenhouse** group point out how much they think that the growers have received through group work and that the group's documented reports are valuable material for extension. An advisor points out the importance of working with the growers and taking part of their reality for her as an advisor. Understanding and taking part in the grower's situations and their problems has been as important to her as finding solutions to some of the problems. The advisors also underline how much fun they have had during the work with the groups.

3. The Researchers' perspective

An active researcher, formerly trained in systems thinking and approaches, claims that the important part is to through the contribution of scientific knowledge be part of creating real change for more sustainable farming systems. Participatory methods are seen as the only means of working with research and development in complex situations such as farming systems. Two researchers, trained in reductionist science, describe the importance to them of getting a fuller picture of the farmers' situations and that this gives them inputs to their research. Still one says "*As a researcher the corky root project was wonderful. There was a possibility of working with this question in practice, research and in the education. We learned a lot and it would be very stimulating to go on.*" A researcher asked for a deeper discussion on the theoretical base of this kind of research under Swedish conditions. Researchers used to traditional research are expressing difficulties in understanding their role as contributing with scientific knowledge but not being "the researcher". Other problems seen by researchers are time planning and new demands on what they are to do.

Conclusions and key issues for future research and development

Some key issues for future development of participatory learning and action research in Sweden are to maintain real participation, where the power of the research process is given to the actors to find and work with the key questions in creating sustainable development through new knowledge and practical change. This may well involve a learning process based on the Kolb learning cycle: Abstract conceptualisation – Active Experimentation – Concrete Experience – Reflective Observation – New Abstract Conceptualisation (Kolb 1984) without being restricted by rigid project ideas and limitations. Funding for participatory research is planned for in the new programme for ecological research but how bound that money is to pre-stated projects is not clear. In this there is also a challenge in finding the researchers and advisors who will facilitate groups, trust the group process and relax control. Finding financing for CUL to support and create possibilities for the facilitators to support and develop their facilitation skills will be crucial. This is a main goal for CUL for 2004.

As both the **Greenhouse** group and the **Cultivation system ecology** group are successfully using the approach within their own limits and differences, their progress shows both quality and richness. The approach is based on trust when groups are given the freedom to find their own issues that need to be addressed, group dynamics are improved and factors that usually interfere with communication are reduced. This has also shown that the groups are fully capable of setting and implementing their own research agendas.

Crucial to the development at CUL and in the groups has been the patience to let things develop, starting small and to give time for everybody to learn. The development of groups has been the base for development at CUL and for everybody involved. That the facilitator has trusted the process, working carefully to develop participatory research in Sweden, sharing the learning and experience and letting go of ownership have also been important elements. The slow process of development, critical thinking about learning and future needs and "sensing" the next step, have been important in the development of PLA at CUL.

A key issue for future development of PLA research in Sweden, when the number of people involved are expanding, is to maintain a constructivist, systemic paradigm. This is not always easily understood by advisors and researchers who have been trained in positivist- reductionist science. Also crucial is the need to impress on researchers that there is an important contribution to a research process here and that what is happening is not a development process divorced from "real" research.

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Appendix 1.

TABLE 1. Lessons and outputs from the Group activities

Group	Composition	Institutional linkages	Group learning	Research outputs	Future action	Practical change on farms
Glasshouse tomatoes	1 researcher 2 advisors 13 farmers 1 facilitator	CUL, SLU 2 County Adminis-trations	Choosing to define what is organic to them, asking specified questions, daring and deciding to scrutinize their own situation.	1. <u>Plant nutrition</u> Knowledge about combining store manuring and top dressing for higher produce. Identified and specified questions of the plants needs of nutrition over time. Discussions with KRAV about need to change rules. 2. <u>Corky root disease</u>. Knowledge about needed changed production methods and effects on taste when growing engrafted plants 3. <u>What is organic?</u> Clarification that the lower limit for what they consider organic has lessened over time.	1. Identifying nutrition needs over time for better nutrition utilization. 2. Trying new ways to live with corky root disease. 3. Calculate environmental impact and discuss ethics	Changed manuring strategies by farmers. Changes from sharing experiences such as changed watering strategies, new technical device and plant tending.
Vegetable	1 researcher 1 advisor 5 farmers	EVP, SLU County administration	Need of structure and work with group dynamics	1. Tried different levels of compost from local fungus production as fertilization to cabbage (1 farmer) 2. Planned planting and sawing time to suit the farm shop selling own produce (1). 3. Developing carrot production on ridges for better products and labour saving (1)	-	?
Energy/Biogas	1 advisor 12 farmers	The Rural economy and Agricultural Societies	Study tours to biogas energy production digesters.		-	?
Cultivation system Ecology	2 researchers 1 advisor 6 farmers 1 facilitator	EVP, SLU County administration CUL, SLU		The research questions have been adjusted to the different farm systems and farmers to fit into real systems.	Continued work with digested biomass, cover crops and composted ley as nutrition source for organic vegetable production.	

The Concept of Eco-regions in Austria

Markus Schermer*

Abstract

The paper aims to provide a closer look into the concept of eco-regions in Austria. The idea behind this concept is to merge organic farming and rural development into a territorial strategy. The actors proposing this are coming from the farmers' side as well as from various stakeholders in regional development.

The results of a survey provide an overview and a base for a preliminary classification of the various approaches. They also show that each region has a specific problem situation and the eco-region provides an answer to this individual situation.

The "Eco-region National Park Hohe Tauern" is used as a specific case study to assess the impact of this concept using the rural livelihood framework. This case study shows that the concept of eco-regions provides a range of improvements to the livelihood of small organic farms in lagging regions. Moreover it allows forging new alliances, which can help to extend the philosophy of sustainability inherent to organic farming also to other actors and sectors in the region. Thus it provides a frame for a territorial application of the principles of organic farming. But the case study reveals also potential dangers, especially by powerful market partners using the concept for their purposes, dominating the further development and creating new dependencies.

Finally some general conclusions for the preconditions necessary to establish eco-regions are drawn.

Introduction

The concept of eco-regions ("Bioregionen" in German) is gaining increasingly importance in the rural development debate in Austria (Schermer, 2003). The idea of eco-regions emerged during recent years in the context of regional and rural development as well as of organic farming (Groier 1998). It is perceived as an important chance for organic farming, but also for the regional development, especially of mountain areas. Contrary to approaches in other countries (like the "bioregion" concept in the English speaking world) it means in the Austrian context a sustainable regional development approach based on the principles of organic farming which are applied also to other economic sectors.

Various stakeholders from the regions themselves have started to propose this concept and to call their region a "Bioregion". The idea to merge "organic" and "region" meets the interests of different stakeholders:

- Organic farmers hope to reduce the exchangeability of their products in indirect marketing channels. This danger is increasingly felt under the prospects of EU-enlargement.
- Representatives of the agricultural sector want to avoid decoupling of food production from the maintenance of the cultural landscape.
- The retailers want to increase trust into their products and foster long term consumer relations.

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- Consumer organisations expect more traceability and food safety from organic products out of a specific region.
- Environmental NGOs support the decrease of food miles by regional production in addition the environmental friendly production method of organic farming.
- Regional development agencies aim to increase the regional added value while strengthening regional identity at the same time. They want to profile the region better in the ongoing “competition of regions” especially by creating additional programs for tourist activities.

This paper examines mainly the impact of eco-regions on small scale organic farmers in mountain regions of Austria. It starts from the hypothesis that eco-regions can offer new opportunities for small organic farmers and help to bridge the shift from production to protection. Moreover eco-regions are supposed to contribute significantly to the sustainable development of lagging rural regions.

The first section of the paper gives a short description of the concept of eco-regions and presents the results of a survey on its various current expressions in Austria.

The second section analyses the impact of the concept using the framework of sustainable rural livelihoods as developed by Scoones (1998).

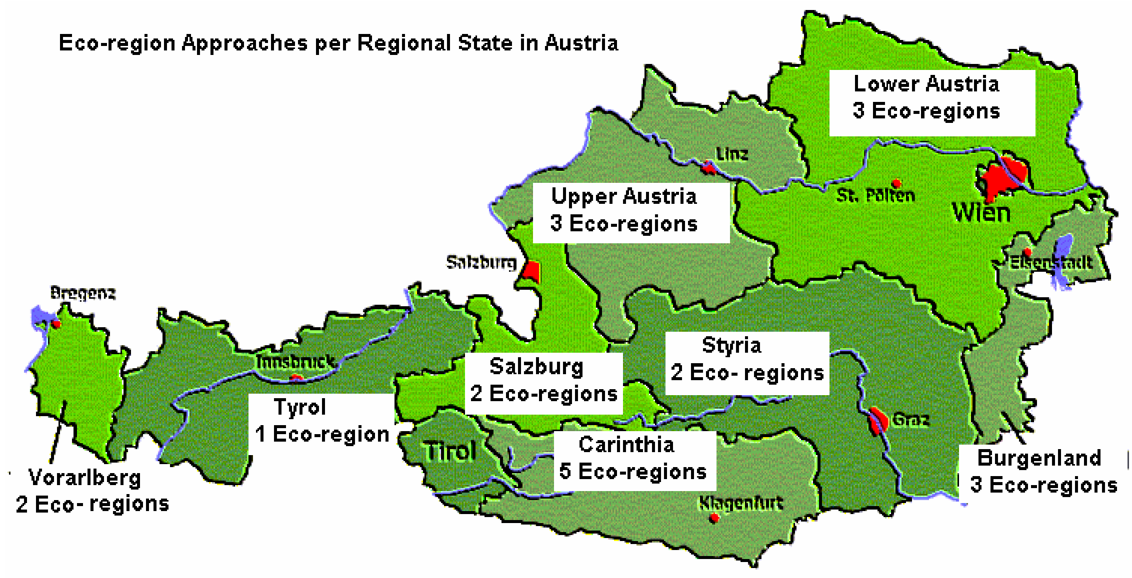
In doing so the paper follows a case study approach. First a brief description of the process describes how the concept of an eco-region developed in the case study region. Then the implications on the livelihood of the organic farmers concerned are analysed according to the elements of the sustainable rural livelihood framework.

At the end of the paper some general conclusions for the conditions, under which eco-regions can be established, are presented.

The present status of the concept of Eco-regions in Austria

In order to assess the present situation, I tried to compile an overview of potential eco-regions out of various sources (secondary literature, news clippings, personal communication with actors in the organic scene, internet search). Even if I missed out some, the number included already provides a quite comprehensive picture.

I managed to trace an eco-region approach in all regional states of Austria. All in all, 22 regions with more than 30 single initiatives were identified that stated the “eco-region” more-or-less as a goal for their development. In nine regions I found explicit references to the term “Bioregion” (eco-region). A special case is the trans-boundary eco-region “Bio Alpe Adria”, which includes Carinthia in Austria, Friaul in Italy and the whole of Slovenia.



Some general points emerged from this initial survey:

- The definition of "region" varies. Generally the delineation follows functional criteria or natural boundaries rather than administrative boundaries. In some cases it is only one municipality, in others it crosses administrative boundaries and reaches up to a regional state or even across borders. In at least one case a protected area serves as a territorial boundary.
- Regarding the inception of the idea most of the initiatives are producer led, but often the retailing sector, especially the supermarket chains are stimulating the development by voicing out the consumer demand.
- Also the structural fund acts as a catalyst in many ways. They often integrate environmental concerns with economic endeavour. Especially the LEADER programs play a prominent role. In 12 regions identified a LEADER II program was active. Most of the regions continue currently under Leader +. Three areas were Objective 1 in the last program period. Moreover, most of the regions are part of an LFA according to the EU-criteria and received support by the Objective 5b program between 1995 and 2000. Such support in particular stimulated the formation of organic marketing initiatives, which were often starting points for the idea of eco-regions.
- Not everywhere "organic" agriculture is explicitly mentioned, some talk about being "close to nature" etc. I therefore also included some approaches where regional agriculture with some component of organic is used as a base for regional development.
- Efforts to improve the marketing of regional products constitute almost everywhere the triggering effect for the development of an eco-region.

The different approaches were classified, modifying the concept of "Culture Economies" as developed by Ray (1998, 2001):

- At least ten groups try to tie organic products to the region and use the concept to **market their products** better. These initiatives stretch over eight regions, which could be classified "eco-regions as regions of origin". Marketing is directed on channels within the region, towards outside or a combination of both. For those supplying supermarket chains the main goal is to reduce the danger of substitution with organic products from more favoured regions. Others favour short supply chains in order to extend their influence up to the end consumer.
- In at least fourteen cases the promotion of the region via an organic image and organic products is an important factor. Some focus on tourism only, others try to integrate agriculture with other economic sectors (processors and retailers) to create added value for the region. These regions use

the eco-region as a strategy for **marketing the region.** Six regions opt for a general vision of sustainability, while four build their strategy on tourism and another four on environmental issues.

- In five regions organic farming is more or less explicitly the leading vision for the agricultural development. They use the concept of eco-regions to **promote a sustainable sectoral agricultural development**.

The above mentioned goals are pursued using three basic strategies in relations to their participation in the overall global market development (Ray, 2001). Either they aim to improve their competitive situation, or they want to cope with the global development using strategies of diversification. The third possible approach would be to disconnect from the world markets as far as possible and to focus on local circuits only.

Those who follow the strategy of **competition** try to improve the position of the producers by horizontal integration or forging vertical networks along the supply chain. Improving the competitive situation of the region means in the Austrian case most often a co-operation with tourism. Such co-operations were identified in at least nine cases. Strengthening the competition within the agricultural sector means building up organic networks of processors and clusters, which can feed into the mainstream markets.

Diversification strategies require a variety of strategic actions applied at the same time, some directed to improve marketing within the region, others outside. Also in this case co-operation with the processing industry, specialised local and regional retailers, tourism and the environmental sector is sought. In five regions, protection of nature is prominent and the eco-region is linked to a protected area or a national park. In some more regions, the maintenance of the cultural landscape is a focal aspect.

A pronounced strategy of **disconnection** from the globalising market development, which would result in favouring regional subsistence, is hardly found. As in Austria both, neo-endogenous development and organic farming have already moved out of the “alternative” corner towards the mainstream, their role of playing an ideological opposition has largely vanished (Dax 2001).

In general the concept in its present state shows a large variety of expressions. A preliminary typology (Schermer 2003) lists nine different expressions. The different goals and strategies are not mutually exclusive, in some cases more goals than one are pursued simultaneously with more strategies than one. This high variation in the expressions can be attributed to the fact, that each region has a specific problem situation and the eco-region provides an answer to this individual situation.

The aim of the paper is to show the impact of the concept on the livelihoods of organic farmers. Due to the high variation of the concept this it is difficult to do this on a general level. The paper follows therefore a case study approach. The following section presents the results of an in depth case study which was selected out of the survey results.

The Case of the “Eco-region Hohe Tauern”

Methodological Remarks

Case study selection and data collection

I initially selected the region “National Park Hohe Tauern” in the regional state of Salzburg, because it was one of the first regions where the term “eco-region” was used. It represents a mountainous region typically for many other regions in Austria. Their eco-region approach combines different goals targeted by different actors: There is a big retailer chain involved who wants to promote its products using the image of the region; the National Park management aims to promote the region itself via sustainable tourism; finally the LEADER group, coming from the farmers side, is proposing to establish organic farming as the leading concept for the further development of farming. Thus all three major objectives identified in the survey are simultaneously present. The main strategy is to improve the competitive situation of agriculture, but also elements of coping strategies are present.

I tried to follow up the process of the concept development over a longer period. Therefore I relied to some extend on analysis of secondary data especially newspaper articles. In particular I went through the weekly regional farmers' magazine "Salzburger Bauer" from 1994 onwards. Other media clippings related to the region were sampled at random. The literature survey included, besides statistical data, also a publication from a research project on regional marketing strategies (Hebertshuber 1998), which had also used the region for an in depth case study. This background information was supplemented by personal interviews with key actors.

The Sustainable Rural Livelihoods framework

I use the concept of sustainable rural livelihoods as a framework to describe the impact of the concept of eco-regions on the rural livelihood of the region in general and of the organic farmers in particular.

The concept of sustainable rural livelihoods is primarily a product of the debate on sustainable rural development in developing countries (Chambers and Conway, 1992; Scoones, 1998). In recent years it has also gained importance in the transitional process of CEE countries. It has been also adapted to the context of EU-countries (see amongst others: Kinsella et al., 2000). Out of the various variations of the concept in use the paper builds on the IDS concept (Scoones, 1988). Scoones defines the key question to be asked in any analysis of sustainable livelihood as follows:

> *"Given a particular context (of policy settings, politics, history, agroecology and socio-economic conditions) what combinations of livelihood resources (different types of capital) result in the ability to follow what combination of livelihood strategies (agricultural intensification/extensification, livelihood diversification and migration) with what outcomes? Of particular interest in this framework are the institutional processes (embedded in a matrix of formal and informal institutions and organisations) which mediate the ability to carry out such strategies and to achieve (or not) such outcomes"* (Scoones, 1988, p3).

The paper follows this structure. A short account of the development in the case study region is followed by the analysis of the vulnerability context, which subsequently leads to a discussion of the various livelihood resources available to farmers. Then the institutional processes and organisational structures in the development of the eco-region are described. Concluding to this section the portfolio of livelihood strategies pursued is presented.

The development of the "Eco-region Hohe Tauern"

As early as 1989 a farmer in the region of Pinzgau, in the regional state of Salzburg, started to think how to battle the declining market share for beef of the traditional indigenous "Pinzgauer" breed. In an interview with me he related his ideas using the following picture: *"If a spring crops up in the mountains the water flows downwards to the valley, merges with a creek, runs into the river Salzach and finally the Danube carries the water to the Black Sea. There the pristine spring water cannot be distinguished from the other any more. On the market it is the same… If it is not visible anymore you will vanish…and it is not recognized, if you do not have a brand"*.

He started to group likeminded farmers around him and approached several butchers to be partners in a regional marketing project "Pinzgauer Naturprodukte". They started to sell beef out of suckling cow production regionally through the outlets of a partner butcher. The project was quite successful and found the interest of the management of the "National Park Hohe Tauern". They invited the initiator of the project to their symposia and congresses. With their help a consultancy office was approached to develop an integrated program for the entire region. The resulting project proposal mentioned the idea of an "ecological regional development" for the first time. The project, however, was never implemented due to lack of interest of other key actors in the region, especially in the tourist sector.

The regional chamber of agriculture wanted to copy the economic success of the "Pinzgauer Naturprodukte" and supported a new project, which also tried to market beef regionally but without restricting it to a certain breed. Both projects rivalled for public funds to set up a slaughterhouse.

Finally the chamber in 1994 installed a working group called "ARGE Nationalparkregion Hohe Tauern", which tried to facilitate between the two projects and to integrate also the activities of other existing initiatives, as well as of the regional dairy coop and the breeders association under a common frame. The basic idea was to develop a common strategy for regional marketing of all agricultural products. The National Park management was first reluctant to co-operate with the "ARGE Nationalparkregion Hohe Tauern" and wanted to restrict the use of the national park logo to organic products only. In the meantime the "Pinzgauer Naturprodukte", with 80 farmers as members, had fully converted to organic. Parallel to this the biggest retailer chain in Austria, Billa/Rewe had started the first organic brand in the supermarket. They made contracts with the regional dairy and the beef producers. After Austrias´ accession to the EU in 1995 the number of organic farms in the region increased dramatically. So the "ARGE Nationalparkregion Hohe Tauern" decided to switch their strategy to promoting only organic production.

From 1997 onward the retailer used the image of the National Park to promote heavily his organic line of dairy and meat products. He also started to use the term "Bioregion Hohe Tauern" for the promotion of his organic brand "Ja!Natürlich". This brand is now finding the highest consumer recognition of all organic brands in Austria and has also the highest market share of all organic brands in supermarkets.

Analysis according to the framework of Sustainable Rural Livelihoods

Context

The vulnerability context of farming in the mountainous regions of Austria is characterised by a strong decrease of fulltime farming over the last generation (Penz, 1997). As traditional farming practices (dairy farming, production of breeding stock), are labour intensive, farm succession is rather insecure if the labour input, required in combination with off farm employment, is not reduced. This change to more extensive forms of production, however, often conflicts with the traditional ways of measuring success within the farming community. Farmers are therefore reluctant to change their production patterns (Schermer, 1999).

In the view of the long term trends of market development since the 2nd world war, mountain farmers found themselves increasingly left behind in the competition with more advantaged areas. Therefore already as early as in the late 70ies innovative farmers started to diversify their livelihood strategies using pluriactivity like on farm holidays, processing on farm and direct marketing (Scheer, 1989). Also organic farming was perceived as an option for diversification. These innovative strategies were finally even supported by the then federal agricultural minister Josef Riegler who, towards the end of the 80ies, published a manifest of "eco-social agricultural policy" (Regenärmel and Schmid, 1989). In the beginning of the 90ies these ideas served as a guideline in the preparation of Austria's accession to the EU. Subsidies for organic farming were introduced and agro-environmental programs designed, which were compatible with EU-legislation.

Still the EU-accession in 1995 can be termed a "shock" as it changed the system of agricultural markets and support policies fundamentally, which effected an immediate price decline. Market prices for most agricultural commodities dropped to about half. This decrease in market revenue was made up by an increase of public payments out of an agro-environmental scheme, which was horizontally applied all over Austria. Organic farming receives the highest payments in the frame of the agro-environmental scheme. Therefore also organic farming was advocated in parts of the mountainous area as a strategy to fight the declining price situation (Schermer, 2003b).

This shift of farmers' tasks from "production to protection" in the public expectation raised an insecurity of farmers on their role in society. In 2001 in the mountainous area of Austria 74% of the total farm household income came from farming and forestry activities. But this figure includes also public transfer payments. The public transfers amounted up to 54% of the total income. The argo-environmental program contributes about 38% to these public payments and another 28% are provided as special payments to alleviate the particular difficulties of mountain farming (BMLFUW, 2002). This means that 66% of the transfer payments or over 35% of the total farm income is not connected to market production. This portion makes up already for the major part of the income as only about 20% is out of product sales and another 26% is contributed by off farm employment. The rest are product related transfer payments, which will be further reduced by the CAP reform. The high share of the income, which is not connected to market or employment activities together with increasing regulations on the farming practices, posed a motivational problem to farmers (Schermer, 2000).

This general context of vulnerability is also the background of the case study region. The region is located in the alpine part of Austria with steep slopes and small holdings. Production is limited to grassland farming. Farmers are predominantly engaged with dairy and beef production also sheep breeding has a major importance. Also the milk processing structures were rather weak. The regional dairy co-operative was believed to be too small under EU conditions.

Livelihood resources

The economy of the region is focussed on tourism. The national park "Hohe Tauern", the biggest national park of Austria, is of high importance for tourism development. The region is of outstanding natural beauty. When the importance of agriculture declined farmers either found employment in tourism or started themselves tourist activities like offering on farm holidays. The proportion of organic farmers reached about 50% in the region. This increase was also a reaction on declining market revenues as organic farming benefited from public transfer payments. After the accession to the EU also their development programs for less favoured regions became available. The region was included as an Objective 5b region and participated also in the LEADER program. This paved the way for financial assistance of small scale initiatives.

Some innovative projects had started as early as 1979 with the small scale processing and direct marketing of mutton. Also the "Pinzgauer Naturprodukte" started already in the late 80ies. There were still some small scale butchers to cooperate with and the farming community tried to keep the regional dairy coop independent.

Farmers´ horizontal networks were already quite dense before. Networks to outside of the agricultural sector were built up primarily by the innovative initiatives already mentioned. The majority of traditional farmers were rather reluctant to engage in new relationships, especially towards the National Park. These farmers had even formed a "protection association" against possible restrictions coming from the national park management.

Also the LEADER program had an impact on the social capital of the farming society. The LEADER-Initiative which was attached to the "ARGE Nationalparkregion Hohe Tauern" created a closer co-operation between the initiatives. They also provided an institutional link to the national park management.

Institutional processes and organisational structures

The institutional arrangements for rural development are dominated by the regional branch of the Chamber of Agriculture. In Austria the Chamber of Agriculture is a legal entity, where all farmers are *ex lege* members. This organisation is representing the farmers' interests towards the wider society, organises the extension services and is increasingly involved in the administration of subsidies and agro-environmental programs.

In the case study region the Chamber has also to deal with the interests of the National Park management, on one hand supporting farmers' interests against restrictions imposed and on the other hand proposing an environmental sound farming system. The Chamber is therefore supporting the "protection association" as well as the "ARGE Nationalparkregion Hohe Tauern". The latter group is also acting as a development agency for the administration of the LEADER-funds.

In the administration of the agro-environmental program the Chamber of Agriculture has an important role to provide farmers with access to public transfer payments. Almost all farmers are participating in the agro-environmental program (ÖPUL) and about 50 % of the farms are certified organic. This is the highest percentage of all regions in Austria. Most of the organic farms are organised under the organic farmers association "Bio-Ernte Austria", who is also setting up marketing projects. There are no other organic farming associations active in the area.

Traditionally marketing is dominated by co-operative structures. The milk market is served by the regional dairy coop and livestock market is managed by the breeders association. The small initiatives for regional beef and mutton marketing were partly founded to provide an alternative to these structures, which were perceived as inefficient.

In 1994 the dairy coop was discussing to merge with a bigger one to provide economically viable structures for the accession to the EU. The members, however, voted for independence, without a clear idea how to go about.

At this stage another big player entered the scene. The biggest retailer chain in Austria Billa/Rewe had decided to start an organic brand in their supermarkets. A pioneering organic trader had developed a concept for organic in the supermarket and had offered it to various retailers. Billa/Rewe had finally shown interest and offered the expert a consultancy position to coordinate their organic brand launched under the name of "Ja!Natürlich" (in English: yes!naturally). They initially focussed on dairy products and meat as there were established structures and the collection and processing was already organised. So the additional transaction costs could be kept low. He offered the dairy coop to buy their organic products. Contractual bindings prohibited the sale of organic products to other retailers. As a high percentage of farmers had decided to convert to organic due to the environmental payments offered, it was profitable to start an organic line. At the same time this provided to the organic farmers new marketing opportunities. This helped them to base their self esteem not only on environmental transfer payments, but also on the recognition of their products on the market.

"Ja!Natürlich" furthermore demanded farmers to comply with the standards of Austrias´ major organic farmers association "Bio-Ernte Austria". Therefore also farmers, who had initially only participated in the environmental program under the regulation of the "Codex Alimentarius", joined the organic movement and were thus integrated into the organic institutional system.

Finally "Ja!Natürlich" teamed up with the national Park Management. They started to use the positive image of the region around Austrias prime National Park with the term "Bioregion" (eco-region) for his promotion. To foster consumer relations they also promoted holidays on organic farms through their own travel agency. This helped to improve, albeit partially, the image of the National Park among farmers.

These strong alliances in favour of organic farming prompted eventually also the Chamber of Agriculture and the “ARGE Nationalpark Hohe Tauern” to switch to promote exclusively organic production. They supported also financially the activities of “Ja!Natürlich”, like the promotion of holidays on organic farms in a special catalogue or a competition for awards as “Ja!Natürlich” organic model farms.

Livelihood strategies

There are strong limitations to the change of practices in farming systems of mountainous areas under ecological conditions. Intensification of land husbandry comes soon to its limits. Extensification of land use is perceived as counterproductive for tourist development. Intensification of cattle breeding is practised mainly by conventional farmers, boosting the milk yields with concentrate feed. At the moment this does not really raise the economic viability of farms, rather than the social status within the farming community. Abandonment of farming and migration to towns is less pronounced in Austria than in other disadvantaged regions of the Alps mainly due to the possibilities of pluriactivity. Additional income comes especially from tourism, either though self employed activities like offering holidays on farm, or through employment in tourist enterprises. In the case of winter tourism this coincides with slack periods in the seasonal labour calendar of farming. Diversification thus provides the main strategy to sustain farming (Dax et al., 1995).

The concept of the eco-region assists this strategy in many ways:

- It provides a market for labour extensive products like beef from suckling cow production systems.
- It helped the farmers to rely not only on environmental transfer payments but to maintain also production functions. This is important for the self esteem of farmers.
- Innovative activities are often risky by nature. The eco-region provides a network to reduce individual risk.
- Marketing into mainstream channels via conventional processing and logistic structures relieved the farmers from additional labour requirements often associated with innovative activities. Free labour capacities can often be used more profitably in off farm employment.
- The co-operation with the retailer chain resulted also in a promotion of holidays on organic farms in the region and thus contributes to additional income.

Effects on livelihood and sustainability

The development of the eco-region creates new possibilities for the farmers. It offers also price premiums for the producers. As a considerable density of organic farms was achieved, conventional processing structures could be used, which kept the additional transaction costs for processing and logistics low. Therefore also in a competitive situation, where all retailer chains have established their own brands, these premiums could be sustained.

The eco-region had also effects on the relations between the economic sectors. While traditionally the strategies were focussed on the horizontal networks within the farming community and some vertical alliances into the processing sector using co-operative structures, now new links were forged into the region and along the supply chain.

Within the region it is mainly the national park, which has a potential to shape the future economic development of the region. The image of pristine nature can be used by tourism, which is the main industry of the region, but it enhances also trust of consumers into regional products in times of food scandals. This needs a compatible form of agriculture. Organic farming, rooted in the traditional ways of land husbandry, which had shaped the cultural landscape historically, can provide this.

"Only a landscape, that is able to sell its produce, will survive". According to this slogan the maintenance of landscapes in the present condition cannot be decoupled from agricultural production. Agro-environmental programs need a market component to be viable in the long run. Especially the formation of contractual guided strategic alliances along the supply chain provides a certain security for medium term planning horizons.

However, there are also some negative aspects and potential dangers to be mentioned: The retailer gained a powerful key position. He used his market power to force the dairy into contracts guaranteeing exclusive supply. The whole marketing situation is dominated by one player and this is creating a strong dependency for the farmers. As the products are sold under the brand of a retailer in principle the supplying region would be exchangeable. There is a concrete danger that this could happen in the near future if, after the EU enlargement organic producers from accession countries would offer products cheaper. Moreover there was a strong relation of personal trust to the central person behind "Ja!Natürlich". Several interview partners confirmed, that he had developed a strong personal affection to the region and that he is crucial to prevent a change to another region. Now, in summer 2003, this central person has left the company. It will be interesting to follow up the future developments.

Conclusions

The case study shows that the concept of eco-regions provides a range of improvements to the livelihood of small organic farms in lagging regions. Moreover it allows forging new alliances, which can help to extend the philosophy of sustainability inherent to organic farming also to other actors and sectors in the region. Thus it provides a frame for a territorial application of the principles of organic farming.

The main danger in the specific case analysed is, that the idea is "hijacked" by a powerful market partner, who uses the organic movement for his purposes. In other regions the organic farmers have tried therefore to establish cooperative producer brands. This strategy seems to be successful in cases where there is a partner on the retail sector who has not yet developed an own organic brand. Especially smaller family based supermarket chains with a strong regional focus are potential allies. They need to differentiate themselves from the big chains on the market and can use the image of a regional producer brand to increase even more the credibility of their products. Another strategy is to supplement marketing through the big retailer chains with direct marketing activities.

In addition to these power struggles of market partners and their implications on the sustainability of livelihood strategies, the rural livelihood framework draws the attention to the various forms of capitals as assets for the development of eco-regions and the institutional mediation processes involved.

In general, different factors contribute to the establishment an eco-region. A preliminary list derived from this case study results and other comparative studies (Schermer, 2003a) includes the following:

- A positive image of the region. This builds mainly on the natural features of the region.
- A certain importance of organic farming within the regional farming society. This importance is shown by the percentage of organic farmers, but also by their dynamic development and their activities.
- The united appearance of the organic producer associations, especially concerning marketing strategies. Networking structures between organic marketing initiatives are also of major importance to build up links to regional development institutions.
- The integration of the organic farmers into the conventional agricultural institutions. This safeguards the cooperation of the institutional level, which is crucial for the long term success.

- Partners, who can, at least potentially, benefit from the idea. This is necessary in order to create "win-win situations" with other actors in the region, as well as along the supply chain. Such alliances again can (re)inforce the support of the idea by the agricultural institutions.

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Conditions for sustainable farming systems: Lessons from implementation of the Territorial Farm Contract

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Summary

The Farming Orientation Law of July 1999, which aims to develop sustainable farming, is the consequence of intense debate concerning the orientations to be given to farming in the context of a new social contract. This Law has set down a precise procedure for its implementation: the *Contrat Territorial d'Exploitation* - or Territorial Farm Contract (TFC). Using the implementation plan of this procedure, this paper aims to analyse the ways in which development of sustainable farming can be supported by the systems approach. Concerning implementation, an analysis has been made of the Territorial Farm Contracts signed in the Midi-Pyrénées region in south-western France, using statistical analysis and qualitative surveys of a sample of farms. The results show that TFC implementation has more or less accommodated the systems principle which was the founding concept of the procedure on a national scale. The TFC is the social product of local action systems, in which professional farming organisations are dominant. These results imply that social and organisational dimensions must not be neglected since they concern stakeholders responsible for the implementation of sustainable farming procedures.

Key words: Farming systems, sustainable farming, systems approach.

1. Introduction

Over the past fifteen years, the farming sector in France has experienced intense debate over the orientations to be given to farming in the context of a new social contract (Hervieu, 1993; Landais, 1998; Doussan et al, 2000). These debates were justified by the manifest limitations of the productivist logic which left its mark on the evolution of farming over 30 years of economic boom. These limitations, which are now evident in terms of overexploitation of natural resources, of damage to and desertification of rural areas, have called into question the age-old image of agriculture as "nature's partner" (Ambroise et al, 1998) and as the primary force managing the land (Groupe INRA-ENSSAA, 1977; Benoît, 1990; Deffontaines, 1994). These debates culminated in new policies, set down in the Farming Orientation Law (FOL) of July 1999, the aim of which was the development of sustainable farming, whilst recognising the multiple functions of agriculture and emphasising its territorial dimension. The Law set up a specific implementation procedure : the *Contrat Territorial d'Exploitation* - or Territorial Farming Contract (TFC), replaced since March 2003 by the Sustainable Farming Contract (SFC), the aims of which are the integration of the economic, social and environmental functions of farming, and the adaptation of farms to the increasingly numerous and demanding expectations of society. The concept of the TFC procedure, planned on a national scale, was guided by systems approach of farms. To what extent is this approach adhered to in the actual implementation of the TFCs? Which lessons can be drawn from this first experience in sustainable farming procedures?

This paper endeavours to answer these questions which are both topical and of utmost importance for state decision-makers and farmers alike, at a time of mid-term evaluation of the TFCs and their transformation into SFCs. Our objective is to analyse how the development of sustainable farming can be based on a systems

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approach. The paper is based on research carried out by the author on the "assessment of territorial farming contracts for farming in the Midi-Pyrénées region in southern France" (Gafsi, 2003). This research analyses a total of 3146 TFCs signed in the Midi-Pyrénées region between 1999 and 2001. A qualitative survey was conducted in 66 farms having signed TFCs.

The paper is organised in the following way: first of all we give some theoretical considerations concerning sustainable agriculture, the TFC concept and its reference to the systems approach. Then we present the empirical study within the research field, the methodology used and the results of our analyses. Lastly, we discuss the results and present our conclusions.

2. Theoretical considerations

2.1. Sustainable agriculture

The notion of sustainable agriculture is complex. Hansen (1996) presented and discussed several interpretations which stem from two schools of thought: goal-prescribing and system-describing (Thompson, 1992). In any case, the definition of sustainable agriculture cannot neglect the debate which has been underway since the end of the 1980s around the concept of sustainable development. This concept was used for the first time in 1980, by the International Union for Conservation of Nature and its resources, and presented clear connections with the concept of "eco-development"[1] (Sachs, 1980). But it was popularised by the Brundtland report in 1987 and the Rio summit in 1992 (Agenda 21). Therefore, the definition of this concept, often given and quoted, is that proposed in the Brundtland report: "sustainable development meets present needs without compromising the capacity of future generations to meet their own needs". Although this definition focuses on the persistence of economic development[2] (Godard, 1992), it does however introduce a few new dimensions regarding development challenges particularly with regard to the conservation of the environment and to inter and intra-generational equity. In the farming sector, these new dimensions take form in the environmental and social functions assigned to farming due to its multifunctional role (Landais, 1999; Aumand et al, 1999). These functions are said to be "new", but in fact they are far from new. Since time immemorial, farming has fashioned the elements of the ecosystem (Deffontaines, 1994; Deffontaines et Thinon, 2001) and has played an important social role for the rural population. Having said this, the sustainability of agriculture is closely associated with the dynamics of ecological and socio-economic change. Sustainable agriculture can be viewed as a "maintenance of the adaptive capacity of farming systems" (Park & Seaton, 1996), thus allowing us to preserve our ability to farm and produce food into the future, without reducing the options available for following generations. But defining sustainability in terms of preservation or duration has little practical value because of the unfeasibility of long-term experiments (Conway, 1994). On the operational level, Landais (1998) has proposed to examine farm sustainability from four angles:

- long-term farm economic viability as a measure of its economic performance,
- well-being or the quality of life enjoyed by the farmer and his family, as a result of work planning and involvement in the local social fabric,
- farm transmissibility
- environmental regeneration.

These four angles are addressed in the Farming Orientation Laws. In fact, in the very first clause, the FOL state that "farming policy covers the economic, environmental and social functions of farming, and this policy contributes to land management with a view to sustainable development". The following definition of sustainable agriculture can be put forward: a farming system commanded by planned long-term strategic decisions, which aims for economic performance and farm reproducibility whilst conserving natural resources.

1 Formulated after the United Nations Conference in Stockholm (1972)

2 Other definitions focus on ecological sustainability (preservation over time of a constant reserve of natural resources) or on intra-generational viability (minimum conditions for survival and development in southern hemisphere).

It is important to emphasise two main characteristics of sustainable agriculture. Firstly, with the inclusion of environmental and social functions, sustainable agriculture opens up the field of farming activity beyond its primary economic aim. Also, since these “new” functions are not market-oriented, sustainable agriculture, in producing public goods, requires a new analytical framework which goes beyond the marketplace logic and calls for a holistic approach addressing all these functions (Gafsi, 2001). In addition, sustainable agriculture has a major territorial dimension, so that the term “re-territorialisation” of agriculture has been coined. The environmental and social functions are directly linked with the spatial dimension of agriculture and its social involvement in the use of the land; in other words, an intrinsic link exists between agriculture and the land. This territorial characteristic is widely recognised. The FOL even includes it in the title of the contract that the farmer enters into with the State (Society): the Territorial Farm Contract, which is the keystone of the farming orientation law.
From a theoretical point of view, these main two characteristics of the sustainable agriculture (i.e : the holistic approach of the agricultural activity and the territorial dimension) are based on inspire the systems approach as theoretical framework.

2.2. Systems perspective

A lot of research works on sustainable agriculture issue refer to the systems approach as relevant analytic framework (Isson et al, 1997; Landais, 1998; Gafsi, 2003). Actually, holistic, objective-oriented and participatory principles represent an interesting analytical tool for analysing sustainable agricultural process.

a/ Holistic approach

One of the fundamental principles of the systems approach is the holistic principle which addresses the multi-dimensional whole, before analysing the different parts (Le Moigne, 1990). Using this principle, the sustainable agriculture approaches are based on a contract arrangement committing the entire farm and not just some of the land area or activities. Then, the farmer agrees to develop multi-functional farming activities, which contribute not only to farm production, but also protect and manage natural resources, whilst giving stability to land areas. This holistic approach constitutes, also, a relevant framework for multifunctionality of agriculture.

b/ Objective-oriented project

The concept of project refers back to the teleological precept of the complex system (Le Moigne, 1990). This is important as much as it allows the final objectives of the farm to be defined (Brossier et al, 1997) with a view to introducing real change in farm practices and pointing the farm in the direction of sustainable agriculture. The project logic is one of the essential foundations of the sustainable agriculture approaches. It was explicitly mentioned in the recommendations made by the *Conseil Supérieur d’Orientation* (CSO, 1999). In real terms, each farmer seeking to sign a TFC has to agree to work out an overall farm plan. This plan is based on an overall diagnostic assessment of the farm (Marshall et al, 1994) allowing identification of its strong points and constraints, as well as strengths needing consolidation and weaknesses needing improvement. The plan culminates in the elaboration of a farm project in which the main aspects of changes in the farming system must be apparent. To what extent has the project logic been respected in the implementation of TFCs? Farmers can be concerned only by economic incentives of the TFC, while keeping their farming system unchanged. Or, also, the elaboration process of farmer’s project can be irrelevant. This question is approached by the notion of " internal coherence " of the contract (in the occurrence the TFC). The internal coherence allows to measure the degree of coherence between on the one hand the real project of the farmer and on the other hand commitments subscribed in the contract.

c/ Territorial dimension and participatory approach

The project logic requires internal coherence between the farmer’s individual project and the tasks agreed to in the contract. It also requires external coherence, in conforming to the collective objectives set to meet the local territorial challenges. The external coherence, which bases the collective dimension of sustainable agricultural approaches, is fulfilled through the territorial dynamics leading to creation of a collective project. This collective dimension is revealed on the territorial level, the only level able to rise above the farm-sector logic which revolves around farm production alone. Thus a transversal logic is born, involving all the stakeholders in the rural area in a participatory approach, both farmers and non-farmers. The territorial dimension refers back, from a theoretical point of view, to the systems principles of partnership and participation (Beuret, 1998 ; Brossier and Gafsi, 2000 ; Gafsi, 2001) allowing complex problems such as sustainable development to be understood and organised (Simon, 1978). The partnership principle is based on cooperation within a shared network of horizontal relationships and particularly focuses on the shared responsibility of all the stakeholders involved. Through vertical social relationships, the participatory principle involves all the affected individuals in all decision-making relative to their future.

The above commentary show the systems perspective of the sustainable agricultural approaches. We have to examine now, using the TCF case study – a French sustainable agricultural approach - to what extent does local implementation faithfully follow these systems principles.

3. Case study and methodology

3.1. Case study

The TFC contract represents the French approach of sustainable agricultural development. It was established by the FOL of 1999. It is based on a contract arrangement committing the entire farm, for a five years. " It must be based on a project involving the entire farm. Through this project the farmer agrees to develop multi-functional farming activities, which contribute not only to farm production and creation of added value, but also protect and manage natural resources, landscapes and biological biodiversity, whilst giving stability to land areas and employment " (Ministère de l'Agriculture, 1999).. Every, TFC contract must comprise two aspects: socio-economic aspect, and environmental and territorial aspects (see Box 1). The TFC, which is based on recognition of the fact that agriculture is multifunctional (Aumand et al, 1999; Gafsi, 2002), not only addresses the economic function, i.e. production and marketing of quality goods, but also the "new" environmental and social functions.

Box 1

The TFC is a contract between the State, represented by the Departmental Prefect, and the farmer for a period of five years, by which the farmer undertakes to carry out the tasks stipulated in the contract, in return for financial support. It covers the following two domains:

Socio-economic domain		Environmental and territorial domain	
Challenges	**Objectives**	**Challenges**	**Objectives**
Employment	Maintain and create employment Facilitate installation of young farmers Help in farm transmission	Water	Preserve and improve water quality Improve water resource management
Work	Adapt expertise and qualifications Improve work conditions and organisation	Soils	Control erosion Preserve physical / chemical/ biological fertility
Product quality	Improve product quality Increase food safety	Air	Preserve and improve air quality
Animal well-being	Improve animal well-being	Biodiversity	Preserve natural species and biotopes
		Landscape and cultural heritage	Preserve and enhance heritage buildings Preserve, enhance and improve landscape quality
Economics - autonomy	Consolidate farmers' economic organisation Diversify farm and non-farm activities Improve marketing channels for farm products Increase added value whilst lowering production costs and optimising natural resources.	Natural risks	Control erosion, flooding, fires, avalanches
		Energy	Reduce energy consumption Develop the use of renewable energy resources

From Ministry of Agriculture (1999)

The Midi-Pyrénées region in southern France, with 2,362,000 ha of usable agricultural area (UAA), is the first region in France to implement the TFCs. The first contracts were signed in autumn 1999. In December 2001, 3216 farms had signed a TFC which represents 9% of all professional farms[3] in the region according to statistics compiled by the Agricultural National Census in 2000. In order to prepare the mid-term evaluation of the TFC procedure due in 2003, the regional TFC evaluation and monitoring committee asked us in 2002 to carry out a methodological study on the first TFCs signed. In addition to the methodological aspect and among other objectives, this study aimed to analyse the internal and external coherence of the TFCs. Internal coherence refers to the farmer's project, and external coherence refers to correlation with territorial challenges and objectives. Analysis of these two types of TFC coherence will allow us to demonstrate to what extent TFC implementation has respected the systems principles which were the foundations of the procedure.

3.2. Methodology

Two levels of analysis were called for in order to examine the two types of coherence, analysis of the farm for internal coherence and analysis of the rural area for external coherence. We carried out surveys in 66 farms, in two different rural areas, and 14 interviews with stakeholders present in these two areas (advisers, technical officers, coordinators…). The choice of farms surveyed was determined by two factors: representiveness of farms having signed the TFCs in the region, and respect of the territorial dimension, allowing a thorough analysis of the coherence of signed TFCs with the territorial challenges.

With regard to the first factor, we carried out a preliminary typology of the 3146 farms having signed TFCs, using data analysis software (Modalisa). A corresponding factor analysis (CFA) allowed us to distinguish five types of farm, in which the UAA variable and choice of production system variable played a crucial role. Thereafter, from each type, we surveyed the number of farms proportional with its number of employees (about 2%). Regarding the second factor, whilst respecting the first factor of representiveness, we opted to select farms situated in two areas : *Bas Armagnac* in the *Gers* department, and *Causse Central* in the *Lot* department. The choice of these two areas, made by a committee of experts, was motivated above all by the fact that they are faced with all the agro-environmental challenges in the region. We made the hypothesis that territorial characteristics are formed mainly by agro-environmental challenges.

In order to analyse internal coherence, for each farm surveyed we first identified the farmer's project, through analysis of the evolutionary path taken by his farm, his production means, his current activities and his perspectives for change. Thereafter, we analysed TFC commitments and the measure of coherence between these commitments and the farmer's project. Regarding external coherence, we began by identifying for each of the two rural areas and using interviews with local stakeholders, three socio-economic challenges and three environmental challenges. Then we attributed for each farm a value for each challenge, which reflected the extent to which this challenge was addressed in the farmer's TFC commitments. Obviously, this value incorporated the specificities of the production systems and the progress margins for each farm. On the other hand, the values did not really incorporate existing practices, especially in the environmental domain. Emphasis is given to perceived effort and change introduced by signing the TFC. Four values were possible: 0 = TFC commitment but no connection with the challenge (not addressed); 1 = low connection; 3 = moderate connection; 6 = high connection. The final value for each farm, allowing assessment of external coherence or the connection between TFC and local challenges, is the average calculated from the six challenge values. If the value is under 2, the TFC has little connection with local challenges (low external coherence); if the value is between 2 and 4 the TFC has a moderate connection; and if it is higher than 4 the TFC is considered to have a high connection.

3 According to the definition given by the statistics department of the Ministry of Agriculture (SCEES), a professional farm must cover an economic dimension of at least 12 wheat-equivalent ha, and employ the equivalent of at least 3/4 of a full-time worker.

4. Results

4.1. TFC coherence with the farmer's project

The farmer's project is taken here to mean the final objectives and strategic choices which are behind farm development and operation. It is different from the "plan of action", for example investment plan or restructuring plan, etc. Data analysis allowed farmer projects to be classified into three categories:

- *Development – investment*: these are projects oriented towards significant changes in farms, either in connection with the development of new strategies or strengthening of current strategy. This type of project is observed in the majority of farms (i.e. 65% of farms).
- *System continuity*: current strategies are preserved, either because the current farming system is satisfactory (good techno-economic performance), or a major idea for improvement is lacking for various reasons (farmer's advanced age, limited equipment capacity, very limited progress margin, etc.). System continuity is observed in 20 farms, representing 30% of the sample.
- *Heritage*: these are heritage conservation projects, observed in 3 farms[4]. These are projects governed by a heritage logic and not a production logic.

Analysis of TFC coherence with the farmer's project allowed us to distinguish three types of connection:

- The TFC initiated the farmer's project, i.e. the TFC was the force behind project implementation. Thanks largely to financial incentives, the TFC encouraged the farmer to envisage new development ideas. Without the TFC, the project would not have been implemented. This type of connection is fairly infrequent and was observed in 4 farms out of the 66 farms surveyed.
- The TFC backs up the farmer's project: the TFC, through financial support and institutional framework, backs up an existing project. The TFC is coherent with the farmer's project. This second type of connection is the most frequent and was observed in 61% of farms (Figure 1).
- A weak connection between the signed TFC and the farmer's project: the commitments made through the TFC, for various reasons dependent or independent of the farmer's choices, have no direct connection with the farmer's project. The TFC can however produce improved opportunities and revenue support. Farms with a weak connection between the TFC and the farmer's project represent a third of the sample.

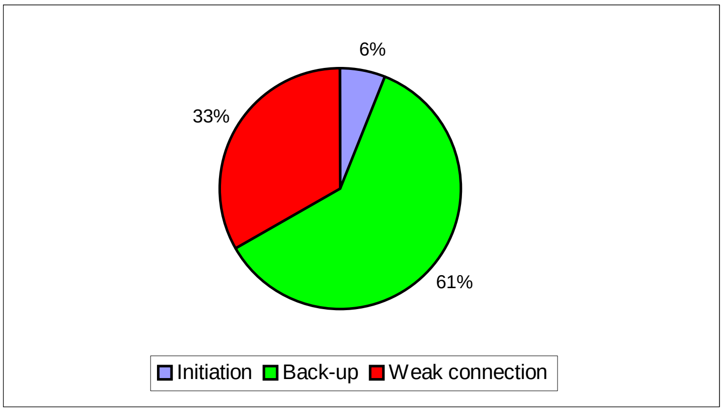

Figure 1: connection between the TFC and the farmer's project

How can these connections be explained? Which factors influence TFC internal coherence? Several factors have been studied: the farmer's actual project and his motivations for signing the TFC, the effect of certain farm structural variables (farm choices, farmer's age, net revenue), conditions of TFC implementation (information channels, conditions for formulating request, length of procedure, etc.). Multidimensional analysis (CFA) shows the importance of two factors in the internal coherence of the TFCs studied. The first factor is the stage reached in the life-cycle of the farm, particularly in connection with the farmer's age. TFCs signed with younger farmers, usually in the development stage, are more likely to be coherent with the farmers' projects. The second factor is

[4] 2 pluriactivity farms and 1 developing a tourism activity not really connected with the farm.

production system choices in connection with the challenges set by the recent change in the economic contexts of the wine sector (in Bas Armagnac) and sheep meat (in Causse Central). TFCs signed for diversified mixed farming systems are more coherent than those signed for systems specialised in sheep meat.

4.2. TFC coherence with territorial challenges

Do the signed TFCs meet the challenges of rural areas? Results show that half of the farms have few connections with the challenges posed in rural areas (Figure 2). Most of these farms are grazing farms in Causse Central. Once again our emphasis is on the real effort and changes introduced by signing the TFC. Only 12% of farms have a high connection with territorial challenges. These results may come as a surprise. The vast majority of signed TFCs reveal a moderate or even low territorial dimension. How can these results be explained?

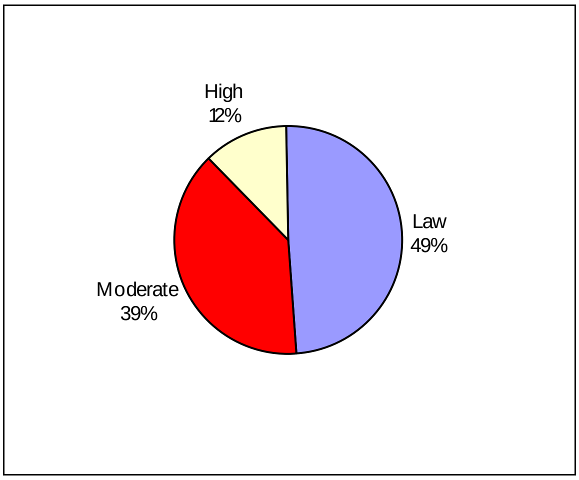

Figure 2: connection between the TFC and territorial challenges

Multidimensional analysis underlines the role of farmer projects and their opinions of TFC, production system choices, the nature of commitments made within the TFC, conditions for implementing the procedure which differ from one area to another. Typological statistical work furnishes four distinct groups of farmers: the first two groups display a low TFC – territorial challenge connection. The third group displays a moderate connection; and the fourth group displays a moderate to high connection.

Group 1: farmers who see in the TFC a tool for obtaining aid without much modification. There are 20 farmers in this group, of which 16 present a weak TFC – territorial challenge connection. This group is composed of farms specialised in sheep meat, using a quality approach (Red Label) and situated in Causse Central. Farmers in this group operate within stabilised systems, and their project is to maintain the system whilst trying to obtain aid for agro-environmental action coherent with their extensive system. This strategy has resulted in few actual investments and TFC requests centred on aid to farmland areas (amount of investment / TFC total amount < 20%).

Group 2: composed of young farmers who consider the TFC to be an economic tool to be used in farm development. 15 farms make up this group with diverse farming choices, particularly off-soil production. The farmers are in the phase of development – investment. TFC signing was motivated by equipment modernisation. The TFC backs up the investment programme: over 25,000 €, with TFC aid over 9000 €. In view of farmer motivation and farm choices, environmental commitments were limited.

Group 3: wine-growers in Bas Armagnac. This group is composed of 17 farms presenting a moderate TFC – territorial challenge connection. TFC signing supports the effort made by these farms to solve the wine production crisis, by adopting quality practices, and committing to major practice modification, particularly in planned control. The number of agro-environmental projects is between 3 and 4 projects per farm.

Group 4: this group is composed of diversified farms where the TFC respond the most to territorial challenges. Composed of 14 farms practising mixed farming in livestock and wine-growing, situated in Bas Armagnac. Farmers in this group have signed agreements for major environmental commitments (5 or more projects) and have carried out economic changes in terms of quality approaches and equipment modernisation.

5. Discussion and conclusion

The results of the empirical analysis show that TFC implementation has more or less incorporated the systems principles on which the concept is based. In the TFCs we analysed, when the project's logic was not closely followed, the territorial dimension was not taken into consideration. With regard to internal coherence, we mentioned the factors explaining the stage reached in the farm's life cycle (Chia, 1987) and production system choices. Other factors, such as implementation conditions, have an undeniable effect on TFC coherence. Improvements are possible, especially regarding diagnostic assessment quality which precedes planning of the tasks set down in the agreement, and above all meticulous definition of tasks set down in the agreement, which must respect the conclusions of the diagnostic assessment. Diagnostic assessment quality is most important, as pointed out by Josien et al. (2000) in their study of typical approaches to carrying out diagnostic assessment in 14 departments in France.

With regard to external coherence or the territorial dimension, this clearly has a limiting effect on the procedure and lessens efficiency. This was revealed by the analysis of expected effects of TFC signing on environmental protection, which are low, or even very low, (Gafsi, 2003). Stakeholders involved in setting up the TFC procedure have already pointed out this limitation, which is the result of stakeholder interaction in which professional farming organisations are largely dominant. This dominance has led to an institutional TFC model (Léger, 2000) proposed by professional farming organisations and in which territorial challenges are reduced to fundamental farming projects. In this model, the "new" functions of farming are perceived as the effects produced by the production function, which remains all-important. From this angle, the TFC is nothing more than a technical modernisation tool or an "adaptation agreement" to new market rules and future environmental regulations (Léger, 2000). This model is of course consistent with a vertical product sector approach, marked by the productivist logic. It is contradictory with the aims of the TFC, i.e. orientation towards sustainable agriculture which requires a transversal and encompassing approach (Park & Seaton, 1996; Gafsi, 2001) involving all the stakeholders in the area.

The limitations that have been highlighted here, in that the project logic and the territorial dimension have not been addressed, are not restricted to our study area, the Midi-Pyrénées region. They have been acknowledged for all TFCs in the audit requested by the Ministry of Agriculture (Eliez et al., 2002). The new procedure, the Sustainable Farming Contract, is supposed to overcome these limits by investigating and simplifying the territorial framework: definition of each area, standard agreement covering a very limited number of measures addressing the essential challenges in the area. But do these results justify the conclusion that the systems approach is insufficiently operational and cannot support effectively the steps being made by farms towards sustainable agriculture? In any case, the lessons that can be learned from TFC implementation, as a procedure at the service of sustainable agriculture, are that the effectiveness of such a procedure does not just rely on the goodwill of the creators of an overall structure based on systems principles, on the national level, but also on the dynamics of stakeholder interaction on the operational levels (implementation and monitoring). The TFC, when actually implemented, is nothing more than the social product of a local action system, for which the mechanics need to be understood and its functioning needs to be coordinated. The development of sustainable agriculture is the result of an approach which seeks to reveal the different, and sometimes conflicting perspectives of stakeholders. In this case, we are truly at the heart of the systems approach (Ison et al., 1997; van de Fliert & Braun, 2002).

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Assessing Socioeconomic Resilience of Rural Livelihood Systems in an Ecuadorian Agrosocioecosystem

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Abstract

Ecuador is the world's largest banana exporter. On the Ecuadorian coast an important part of the population lives as limited-resource farmers or landless commercial plantation workers. Much agriculture in Ecuador depends heavily on hand labor. However, many people are migrating away from the country due to economic crisis and other factors. This study presents an assessment of the current situation in a selected agrosocioecosystem, by studying its principal components, their socioeconomic resilience, and what economic output they provide. The study also assesses the benefits of remaining a small farmer, as an alternative to migration. There are a limited number of livelihood options in the study area. People can be small-scale farmers; town-dwelling, salaried plantation workers; live and work on plantations; or migrate. This lack of opportunity creates an unstable social situation. Four components or subsystems were studied: commercial banana plantations; town-dwelling plantation workers; small-scale farmers; and nature reserves. Analysis was undertaken using Ethnographic Linear Programming (ELP) that uses qualitative and quantitative data to estimate systems outcomes under several scenarios. Elicited data were used to construct models. Households were subjected to shocks, and those able to best respond were said to possess higher socioeconomic resilience. The study found that small-scale farmers are highly socioeconomically resilient to shocks. Town-dwelling plantation worker households possess little resilience. Transferring households from the town labor supply to small-scale farms improves economic output and adds resilience to the overall system. A rural worker survey revealed that small farms are perceived as the safest, most food secure place to live. The multifunctionality of small-scale farms, including their ability to add resilience to larger systems in which they are embedded is an additional outcome of the study.

Key Words: Ecuador, socioeconomic resilience, small-scale farms, banana plantations.

1. Introduction

The objective of the study was to understand structure, linkages and resilience in a complex agrosocioecosystem. Three components were studied and modeled: the commercial banana production system; the plantation worker household livelihood system; and the small-scale farm livelihood system. The potential role of a local forest reserve in improving local livelihoods was also explored. The ultimate goal was to explore improved livelihoods for rural workers and the possibilities for improvement for the overall system. Each sub-system was modeled in order to understand how socioeconomic resilience might vary according to different living arrangements. Some plantation workers live on large plantations, others live in a local town and others live on small-scale farms. It was

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not known which of these living arrangements provides more socioeconomic resilience and thus more stability in the long run for the agrosocioecosystem, and better livelihoods for rural workers.

This study approaches sustainable rural livelihoods by seeking to measure resilience of rural worker households to major disturbances, commonly called shocks or stresses. The type of resilience is social and economic (hereafter socioeconomic resilience). Specific objectives were to assess resilience *vis-à-vis* economic crises; El Niño climate events, and sudden household composition changes. The working hypothesis was that while small-scale farm households are able to recover from stress and shocks, town-dwelling plantation worker households possess less ability to do so. This issue was explored using an ethnographic linear program models.

2. Theoretical Framework

Research was spawned by a local foundation that owns a remnant primary forest and had an interest in promoting social stability in the area. A systems approach was used in order to deal with the complexity at hand and to embrace economics, ecology, and institutional analysis to provide a deeper and more integrative understanding. People interact with nature in systems affected by economic, ecological, social, and evolutionary changes. Both gradual and episodic changes exist on the temporal scale, and local and global changes on the spatial scale (Holling and Gunderson 2002). The ability to recover from sudden change –and an attempt to measure it—is central to this study.

In Ecuador, as in much of the developing world, sustainable development deals with people between islands of wealth. A normative view of landscape envisions a mosaic of natural forest, sustainable agriculture, and human settlements. These elements are all contained within the study area. Food security is explicitly accounted for in models used to analyze the system under study. Food security analysis causes us to deal with the entire complex web of issues: ecological, sociological, economic, political, and others to begin the process of reorganizing socioeconomic-ecological systems (Vandermeer and Perfecto 1999).

Small-scale farmers are emphasized because their numbers continue to rise in developing countries, and because traditional farms have several known characteristics among which is the ability to survive a crisis. However, livelihoods encompass more than the farm. Commercial plantations are included in the analysis because the rural poor must have the means to purchase food they cannot grow. Food security depends as much on employment and incomes as it does on food production. Agriculture and natural resource development are crucial in both respects (Conway 1997).

Resilience is a key property of sustainability (Folke at al. 1998). Ecological resilience has been defined as the magnitude of disturbance that can be experienced before a system moves into a different state and a different set of controls (Holling 1973, 1986). Social resilience has been defined as the ability of human communities to withstand external shocks to their social infrastructure, such as environmental variability or social, economic, and political upheaval (Adger 2000, Conway and Chambers 1992).

Change and crisis are part of the dynamic development of complex coevolving social-ecological systems (Gunderson 1999). One of our principal theses is that small-scale polyculture agriculture may be an asset for sustainable development because those who engage in this activity may possess socioeconomic resilience and may confer some of this property to other levels of the systems hierarchy. Shocks and stresses are emphasized to differentiate from the normal small disturbing forces such as fluctuations in cycles in the surrounding environment (including physical, biological, social, and economic variables that lie outside the agroecosystem under consideration). Shocks can be external, that is, exogenous, meaning issues that are beyond the farmers' control. Internal shocks are directly associated with farming system operations and decision-making. Resilience may be one of the best measures of sustainability. Sustainability is an emergent property of the interactions between communities of interest and of place that includes a healthy ecosystem, vital economies, and social equity (Flora 2001).

Greater resilience (to a point) can be built into farm systems. Sustainable agricultural systems will therefore display the characteristics of a resilient system (Folke et al. 1998, Carpenter and Gunderson 2001, Milestad et al. 2002). Berkes and Folke (1998) hypothesized that successful resource management systems will allow disturbances to enter on a scale that does not disrupt the structure and functional performance of the ecosystem and the services it provides. This capacity to absorb and adapt to change in an active way includes the following aspects: a) understanding cycles of natural and unpredictable events (Röling and Jiggins 1998); b) diverse and flexible on-farm and off-farm activities to stabilize the farm system (Ellis 2000); and c) stewardship and socioecological management (Milestad et al. 2002). In this study, systems resilience was explored by introducing shocks into linear program (LP) models and quantifying the outcomes. On-farm and off-farm activities are included. The study concludes with a plan for environmental management and ecosystems stewardship.

3. Study Context

Total Ecuadorian population in 1970 was 5,970,000. In that year the agricultural population was 3,201,000, which represented 53.6% of the total. In 2000—the most recent year for which data are available—total population of Ecuador was 13,184,000. The agricultural population for that same year was 3,480,000 (FAO 2002). In percentage terms the agricultural population has dropped. Yet, in absolute numbers, there are nearly 300,000 more people involved in agriculture today. Ecuador is an economically unstable country.

An area where a major Ecuadorian banana production and export company operates several important plantations was measured using a hand-held GPS unit in March 2002. Waypoints were taken at the extremes of the area's limits and the resulting polygon contained 13,308 ha. The study area in Los Ríos Province is located about lat. 0.5°S and long. 79°W. The principal infrastructure feature is the Quevedo-Santo Domingo highway, which bisects the study area north to south. Located in the northeast corner of this area is the Río Palenque (RP) Science Center and Nature Reserve.

Average altitude is 300m above sea level, with a mean annual temperature of 24.5°C. Most soils are of volcanic origin with high organic matter content. The fertile andisols are highly permeable and porous, with low water retention capacity. The drier season runs from June through November. The rainier period is from December through May. Two cropping cycles exist in the area. Soil moisture (and sunlight) in this part of Ecuador, especially during the summer dry season, is a function of cloud cover as well as rainfall (Núñez Torres 1998, Jones 1987).

Agriculture and ancillary industries and services that support it overwhelmingly dominate the area. It is clearly an agricultural system. Relationships among plantation companies, workers and farmers make up a social network, albeit a rather loose one. It is also then a social system. It is a place where cultivation, manufacture, trade, salaries, supply, and demand link actors together; it is also an economic system. Finally, it is a complex interplay of living organisms, human beings, and the habitat that surrounds them. It is an ecosystem as well. Agriculture, socioeconomics, and ecology are interwoven in this *agrosocioecosystem* (ASES).

Nearly 400 (n=389) small-scale farms under 10 ha in size (mean = 3 ha) are located within the research polygon. Also located in the area are 513 medium-size farms between 11 and 99 ha in size (mean=12 ha), and 49 large properties over 100 ha in size (mean=110). The Parish, (an administrative unit below the canton or county level) of Patricia Pilar has a population of 6,241 (SIISE, 2002). The town of Patricia Pilar proper has around 4,500 inhabitants. Additionally, three hamlets and several crossroads settlements exist. Total farms in the area are 951. In summary, the population of the study area, although very mobile, is roughly 5,000 in small towns and hamlets; 3,000 on small and medium farms. Total population of the study area is approximately 1,800 households, or 9,000 people. Of these, some 3,000, or nearly 32%, are banana plantation workers. Just one company employs some 650 of these plantation employees. Some 2,000 additional banana plantation workers do not reside in the study area.

2. Methods

Field research was conducted from November 2000 to March 2002. A Sondeo, or multidisciplinary team appraisal (Hildebrand 1986) allowed for initial understanding of felt needs as well as the diversity and complexity of the research area. Focus groups were held to gain insight into livelihood options and strategies. Conversational, open-ended interviews were conducted in farmers' and workers' dwellings, fields, and at local markets. The researcher participated in everyday activities with farmers (n=32). Farmers provided valuable information needed to simulate the livelihood system in computer models. A perceptions survey was conducted with n=85 rural workers. The survey revealed stated preferences regarding safety and well-being in times of shocks and stress (Breuer and Hildebrand 2003, in review). Livelihood systems were modeled using Ethnographic Linear Programming (Breuer et al. 2003). Models were calibrated and validated on return visits to farms using participatory linear programming. Twelve of the original farms were re-visited for validation.

Ethnographic linear programming models link ethnographic information to a quantitative analysis tool. The strength of the ELP is that it can incorporate demographic, socioeconomic, ecological, climatic, production, and other data in one model. These models use information gathered directly from producers and workers using participatory methods. Model calibration with farmers was invaluable for understanding the system. Models were used to explore reaction to shocks, to look at the mechanics of linkages, and to test new technologies. ELPs are a rapid, low cost, effective tool for *ex ante* prediction and hypothesis exploration. Models may be scaled up to the community or landscape level simulating an entire agrosocioecosystem for predictive purposes. Since they are decision-making models, and heuristic in nature, they account for the human element in the system. Models were used to draw inferences rather than test hypotheses.

3.1. The Models

3.1.1. Household Models

Household composition has been recognized by researchers as one of the most important variables in small-scale farm economies for many years. Thirty-two families were modeled for two of the living arrangements found in the study area—small-scale farms households and town-dwelling worker households. They were not analyzed on average but rather as individual units. Families grow in steps over the 10-year study period by younger children changing into a higher consumption and production category every 4 years. Sudden household changes, such as a relative coming to live with the family, a new baby being born, the male adult leaving the household, etc., are introduced as shocks in the different scenarios.

Work availability and seasonality are built into the models. The latter is captured in the division of most activities into dry and rainy seasons. Selling activities are divided into monthly periods when crops are normally sold. The models assume that a limited amount of work is available overall in the local community, especially informal work, which, in the case of the town-dwelling workers, is the only source of income available to adult and adolescent females. Discretionary cash is carried over from one year to the next. While agroecosystems are networks that usually include feedback loops and learning processes, these are not contemplated in the models used in this study.

3.1.2. Small-Scale Farm Model

Most input data used were gathered from farmers in the study area to take full advantage of local experiential knowledge and real-life, current, farmer-reported information. Production activities include maize, rice, a cacao-plantain agroforestry intercrop, passion fruit (*maracuyá = Passiflora edulis*), chili peppers, chickens, pigs, and selling male adult and teen labor off the farm. Constraints consisted of food requirements, land, labor, and capital available. A minimum of UDS 240 is required to begin the new season's planting. This money is given in the first year (assuming it is carried over from the previous year). Cash can also be borrowed in the informal market at a cost of 180% interest per year. The model runs for ten years.

3.1.3. Town-dwelling Banana Plantation Worker Model

Production activities are limited to salaried work on banana plantations available to adult and teen males only. Adult and teen females have access to informal work. A formula subtracts reproduction activities (child care, cooking, cleaning, etc.) from the total time available for obtaining income for adult females. Constraints consisted of food requirements, cash available for non-food costs (rent, water and gas, when applicable), school fees (when applicable), and miscellaneous. The model runs for ten years.

3.1.4. Agrosocioecosystem Model

The third model is a whole-agrosocioecosystem model. This LP incorporates the commercial banana component, the banana worker component, the small farm component, and the natural area component. In this large model, constructed as a matrix using a Microsoft Excel® spreadsheet, many activities occurring in the study area are incorporated. These include crop production and selling activities, total use of land, and hiring of temporary and permanent labor. Labor is of great importance because labor supply gaps are a problem for banana plantations.

Constraints include food necessary to feed all 9,000 persons (1,500 families) residing within the 13,300 ha study area; availability of two types of land (best and marginal); capital; family labor; and others. The objective function is the maximization of discretionary cash at year's end. The main activity in the study area is the commercial production of bananas. Overall maximum discretionary cash incorporates efficiency of both small-farm households and large banana haciendas.

4. Results

4.1. Results from Small-scale Farm Household and Town-dwelling Worker Household Models

Quasi data from model outcomes are semi-comparable. Each type of livelihood system is endowed with different resources and opportunities (or lack thereof). Small-farm households need to carry over more cash ($240) than worker households ($80) from one year to another. Keeping these differences in mind, small-scale farms are resilient to several types of shocks. Plantation worker households show little resilience to most shocks. When a household's output (discretionary cash, the objective function) was 40% below the average across all scenarios, some households were not able to recover (i.e. move back into positive output). The criterion for describing a household of either type as "resilient" was when it did not drop below 0.4 of baseline under two or more scenarios. This threshold is the "threshold of resilience" in this study.

Any household that was not able to recover from two or more scenarios was considered not resilient, especially if the scenario produced two years in a row of negative outcomes. Thus, 23 of 32 sampled farm households were resilient over 15 scenarios (71.9%). Of the town-dwelling worker households, only 17 of 32 households were resilient under the same criteria (53.1%). In figures 1 and 2, 15 scenarios appear on the X-axis in the order in which they are listed in Appendix 1. The Y-axis is the total amount of accumulated discretionary cash at the end of the tenth year of simulation.

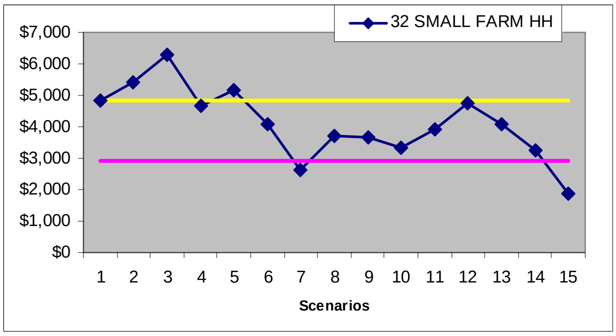

Figure 1. Average of 32 small-farm households: Discretionary Cash (blue), Baseline Discretionary Cash (yellow), and Threshold of Resilience (pink), under 15 Different Scenarios

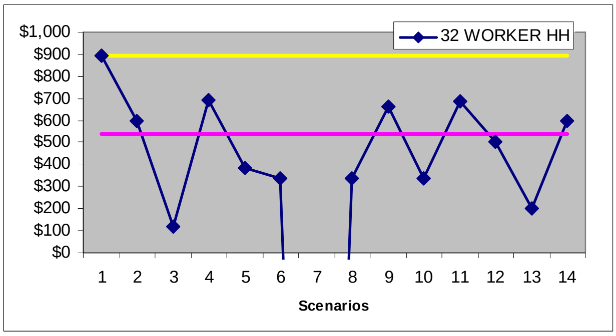

Figure 2. Average of 32 town-dwelling worker households: Discretionary Cash (blue), Baseline Discretionary Cash (yellow), and Threshold of Resilience (pink), under 14 Different Scenarios

4.2. Results from Agrosocioecosystem Model

One objective of this study was to understand the connections among small-scale farm households, town-dwelling worker households, and the overall agrosocioecosystem. Households were modeled first to measure their responses to shocks. Next, the coefficients were introduced into a larger matrix that also contained data on banana plantations and nature reserves. Twelve scenarios were modeled. The scenario that captures the dynamics of modifying numbers of small farm households and worker households is described here. One hundred households were transferred to small-scale farms in the proportion of one adult male and two teen males per household available for a full 296-day work year on the banana plantation. In the same scenario, this same number of workers was subtracted from the town supply of labor.

Total discretionary cash output of the entire agroecosystem was then calculated and compared with the baseline scenario. The transfer of 100 small-scale farm households from town to small farm in the model provided an overall economic outcome that was more than one third greater (36.78%, or $15,477,325 vs. $11,316,075) than the baseline, or current steady state of the modeled system.

Figure 3 shows estimates of socioeconomic resilience and economic output from the agrosocioecosystem as determined by running several scenarios in the LP models.

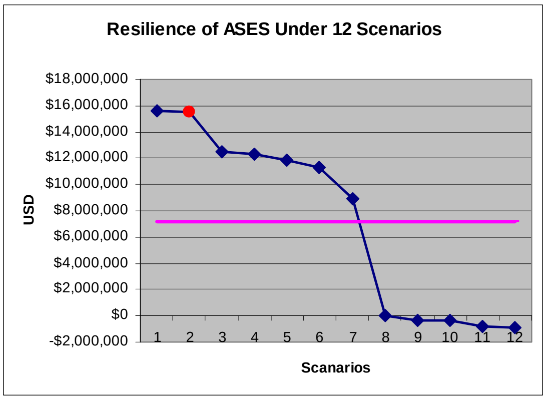

Figure 3. Resilience and economic output of the agrosocioecosystem

5. Conclusions and Discussion

5.1. Resilience of Small-scale Farms

Small-scale farmers are, in general, socioeconomically resilient to internal and external shocks. The results of a worker survey suggesting this were validated through modeling. Town-dwelling plantation workers show much less resilience to shocks. An important and perhaps often overlooked quality of small-scale farms is their ability to survive crises. This property may be especially important in landscapes that are dominated by productive though fragile monocultures such as banana. The concept of the multifunctionality of the small farm including livelihoods and environmental services, and as a provider of a measure of resilience in larger systems is clearly seen in the results of the study, although the precise factors responsible for this need to be further studied.

5.2. Agroecosystem Design

Results of this study lead us to infer that socioeconomic and environmental sustainability can build upon and mutually reinforce each other. A design that mitigates patchiness of nature reserves also serves to create new small-scale farms. Social and ecological sustainability are thus improved in one action. Land would be purchased first by banana companies, and later sold or leased to loyal trustworthy employees. Strips of land would connect "natural areas" on banana plantations to a local forest reserve. These strips, about 400m wide would consist of a central corridor, roughly 200m in width. Adjacent to the corridor, on both sides would be small-scale farms measuring approximately 200m x 100m (Figures 4 and 5).

The banana companies would spearhead this transformation with several objectives in mind. First, a constant supply of workers would ensure that labor gaps would be less of a problem. Overall worker stability and resilience could be enhanced in the area possibly preventing out migration. Formerly disengaged workers would become stakeholders in environmental matters in their home area.

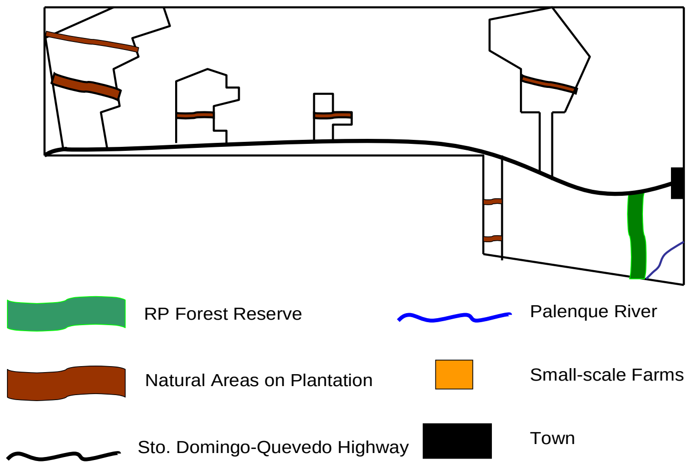

Figure 4. Banana plantations including natural areas, and a forest reserve as currently exists

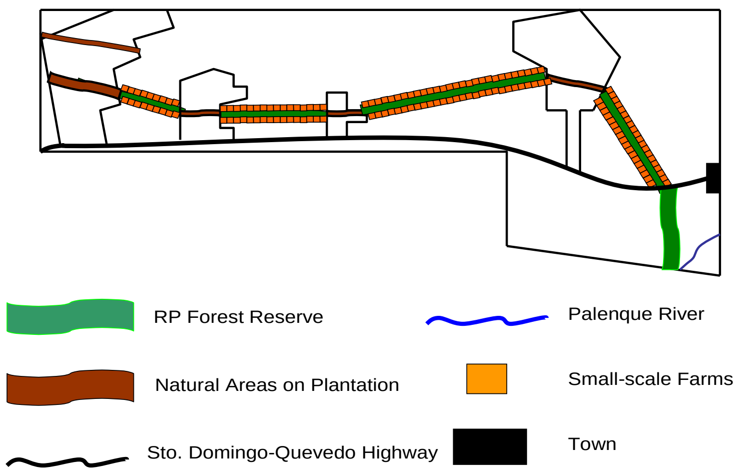

Figure 5. Corridors lined with small-scale farms between natural areas on banana plantations.

Banana monoculture is particularly susceptible to disease. An important benefit would come from the agroecological balance such areas would provide surrounding plantations. As habitat for predatory insects and pollinators, agroecological resilience may be enhanced. Erosion control, improved water and nutrient cycling, and carbon sequestration are other environmental services that would be provided by these corridors.

6. Limitations of the Study and Future Research

This paper compares modeled outcomes from entities that are only just comparable, small farms and plantation employees. However, simply comparing farms with farms, for example smaller farms with larger ones, would have denied a basic reality in the study area. The deficiencies incurred by comparing only slightly comparable units is made up for by the inclusion of the plantation worker, because it is this sector that is most vulnerable, liable to emigrate and create social unrest. The possibility of making some of the landless landed, is a worthwhile research endeavor. Model outputs were limited by their design and construction.

The study is based on research conducted in a specific 13,300 ha study area located in northern Los Ríos Province. Many factors are known to contribute to greater resilience in small-scale farm systems. Attributes of small-scale farm livelihoods that allow for resilience are diversity, complexity, indigenous knowledge, ecological adaptation, and a host of others. In this study, we have not attempted to identify what factors are specifically responsible for resilience of the resource-limited farmer. Research in this area is a logical next step. More information is needed on the effects of changing dynamics of household composition, migration, remittances, and gender. Accessibility to infrastructure and amenities, as well as physical safety in the countryside needs research to complement any scheme of maintaining or increasing the current population in the countryside.

New technologies such as bamboo, medicinal plant, and papaya production for latex and fruit should be undertaken as subjects for research. Newly available climatic information, such as improved forecasts of El Niño climate events should be explored.
Studies need to be undertaken on the current biodiversity situation. A study of edge effects, patchiness, and connectivity is also needed to support agroecosystems design and management. Environmental services including Beta diversity, carbon sequestration, improved nutrient cycling, and erosion reduction need to be better understood.

Acknowledgements

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Appendix A.

Table 1. Scenarios for three models used in analyzing socioeconomic resilience

Small-farm household	
Scenario 1	This "baseline" or steady state of 32 farm families.
Scenario 2	The adult male (father) of the household is removed through emigration or death.
Scenario 3	The adult male being absent and teen males are removed from the household composition.
Scenario 4	An additional consuming and non-producing person (baby or relative) is added to the household, thus affecting the consumer to producer ratio.
Scenario 5	New dependent added to the household in absence of the adult male.
Scenario 6	The cost of living rises 30%.
Scenario 7	The cost of living rises 100%.
Scenario 8	Small-scale farmers are unable to obtain cash generating off-farm work.
Scenario 9	Farmers cannot sell their produce in the year 4 (El Niño).
Scenario 10	Farmers cannot sell their produce in the fourth and eighth years (El Niño).
Scenario 11	Produce cannot be sold in years 4 and 8. Principal adult male missing.
Scenario 12	Small-scale farm households cannot hire labor.
Scenario 13	Crash in the market for passion fruit pulp – no sales.
Scenario 14	No passion fruit or chicken sales.
Scenario 15	Late rains. All crops yield 30% below average.
Town-dwelling Worker household	
Scenarios 1-7	Identical to scenarios used in small-scale farm household model
Scenario 8	Daily wage reduced from USD 4.00/day to USD $3.00/day.
Scenario 9	No plantation work available. Unlimited informal work is available in the area.
Scenario 10	No plantation work available. Informal work limited to 10 days per person per month.
Scenario 11	Two El Niño years in a row. No banana work available in years 4 and 5 of the model.
Scenario 12	Two El Niño years, no banana work every 3rd year.
Scenario 13	No work available in the informal sector.
Scenario 14	No plantation work available in years 4 and 8. No adult male.
ASES	
Scenario 1	Medicinal plants and bamboo adopted and grown by for small-scale farmers.
Scenario 2	100 families are subtracted from the town labor supply and transferred to small farms within the study area. Off-farm work for the new farm adult males and teen males is limited exclusively to banana plantations.
Scenario 3	100 households are added to the town labor supply, while a similar amount is subtracted from area small-scale farms.
Scenario 4	Plantation workers who usually leave the area on a temporary basis (labor gaps) to plant and harvest during certain periods, are constrained from leaving the area.
Scenario 5	10% of workers leave during labor gaps (ordinarily 25%).
Scenario 6	Baseline: 25% of workers temporarily leave the ASES and create labor supply gaps.
Scenario 7	Banana yields are reduced 30% during very intense El Niño climate events.
Scenario 8	Only environmentally certified bananas can be exported.
Scenario 9	Fifty percent of the worker population migrates during the rainy season.
Scenario 10	50% permanent out-migration (as opposed to temporary absenteeism).
Scenario 11	75% of the worker population permanently out- migrates. The entire system, which depends heavily on hand-labor, becomes infeasible under these circumstances.
Scenario 12	No bananas are produced in the study area. Although the total economic output of the region suffers a severe decline, food for local consumption is still produced.

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Meeting the challenges of change: Cattle farms in Vina (Cameroon) between opting for security, diversification or intensification

Patrice Djamen Nana*

Abstract

The livestock farming systems of Vina have been faced with many changes in recent years. Understanding these dynamics requires a better knowledge both of what is behind them and of the strategies the farmers use as an answer to them. A multidisciplinary approach was used consisting in the analysis of how farms operate and in the study of the market channels. Results show that the current transformations are due to the joint effect of resource inadequacy and to the development of market channels for the milk and meat sectors in the periurban area of Ngaoundere. These transformations which give rise to new opportunities destabilize the functioning of traditional farming systems. Cattle farmers' answers are diversified and vary from favoring security, diversification or intensification. These various options which match the different steps of a move from extensive to intensive farming need to be accompanied and raise questions about the emergence of new counseling services for farmers and about the sustainability of livestock activities in Vina.

Key words : Cattle breeding, transformations, multidisciplinary approach, strategies, Cameroon

Introduction

The Vina territorial and administrative division is one of most important cattle breeding zones of Cameroon. It is considered as the cradle of the Ngaoundere breed of Gudali, one of the outstanding African butcher breeds. Beyond its Sudano-Guinean climate, favorable to cattle breeding activities, this region has long been coveted by different groups of breeders (Mbororo vs Fulbe) because of the abundance and good quality of its pastures (Boutrais, 1999).

The 70's and 80's were a period of deep crisis because of the invasion of pasture land by tsetse fly and the occurrence of a cattle plague epidemic which decimated part of the livestock. Today, heavy mortality and epidemics are rare thanks to vaccination campaigns carried out each year. New opportunities are emerging: milk production and intensive cattle-fattening activities are expanding because of an ever-rising market demand. But the exploitation of these new opportunities is compromised by declining and highly damaged pastoral resources.

These transformations have consequences on livestock breeding systems which Landais (1987) defines as "a set of elements in dynamic interaction organized by man to make the most of resources through the use of domestic animals". As pilot and organizer of the system, the breeder of Vina is at a crossroads. His points of reference are shattered. Presently, the technical and managerial support that he could need to negotiate this period of turmoil cannot be brought because of the lack of reliable knowledge on the current dynamics and on the functioning of farms. This concern has led to the carrying out of the present study. Its objective is to identify the determining factors behind the current evolutions and to emphasize strategies developed by farmers as an answer to these change.

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Theoretical and methodological framework

A comprehensive analysis focused on the stakeholders' strategies and practices

The model used is inspired from the one designed by Caron and Hubert (2000). It focuses on farmers' objectives and projects through the analysis of strategies that farmers work out. Strategies are defined as a coherent set of operational objectives worked out by farmers in order to meet challenges they are facing. These challenges could be aimed at the maintenance, the improvement or the change of their way of life. Thus three types of strategies could be distinguished (Chauveau, 1997).

- Defensive strategies, these are aimed at the defense and the maintenance of the way of life and standard of living. The innovations they give rise to are of low cost; they are aimed at finding a certain security and a control of risks.
- Offensive strategies: these are indicative of the orientation of the farm toward accumulation and increase of income. They are very risky and require a lot of investment.
- Combined strategies: these associate the two previous categories. They express a state of transition and uncertainty.

The study of farmers' strategies can give insights into their objectives. But to better understand these projects and their motivations, it is necessary to analyze concrete actions carried out by farmers. In order to organize the study of breeding practices, Landais (1987) suggests the following classification: i) aggregation practices, operations through which herds and lots are built up; ii) conduct practices, which group together all the operations carried out on animals in order to look after them and put them in suitable conditions to achieve growth, reproduction and production performance; iii) exploitation practices through which the farmer "takes" some production (e.g. milk, wool); iv) improvement practices and v) renewal practices, which concern the culling or acquisition of young animals.

Data collection and analysis

The methodology used associates the study of the functioning of farm units and an analysis of the milk and meat sectors. The approach uses analysis and synthesis at the same time, because it is more the understanding of the motivations behind farmers' strategy than their inventory which was targeted.

Data were collected from 32 farmers using a questionnaire of which the main headings were: the trajectory of the farm unit; its means of production; farmers' activities; farmers' objectives and strategies, and different breeding practices.

Because of the lack of a reliable database, the method of random sampling was used. Thirty-two cattle breeders were interviewed. These farmers belonged to three types of livestock farming systems: i) pastoralists (10); mixed-farms (14) and iii) semi-intensive farms (8). Moreover, 20 complementary interviews were carried out with other stakeholders of the sector (cattle dealers, veterinarians) and other resource persons (researchers, NGOs, extension services).

Data analysis was inspired by the method of speech analysis. First, stakeholders' speech was reformulated and submitted back to them. The first replay permitted us to validate the initial speech interpretation and possibly to go further with some questions which were not tackled during the first meeting. Secondly, this reformulated statement was confronted with other data sources (bibliography, personal observations and statements of other stakeholders). Finally, a general report of the results was made during a meeting to which all the persons interviewed and other stakeholders interested by the research topic were invited. Discussions and remarks raised during this meeting enabled us to refine and give the results a final form.

Analysis of the market aims at understanding the organization and the functioning of the milk and meat sectors. This analysis consisted of the study of different flows, the location of markets, the cover of the demand, the regulation of supply and the type of relations between the different stakeholders of the sector.

Results

Access to market and resource unsuitability: factors determining cattle breeding dynamics in Vina

Data analysis shows that farmers' practices and strategies evolve under both the effect of resource availability and accessibility to markets and services (Figure 1). This result is similar to that of Landais (1986) who underlined the fact that African farming systems change as a result of the modification of the natural environment and socio-economic context. The population of Vina has doubled within twelve years, moving from 122,000 in 1987 to almost 240,000 people in 1999 (Tsapi, 1999).

The increase in human population and its numerous consequences (urbanization, increase in the number of stakeholders and diversification of their activities) encroach on pasture lands which are now used by different stakeholders. For example the size of farmlands in Ngaoundere region increased by about 1,500 ha each year. At the same time livestock keeps on increasing. From 240,000 in 1987, livestock has increased to 600,000 cows in 2003 (DDEPIA-Vina, 2003). This situation gives rise to higher animal density (1.2 to 1.6 Ubt[1] /ha while the recommended norm by extension services is 0.4 Ubt) which in turn leads to the shortage and the damage of pasture resources (forage, water).

However, the high density of cattle in a given area is not always the sign of a decrease in pasture land. It could be an "opportunistic concentration" because of a poor spatial arrangement of infrastructures (water points) or to proximity of markets. This case is found in the urban area of Ngaoundere where there is a multiplication of milk production and cattle-fattening units.

When resources decrease, cattle farmers face a dilemma: migrate/move to a zone where natural resources are still abundant or choose to settle down. In that case they thus engage a modification of their practice and strategies in order to supply their cattle with a good feeding. The choice of settling down will be all the easier when the accessibility to market and services, a sign of opportunities, is good. This is the case of former pastoralists who have settled in the proximity of the town of Ngaoundere.

In some respects, the emergence of markets and services could be interpreted as an answer to a real demand because of the development of breeding activities. Thus, in Mbé (one of the three administrative subdivisions of Vina) where animal husbandry is less developed, there is no cattle market nor veterinary pharmacy. But, in the sector of Ngaoundere, an important zone of animal husbandry (almost 400,000 cattle) there are about ten veterinary pharmacies and twelve cattle markets. In fact, the town of Ngaoundere plays an important role in the development of livestock activities in Vina.

1 Ubt = Tropical cattle unit, an animal with an average weight of 250kg.

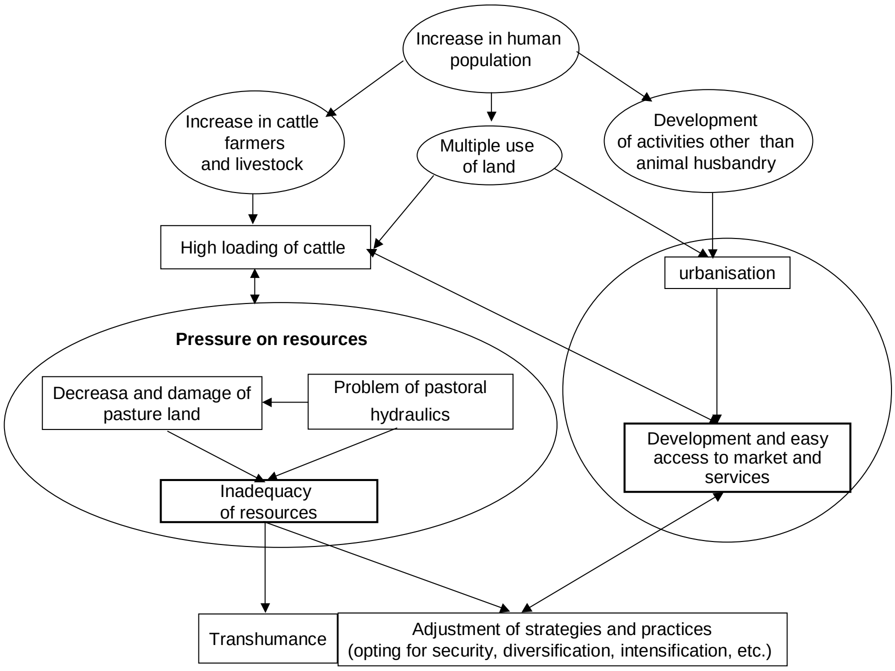


Figure 1: Forces behind the evolution of farmers' practices and strategies

Ngaoundere, the epicenter of the mutation of farming systems and driving force behind the cattle sector

The population of the town of Ngaoundere is about 120,000 inhabitants (that is 50% of the overall population of Vina). This population represents 45% of the urban population of the Adamawa province. Thus, Ngaoundere is an important market for meat and even more for milk products. Furthermore, because of its strategic position as the end point of the Transcamerounais rail line[2], this city is a point for the collection, transit and loading of cattle for the consumer markets of the main cities of the south of Cameroon (Yaounde, Douala) and neighboring countries (Equatorial Guinea, Congo and Gabon in particular). These various reasons could explain the emergence of milk and intensive cattle-fattening activities around this town.

New opportunities

<u>*Milk production*</u>

The development of milk production is linked to the setting up in 1992 of the "dairy project" in the suburbs of Ngaoundere. Despite its privatization in 1996 and its closing in 2002, this project has played an important role in the popularization of the consumption of fresh milk products by city-dwellers. Before this project, only shepherds and a few Mbororo women were interested in milk production, using it for family consumption and if possible for sale.

Today, about 4,000 liters of milk are processed and marketed daily in Ngaoundere by a dozen "milk bars". For comparison, this quantity is about 10 times what Sogelait[3], at the time the main operator, was treating on the eve of its closing (Tsapi, 2002). Moreover, there are 50 milk producers' groups all grouped together under Fekossam, a dairy organization. This a sign of the interest that cattle farmers

[2] It is the railway line that links the southern and the northern parts of Cameroon. Railway is the main means of transporting goods and passengers between these two parts of the country.

[3] Société de gestion de la laiterie. In 1996, this company took over the "dairy project" with aim of revitalizing it.

have for this activity. For those cattle farmers, milk production has three main advantages: “income, milk for family consumption, and not being not obliged to sell one’s animal in order to earn money”. Thus for some farmers it is a means of diversifying activities. For others, it is an economic activity that generates income as much as meat production.

However, the further development of milk production has encountered some difficulties because of an insufficient technical mastery observed on some farms. Also, the dairy sector is not yet well organized. Except for the locality of Idool which is more distant (70 km), nearly all milk production units are located within a radius of 50km around the urban center. Ngaoundere is the main market because of a lack of transport means. During the rainy season, the production is abundant (more than 4,000 l daily), prices are at their lowest level (100 to 150 Fcfa[4] as compared with 200 to 350 Fcfa in the dry season) while the processing and marketing units are unable to deal with it all. This situation would worsen with the current extension of milk conservation by the lactoperoxidase (LPS) method. A better technical management would allow farmers to postpone production until the dry season. During this period the supply (1,500 to 2,000 l daily) is insufficient. Thus milk processors and buyers buy reconstituted milk to make up for the shortage.

Intensive cattle fattening

Because of the position of Ngaoundere as the final point of the Transcamerounais rail line, there is a large number of intensive cattle-fattening units around this town. Each year about 30,000 cattle are transported by train to markets which are located outside Vina. Beside rail, transport by truck and on foot is also practiced but is of lesser importance (5000 cattle / year). Setting up near Ngaoundere allows farmers who practice fattening to minimize loss of weight caused by the walk from the farm to the loading platform.

The development of cattle-fattening is linked to the loss of weight experienced by cattle during the dry season (November – April). During this period, the supply of cattle is very low because of the departure of many farmers in transhumance. Cattle-fattening activities appear as a regulator of flows both on the local and external market. Cattle are bought at the moment of departure to transhumance when prices are relatively low (140,000 – 200,000 Fcfa). The maintenance and the increase of body weight of these cattle enable farmers to gain a substantial profit (30,000 – 60,000 Fcfa /animal), when the supply is insufficient.

Generally, fattened cattle are steers or young bulls. They are reared in small herds (20 to 35 cattle) for 30 to 45 days. Thus, some farmers have the possibility to rear two or three bands per year.

In some respect, fattening could be considered as a will to improve productivity, and particularly carcass yield, given the current context marked by the increase in demand while resources are lacking. Progressively, farmers are conscious that at mid-term the challenge would be to “rear only three cattle instead of five” while keeping the same or even raising the level of income if possible.

On the other hand, fattening activities require capital. A good technical follow up is also necessary. If not, capital invested would not be profitable.

In a context where rural loans are lacking, the majority of farmers who practise cattle-fattening are found among the wealthiest farmers (cattle dealers, ranchers). Some people rely on this fact to affirm that fattening is a means of diversification for the wealthiest while poor farmers are more interested in milk production. However, this statement is questionable given the high level of investment found on the farm of some milk producers. Moreover, farmers who practise both activities are common.

4 1 euro = 656 Fcfa

In fact, fattening as well as milk production cannot yet be considered as a complete production system. They are still made up of a few additional and more or less specialized cattle herds beside traditional herds. The creation of these units brings farmers to review their farming practices.

Transformations of farmers' practices and strategies

The main modifications concern the improvement of the feeding and health of animals, husbandry techniques and the starting of a process aimed at improving the genetic potential of animals. These adjustments can be considered as the beginning of intensification. They lead to changes in the structure of the farm.

Improvement of feeding and health follow-up of livestock

Forage plants are cultivated in order to complement the feeding of livestock, particularly in the dry season when pastures are sparse and lose nutritive value.

Almost 60% of farmers producing milk and those practicing fattening activities own forage fields of which the average size is about 1 ha. However, the extension of these forage fields is slowed down by the land tenure systems which render access to property very difficult. Moreover, seeds of the most sought after forage species (*Brachiaria ruziziensis* and *Stylosanthes guianensis*) are less available on local markets and not all farmers have a good mastery of production techniques (seedlings, follow up, harvesting). Thus there is a general use of agro-industrial by-products such as maize and wheat bran. But above all, cotton cake is the most used by farmers. The supply of cotton cake is provided by Sodecoton (Société de développement de coton du Cameroun), a company located 270 km to the north of Ngaoundere. More and more, the quantity supplied falls short of the demand. For instance, for an order for 1,200 tons that Ugiceta[5] placed during the 2002/2003 campaign, it received only 60 tons. This situation emphasizes a problem which threatens the further development of cattle fattening and milk production activities.

The creation of water points for livestock is also part of the investment underway in farms which are intensifying their production techniques. Apart from some ranches which have permanent water points, more than 90% of farmers water their animals in rivers or pools. With the increase in livestock and the insufficiency of water infrastructures, the death rate during the dry season is rising, reaching the threshold of 5 to 8% of livestock.

Finally, the existence of a dozen veterinary pharmacies in Ngaoundere expresses the importance that farmers attach to the health of their livestock. Each year, the ministry of livestock and animal husbandry carries out a vaccination campaign on cattle against pneumonia and pasteurollosis. Farmers take care themselves of other diseases whose effects could lower the performance of the herd. Skin diseases (dermatophilosis, ticks, scabies) and intestinal parasites are the most common. However, farmers still do not have treatment against foot-and-mouth disease. This disease which is endemic in Vina with a prevalence rate of 84.3 % (Bronsvoort *et al.*, 2002), will be in the mid-term one of the main constraints to the development of milk production.

It is important to notice that apart from food complements (wheat and cakes) and veterinary drugs, small equipment necessary for different animal husbandry activities (syringes, castration pliers, scales for weighing) is not very available on the local market. Thus farmers have to import these materials as they do for the animals and semen of exotic breeds to improve the genetic potential of their Gudali breed livestock.

[5] Union des Gic du comité d'éradication des tsé-tsé en Adamaoua. It is dairy organization which groups together more than 2,000 farmers.

Gene flows and "hydridization" of the African Charolais

Traditionally, farmers used to rear livestock of the Gudali breed. The butcher performances of Gudali (400 to 500 kg of body weight at adulthood, average carcass yield of 55%) are among the best in Africa (Boutrais, 1999). Thus it is called the African Charolais. For local farmers, mostly of the Foulbe ethnic group, the Gudali breed has always been been considered as a mark of their identity. But, more and more, these farmers are showing an increasing will to improve the genetic potential of their animals. This objective is concretized through an all-out crossbreeding of Gudali with exotic breeds considered more efficient.

In this trend, three cases can be distinguished among milk producers :

- The farmer crossbreeds his Gudali cow with a Holstein bull belonging to another farmer or to the dairy station located in the suburbs of Ngaoundere.
- Some wealthy farmers buy a bull, very often a crossbreed, with a potential varying from less than 25% to up to 50 % of Holstein blood. This bull is introduced into the dairy livestock.
- The wealthiest farmers (ranchers and some sedentary semi-intensive farms) progressively make up a dairy herd composed mostly of animals of exotic breed (Holstein or hybrid). This is done through the purchase of animals themselves or by artificial insemination.

The same phenomenon is observed in the meat sector apart from the difference that here, the exotic breeds used are Charolais or Brahman. To justify their choice, some farmers argue that "*a four-year old Gudali is the equivalent of a two-year old Charolais.*"

In an environment where animal breeds have a high identity value, these gene flows could be considered a sign of the current context that the economic function of cattle is predominating progressively over their socio-cultural value (Boutrais, 1994). The last stronghold of Gudali breeds is constituted of pastoralistes, and in general, of small farmers who do not have enough financial means to cover food needs and health care of crossbreeds. The "cradle of Gudali" is becoming more than ever a utopia. Many risks are rising because no herd-books are kept, and fewer farmers have a farm notebook that could help them to manage and follow up the breeding of their cattle. More often, what is commonly considered as a purebred Charolais, Brahman or Holstein is in reality a crossbred.

Gudali is not a dairy breed (Table 1), thus the desire of milk producers to improve the genetic potential of their cattle seems justified. On the other hand, the use of crossbreeding by meat producers is questionable. In fact, it has been shown that if they are reared in the same conditions, Gudali and Charolais or Brahman crossbreeds will have almost the same yields. Thus it appears more judicious for those farmers to emphasize their strategies on the improvement of breeding conditions, and the designing of selection processes of Gudali breeds. This suggestion rejoins the statement of Lhoste *et al*., (1993) according to which the genetic potential of local breeds has rarely been the "limiting factor" of livestock farming systems' yields in tropical regions.

Table 1: Milk production of Gudali, Holstein and crossbred Gudali x Holstein at the «Station zootechnique de Wakwa»

Breed	Length of lactation (days)	Production (liters)
Holstein	238	3,431
Goudali x Holstein	256	1,524
Gudali	168	499

Source: Maliki (2001).

Multiplication and monospecifity of herds

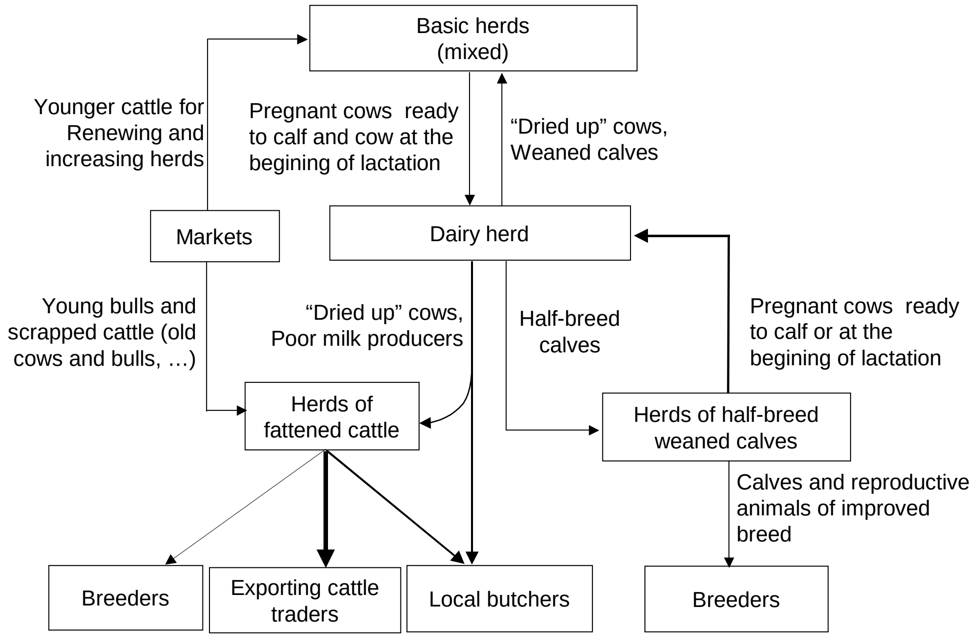
Traditionally in Vina herd sizes vary from 40 to 70 cattle (IRZ and GTZ, 1989). Herds are mixed, that is to say cattle of different ages and categories (bulls, cows, heifers, calves etc).They expand at the rate of birth and acquisition of new cattle.

The carrying out of milk production or fattening activities leads to changes in aggregation and conduct practices. There is a trend towards the multiplication and the monospecificity of herds. This change is more common to dairy farmers. While keeping their traditional "bush herd" (BH), which is generally situated in the rural area, they start up the constitution of a 'dairy herd' (DH) in the periurban zone of Ngaoundere. This second herd is made up of pregnant cows and/or cows just beginning lactation that come from the BH. Once these cows have finished their lactation, they and their weaned calves are brought back to the "bush herd", and the cycle starts (Figure 2).

In some cases, the flows between BH and DH, express a process of selection. Only cows giving high yield (milk production, space between two births, obedience, etc.) will return to the herd. Others would be sold to local butchers or to "exporting cattle traders" who supply markets outside of Vina. In some cases, the same farmer in addition to his dairy herd, possess a fattening unit where cattle are scrapped animals, coming from his own farm, or as in 70% of cases, are bought to the market. Paradoxically, some farmers, but few, buy back fattened cattle and use them to increase their livestock, or as reproductive animals.

Calves born from "improved crossbreeding" Gudali x exotic breeds (Holstein) will form a separate herd, conducted by one shepherd. This is contrary to the common practice where the cow and its calf are brought to pastures together. This herd of half-breed calves which are generally reared in the periurban zone will later on form the basis of the dairy herd. The owner of this cattle supplies other milk producers in reproductive animals of "improved breeds".

For the moment, there is little knowledge on the efficiency of this selection process and its technical and economic impact on farms. Furthermore, the necessity to take adequate measures to avoid deviations caused by the current wave of "improvement crossbreeding", expresses the fact that farmers need support to help them meet challenges of transformations. Thus, it is important that extension services and research design tools and methods can be permitted to size up and accompany the current transformations.



Legend: The thickness of the arrow expresses the importance of the flow

Figure 2: Flows of cattle between different categories of herds and selection processes of dairy cows

Discussion

Faced with transformations, cattle breeders of Vina between opting for security, diversification or intensification

Figure 3 gives an insight into strategies designed by farmers to meet the challenges brought by the transformations of their environment. These strategies appear very diversified and depend on the position of each farmer with respect to accessibility to resources and the economic position of the farm (Chauveau, 1997).

The functioning of an extensive livestock farming system is based on a great availability of resources. That is why the farmers practice seasonal transhumance. But when the possibility to move is reduced, we see another form of security strategy consisting first in the maintenance of the productive capital, then in the diversification of activities and income. Diversification can be achieved through the creation of agricultural plots and/or the development of non farm activities such as trade. In any case, livestock remains the main activity. Growing crops helps to diminish expenditure for food and thus to sell as few cattle as possible and to strengthen savings in the form of live animals. More than 70 % of breeders have small plots (less than 1 ha on average) of food crops (maize, cassava, sorghum).

It could also happen that diversification concerns only livestock activities. This is the case for breeders who become butchers, or cattle traders or who while keeping their traditional livestock herd start up milk production or a cattle-fattening unit.

Generally, the strategy of diversification goes hand in hand with the dynamics of settlement. According to Steinfeld *et al.* (1999), mixed-farming systems (crops – livestock) will intensify their practices to keep up with the rate of resource damage or market accessibility and price levels. Later, specialisation in crops or livestock will appear according to the profitability of each activity and the farmer's strategy. But in Vina, the current trends marked by a revival of interest of breeders for farming let us think that at the mid term, specialisation of farmers will be done within livestock activities (milk production, fattening, cattle trading). Progressively, the integration of livestock to farming is moving from a "technicist myth" (Landais and Lhoste, 1990) to a field reality, fruit of a endogenous farming system dynamic.

Forming contracts is a result of the specialisation of stakeholders. Already, there are two examples of contracts which are more or less formalised: i) agreements linking milk producers to milk processors and "milk bars" situated in the urban zone; ii) some "exporting" cattle traders who have signed agreements both with their suppliers (farmers practising cattle-fattening) and with their customers (butchers situated outside Vina). Here, mainly intensive farmers (ranches), high input users are found.

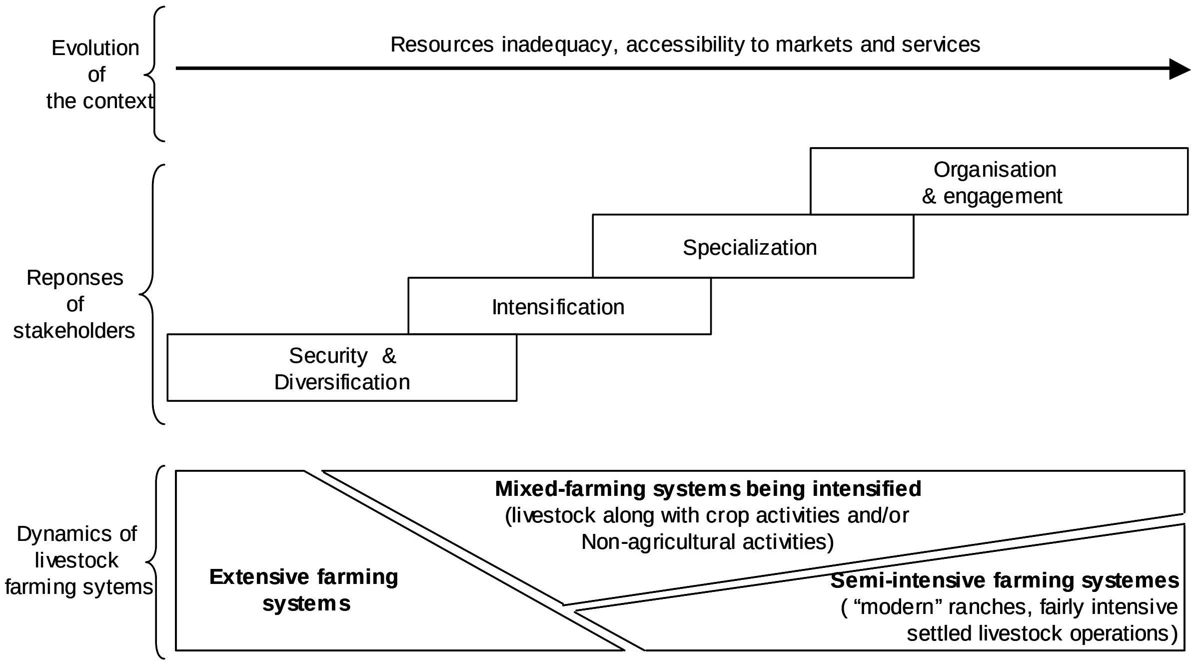


Figure 3: Dynamics taking place, responses of actors and impacts on the production systems

This result shows that in the current context, the diversity of farming systems can be highlighted by lining up farms on a scale where the two extremities are made up of two factors : availability of resources and accessibility to markets and services. All along the scale, intermediate cases can be distinguished. They are separated by a continuum. At mid-term, one can imagine that the current trend towards settlements will end in a transformation of extensive farming systems to mixed or semi-intensive systems.

The coexistence of different farming systems (extensive, mixed and semi-intensive) could express a static situation, but also stages of evolution linked to one and the same dynamic. It is necessary to continue the present study in greater depth looking at how this dynamic works, the levers and threshholds which allow producers to go from one form of farming to another.

Combined strategies, characteristics of uncertainty

Table 2 gives a general idea of practices and strategies that farmers have designed to meet the challenge of the current transformations.

Pastoral systems have defensive strategies. The main goal is the maintenance of production capital and thus the survival of the farm. Choices are made with the objective of minimizing risk and overcoming challenges brought by the inadequacy of resources. Extensive farmers prefer the Gudali breed because they feel that animals of this breed are less demanding with respect to feed and health care. This is a sign illustrating defensive strategy.

The crossbreeding of Gudali practiced in mixed-farming experiencing intensification is a sign of the combined strategies that help farmers to keep livestock as the main activity while seeking other opportunities raised by a better access to markets.

The canvassing of new opportunities is done through the development of agricultural and non-farming activities. In those cases, livestock can serve at the same time as: i) a launch pad for new activities inasmuch as income earned from the sale of cattle is reinvested in another activity; ii) the force that helps the farmer to absorb impacts, to restart a trade which has collapsed. This could explain why the sale of cattle is occasional in extensive and mixed-farming systems.

Livestock can also be a means of accumulation. This is the case both for farmers who are interested in cattle-rearing and cattle farmers, cattle traders or butchers who increase their herds from income earned through extra-livestock activities. Lastly, the diversity of the role of livestock (productive capital, savings, factor of social prestige, source of different products, etc.) appears as a lever that farmer use to adjust their strategies according to their objectives. Moreover, in a context where animal breeds have at the same time a biological, socio-cultural and economic function, the rate of selection or crossbreeding of Gudali can be considered as a key to reading and understanding farmers' strategies.

Table 2: Objectives, practices and strategies of different livestock farming systems facing changes

Extensive farming system (Pastoral system)	**Mixed farming system being intensified** (livestock along with crop activities and/or non agricultural activities)	**Semi-intensive farming system** ("modern" ranches, fairly settled livestock operations)
	Objectives	
Survival of livestock during difficult periods Increase livestock	Improve the productivity of livestock Reduce household expenditure Diversify activities and income Build up savings through livestock	Improve the profitability of the farm Improve the productivity of livestock Increase the productive capital
	Strategies	
Use of community pasture land Control risks A strong preference for local breed (Gudali) considered as less demanding in food and health care	Improve the diet and health of cattle Carry out crossbreeding with exotic breeds Start up milk production and/or fattening units Carry out agricultural and extra-farming activities	Improve rearing techniques and genetic material Constitution and use of fodder stock Acquire new infrastructures Take risks Partnership with other stakeholders Increase the renewal rate of herd Keeping of farm notebook
	Practices	
Mainly family workforce (wf) Transhumance of the entire livestock during the dry season (ds) Little food complementation Poor health care follow up	Family and wage workforce Use of community pasture land Transhumance of part of livestock during ds Feed complementation Fodder plot, milk production during the rainy season (rs), intensive fattening in ds Trade of cattle in some cases	Mainly wage wf Import of exotic breeds and "improvement" crossbreeds, mono specificity of herds, complementation of feed, fodder land, Intensive fattening in ds, growing interest for milk production, good follow up of animal health care Partnerships and agreements with input suppliers, cattle traders, etc.
Occasional sales of cattle	Occasional and/or planned sales of cattle	Planned sales of cattle

Key: wf : workforce ; ds : dry season ; rs : rainy season

Semi-intensive farming systems have a clear economic trend. In addition to the accumulation of the capital, their main objective is to improve the technical and economical profitability of the farm. Thus they practice selection and crossbreeding of Gudali with exotic breeds, intensify their rearing practices and have a better follow up of animal health. Heavy investments are carried out (setting up of forage plots, building of water points, vehicles, etc.). Here also, productions are diversified. In addition to cattle trading, some farmers also practice intensive fattening. Sales of cattle are made during the period of November to February when the supply is low on the market. Generally, these sales are planned in order to have a higher profit. However, interest of semi-intensive farmers for milk production is still low though it is increasing. All these futures indicate an offensive strategy, with more risky innovations and an economic trend leading to considerable impact on the production system (Chauveau, 1997).

However, the different strategies are not so clear-cut nor are they mutually exclusive. It is common to encounter them on the same farm, that is the case of combined strategy. Thus, a farmer can have a maintenance strategy for livestock while for crop activities, he has chosen to increase the yield in order to move from self-consumption to sale. Moreover, in almost all types of farming systems, farmers are diversifying their activities. This trend emphasises a context of uncertainty. Stakeholders canvass different opportunities by a “trial and error” method. Strategies are designed progressively without a real plan. Thus it appears that strategies which are coherent and designed in advance are found among those farmers who have a good mastery of their production system and of their environment.

Conclusion

The transformations of livestock farming systems of Vina in recent years are due to the joint effect of resource inadequacy and to the emergence of milk and meat market channels in the periurban area of Ngaoundere. The current changes bring new opportunities, but they also disrupt the functioning of traditional systems. Moreover they accentuate the dependence of farmers on foreign markets both for the sale of productions and for the acquisition of inputs.

To meet new challenges, the breeder in his role of pilot and organizer of the system adjusts the functioning and the structure of his farm. The issue is not only to redefine objectives, but it is also above all to find ways and means necessary for their achievement. Farmers’ answers are diversified and vary from favoring security, diversification or intensification. The high use of combined strategies in the implementation of these different answers expresses a transitional situation marked by uncertainty, thus emphasizing the needs of stakeholders for new counseling services. To accompany these changes, research should move from diagnosis to prospective in order to anticipate the rapid transformations of farmers environment.

In the mid-term, the success of this transitional period demands that the government and different stakeholders involved in the cattle sector work out together a regional strategy likely to contradict Malthusian forecasts (Boserup, 1965; 1994) and, also to permit farmers to have a better mastery of their farm within a context of heavy internal and outside pressures.

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Organic Farming in Austria with the concept of Selbsternte: A new and innovative production system for small-scale farming connecting farmers and consumers

Paul Axmann and Christian R. Vogl*

Abstract

In Vienna consultants, organic farmers and green-minded consumers have developed a new concept of urban organic farming – called Selbsternte. Organic farmers prepare a part of arable land (the Selbsternte plot) and sow or plant rows with 18 – 23 plant species. In mid May the plots are divided into subplots that contain 2 – 6 m of every sown species and are rented to consumers. In 2002 Selbsternte was being practiced at 15 plots in Vienna or in neighboring cities represented by 861 subplots, totaling an area of 68,740 m² and managed by 12 organic farmers for 861 registered consumers. At the plot Roter Berg, experimental subplots were established to evaluate yields and value of the harvbested produces, and interviews were conducted with the 27 consumers, the 8 Selbsternte farmers and one Selbsternte consultant. Management of the experimental subplots was done in two different ways, namely, "extensively" (EMS) and "intensively" (IMS; intensively meaning: additional harrowing, mulching and sowing of additional plants). At both subplots, work was done on 51 days each. At the EMS 24.2 hours and at the IMS 38.9 hours of work were invested on these days. 184 $ USD for the EMS and 259 $ USD for the IMS were invested. The total harvest of fresh produce was 163 kg/subplot at the EMS and 208 kg/subplot at the IMS. The total value of the harvest at the IMS is 364 $ USD for conventional and 766 $ USD for organic prices. All consumers saw the rental of a subplot and the work as an activity of leisure. More than half of the consumers reported "trying something new" at their subplots. The most frequently mentioned innovation for them was growing an unknown species. 25 consumers sowed 54 different, additional plant species. The motivating factors in establishing Selbsternte plots, as reported by all the farmers, were firstly personal ones (e.g., diversification of work to be done), and only then economic ones. The contribution of Selbsternte to the income varied at the farms between 0 and 30 % of the total farm income. As a main success factor, all of the farmers reported the intensity of relations between the consumers and the farmers. Selbsternte subplots can be understood as small experimental stations where consumers merge traditional horticultural techniques with urban ideas on permaculture, sustainable land use and participatory farming. Selbsternte has potential value for the improvement of urban agriculture, but also for the development of organic farming in general.

Key words: urban farming, organic farming, small-scale farming, agrobiodiversity, innovation, production systems, consumers relations, farmers experiments

Introduction

Cities like Vienna (Austria) are known for their great monuments and wonderful fine arts. At first glance, Viennese urban agriculture seems to be limited to public baroque gardens, vineyards, allotments (*Schrebergärten*) and intensive vegetable cultivation.

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Today especially the outskirts of Vienna are used by intensive agricultural management due to their favorable soil conditions.

At the end of 1950, 2.600 farms existed which managed about 100 km² (about one fourth of the total area of Vienna) of arable land within the city boarder of Vienna. Since this time, agricultural activities have decreased continuously. At present an area of 66 km² (about 16% of the total area of Vienna) is managed by 900 farmers. Most of the arable area is used for crop growing (5.000 ha, cereals & sugar beet), followed by intensive vegetable horticulture (870 ha) and winegrowing (700 ha).Livestock husbandry is not existing anymore.

But recently, consultants, organic farmers and green-minded consumers have developed a new concept of urban organic farming – called *Selbsternte* – that allows new ways of interaction between organic farmers and urban citizens in residential areas. The aim of this paper is to describe the concept, to characterize the involved consumers and the organic farmers behind it, to assess the agronomic and socio-economic benefits and the possible constraints of the concept, and to develop hypothesis for further research.

The involved farmers, consumers, urban planers and scientists dealing with urban farming expect that this kind of land use in and around cities leads to better food security, nutrition and health, improves the social development of neighborhoods, and raises the sustainability of cities by reducing their ecological footprint (Moustier, 1996; Armar-Klemesu, 2000; Deelstra & Girardet, 2000). And there is awareness that urban agriculture needs to be connected to organic farming in order to ensure its own sustainability (Galanti, 2002; Van Hirtum *et al.*, 2002).

The concept of Selbsternte

On agricultural land within the urban area, organic farmers (organic according to European Council Regulation No. 2092/91) prepare a part of arable land by tillage, fertilization, fencing and the construction of irrigation facilities for *Selbsternte*. The shape of this piece of land for *Selbsternte* is usually rectangular and it is here henceforth called *Selbsternte* plot. At their *Selbsternte* plots, the farmers sow or plant rows with different vegetable species, subspecies or varieties, all henceforth called here species. 18-23 species can be found at these *Selbsternte* plots. For each specie between 1 and 4 rows are sown. In mid May the plots are divided into – as we call it here – subplots of 20, 40, 60 or 80 m^2. Subplots are situated with the longer edge of the subplot in a pattern rectangular to the direction of the rows so that they contain 2 – 6 m of every sown species, or more in cases when one species is grown in more than one row (see an example of a *Selbsternte* plot in Figure 1). Then subplots are rented to consumers at a price falling between 73-182 $ USD in total for the time between May and October. The price of the rental fee depends on the size of the subplot and the additional management offered by the farmer (irrigation, weeding, winter storage of produce, additional plots for flowers and spices, etc. In November the consumers have to leave the subplots and the organic farmers proceed with soil management for succeeding agricultural crops or for the next *Selbsternte* period (basic ideas and working processes of a *Selbsternte* period are shown in Figure 2).

The sequence of work as described above is called *Selbsternte*, literally: "Harvest by ourselves". But *Selbsternte* is not only the technical term for the concept; it is also a registered logo and text trade mark for the *Selbsternte* company that provides the *Selbsternte* trade label to farmers and that supports all participating farmers and consumers with necessary technical information. Consultants of the *Selbsternte* company advertise the concept, and are engaged in the organization of courses for consumers on organic farming, on healthy cooking and on several related topics. Farmers using the trade mark and receiving consultancy pay an annual license fee (between 185 and 810 $ USD, depending on the number of the subplots) to the *Selbsternte* company.

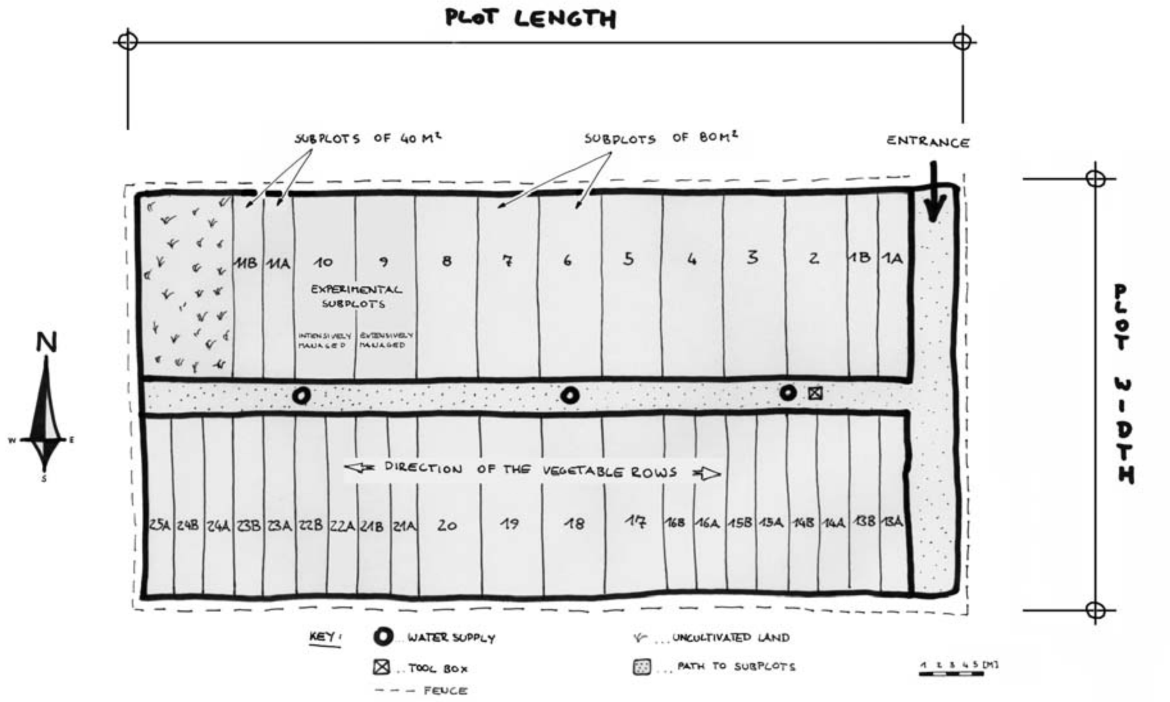

Figure 1: The Selbsternte plot Roter Berg / Vienna with the consumers' subplots of different size (40m2, 80m2) at the two experimental subplots (intensively managed subplot, IMS, subplot 10; and the extensively managed subplot, EMS, subplot 9). Direction of sowing of plant species at the plot as done from right to left and vice versa

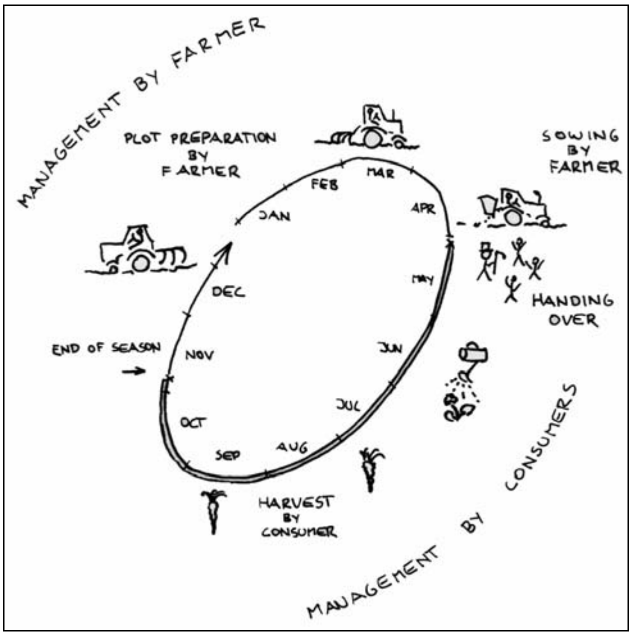

Figure 2: The Selbsternte lifecycle during the year

Methods

To assess the benefits and constraints of the *Selbsternte* concept, experimental subplots were established to evaluate yields and net profit for the consumers, and interviews were conducted with the consumers, the *Selbsternte* farmers and one *Selbsternte* consultant.

Survey at the experimental subplots

The site where this experiment was done has been used since 1999 for *Selbsternte* plots. Precipitation here is 613 mm/year and the annual mean temperature is 9.9°C. In 2001 the plot had a size of 3,000 m^2 and it was divided into 13 subplots of 80 m^2 and 21 subplots of 40 m^2. 20 plant species were sown on May 2, 2001 or planted on May 17, 2001 by the *Selbsternte* farmer at this site. The experimental management started on May 18, 2001, when all subplots were handed over to the consumers and ended on October 31, 2001, when subplots had to be returned to the farmer. Management of the experimental subplots was done in two different ways, namely, "extensively" and "intensively" at two different subplots. We call them the extensively managed subplot (EMS) and the intensively managed subplot (IMS).

Work was done at the EMS in a manner equivalent to that of the average consumer at Roter Berg. Some consumers at Roter Ber*g* took extra care with their subplots and introduced practices like harrowing, mulching and sowing of additional plants. In a kind of mimicry of these consumers, these activities were also overtaken by the authors in the IMS. During the management, inputs (cash to cover the necessary costs, duration of work) and the output (fresh weight of all harvested produce) were surveyed on data sheets. Only those costs related directly to the management of the subplot were recorded (rental fee, cost of seeds and plantlets, materials necessary to manage the subplot). After harvest, the produce was cleaned and/or washed and then dried with a rag from washing water at the plot. It was then weighed and the price of the produce for that species was investigated at a randomly chosen organic produce shop (price for organic produce) and at a randomly chosen supermarket (price for conventional produce) in Vienna. The harvest (kilograms) was multiplied by the organic and the conventional marked prices of the respective produce and quantity at the selected shops.

Survey on the Selbsternte consumers

In 2001 28 female, 3 male consumers, and one family were registered for subplots (all 32 called henceforth here consumers) at Roter Berg. A typical user at this site was female, between 30 and 50 years old, married or lived with a partner and had a high school diploma. Half of the users had children. Two thirds spent their youth in cities and only one third in the countryside, but three quarters reported having helped, at least for a while, in a garden or on a farm at some point in their childhood. 60 % of the predecessors of the users had a farm, nursery or a home garden where some vegetables were grown. 8 consumers participated in *Selbsternte* for the first time in 2001, 8 for the second time, and 9 for the third time. Two of the consumers had more experience than did all the others.

Survey on the Selbsternte farmers

Pre-tested interviews with pre-coded, and with open questions (Bernard, 2002) took place with 8 *Selbsternte* farmers in January 2002. *Selbsternte* farmers own between 30 and 140 ha of land. 7 of them are managed full time, 1 part time, but all of them are managed by the farmers' families. The size of the *Selbsternte* plots is between 0.02 and 3.3 ha. In addition to the *Selbsternte* activities, farmers keep animals and manage arable crops. Only one farmer grows vegetables in addition to those of the *Selbsternte* plot.

Results

Survey at the experimental subplots

At both subplots, work was done in the *Selbsternte* period (136 days) on 51 days each. At the EMS 24.2 hours (28 minutes per visit) and at the IMS 38.9 hours (46 minutes per visit) of work were invested on these days. At both subplots the biggest proportion of time was used for irrigation (EMS: 12.2 hrs.; IMS: 17.5 hrs.). More time was dedicated for sowing/planting and soil management (preparing the soil for seeding or planting of additional plants) at the IMS than at the EMS due to the additional activities realized at the IMS. 184 $ USD for the EMS and 259 $ USD for the IMS were invested. The biggest proportion is due to the rental fee for each subplot (182 $ USD). The higher costs at the IMS are result from the expense for the additionally sown/planted species (56 $ USD) and the therefore necessary equipment (21 $ USD; e.g. for posts supporting tomatoes).

The total harvest of fresh produce for the plants sown/planted by the farmers was 163 kg/subplot at the EMS and 150 kg/subplot at the IMS. The monetary value of the total of all harvested produce of those plants sown/planted by the *Selbsternte* farmer is at the EMS 219 $ USD, and at the IMS 214 $ USD for conventional prices, and at the EMS 522 $ USD and at the IMS 495 $ USD for organic prices. At the IMS the value of the harvest of the additionally sown/planted produce is 150 $ USD for conventional and 271 $ USD for organic prices. The total value of the harvest at the IMS is 364 $ USD for conventional and 766 $ USD for organic prices (Figure 3). The highest net-profit is achieved at the IMS for organic prices (507 $ USD) and the highest net profit per work hour is achieved at the EMS for organic prices with 14 $ USD per invested hour of labor (Table 1).

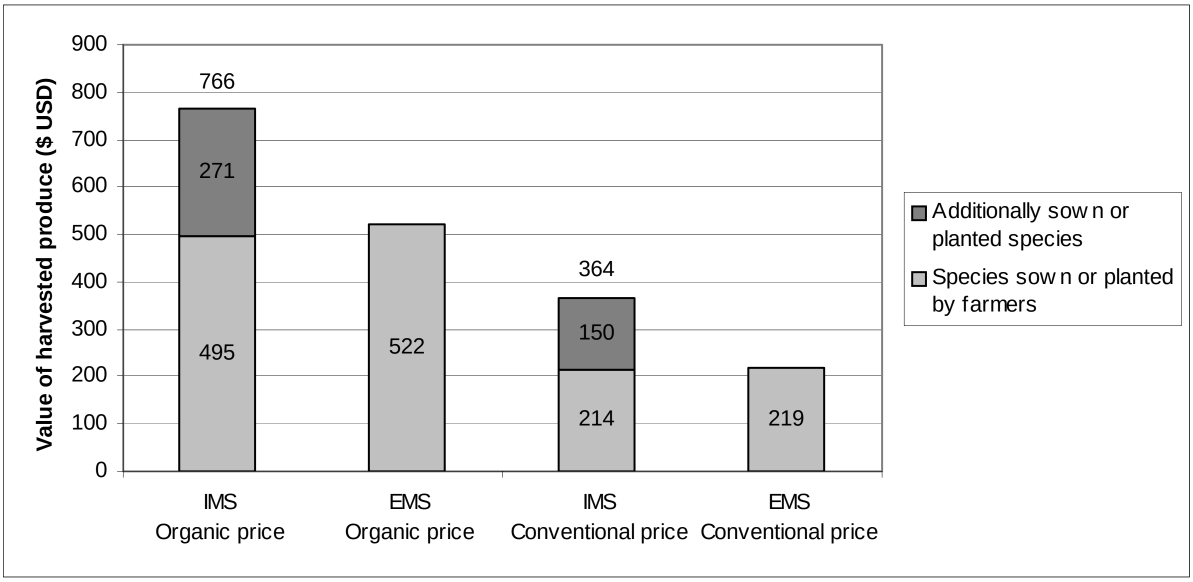

Figure 3: Value of the total fresh harvest calculated according to organic or to conventional prices in $ USD at the both experimental plots (IMS = intensively managed; EMS = extensively managed) at the Selbsternte plot Roter Berg in Vienna

Survey on the Selbsternte consumers

The 27 consumers interviewed live on average 1.8 kms. or 10 minutes away from the *Selbsternte* plot. 26 bridged the distance on foot or by bicycle. Only one consumer traveled exclusively by car. 7 consumers, who usually went on foot or by bicycle used the car only if they had to transport big quantities of harvest.

Of the 27 consumers interviewed, 18 consumers rented subplots of 40m^2 and 9 of 80m^2. They worked at their subplots, on average, 2.4 times a week. Every visit took them, on average, 1.5 hours. On average, every consumer reported having been 68 hours at his/her subplot between 18 of May and 31 of October. For half of the respondents, time invested was as they had expected, for one quarter it was less and for one quarter it was more time than expected.

One third of the consumers believe to have invested more cash in the subplot than the value of the harvest yields. Two thirds believe to have harvested more than to have invested. 20 consumers harvested all ripe produce; 7 left ripe produce at the subplot without harvesting it. 26 also reported having given produce away to friends, relatives, other consumers and passers-by as a gift. Reasons given for leaving ripe produce at the subplot or for giving it away as a gift were the large amount of harvested produce or the dislike of a certain plant species. Neither barter nor commercialization was reported or observed.

Table 1: Results of the survey at the experimental subplots (EMS…extensively managed subplot; IMS…intensively managed subplot)

Topic	Parameter observed	unit	EMS	IMS
Species	**Number of plant species, subspecies, or varieties sown/planted**			
	- by the *Selbsternte* farmer	number	20	20
	- by the *Selbsternte* farmer, where additional individuals were sown by the authors	number	0	6
	- by the authors	number	0	14
Work	**Duration of *Selbsternte* vegetation period**	days	136	136
	Days working at the subplots = Number of visits	number	51	51
	Total work time	hours	**24.2**	**38.9**
	Work time/visit	minutes	28	46
Cost	**Cost Total**	$ USD	**184**	**259**
	Cost details	$ USD		
	- rental fee		182	182
	- additional seeds/plantlets		2	56
	- tools/equipment		0	21
Yield	**Total yield fresh for species sown by farmer**	kg/subplot	163	150
	Total yield fresh additional individuals and additional species	kg/subplot	-	58
	Total yield all individuals and all species	kg/subplot	**163**	**208**
Value of harvest	**Value of produce sown by farmer**	$ USD		
	- Conventional prices		219	214
	- Organic prices		522	495
	Value of additionally sown/ planted species/individuals	$ USD		
	- Conventional prices		0	150
	- Organic prices		0	271
	Value of produce total	$ USD		
	- Conventional prices		219	364
	- Organic prices		522	766
Net-profit	**Net-profit for total harvest (Value minus costs)**	$ USD		
	- Conventional prices		35	105
	- Organic prices		338	507
	Net-profit per work hour			
	- Conventional prices	$ USD/hour	1.5	2.7
	- Organic prices	$ USD/hour	14.0	13.0

All consumers saw the rental of a subplot and the work as an activity of leisure. On each occasion, 19 consumers visited the plot with the explicit aim to work there. 8 consumers made additional visits to the subplot without any explicit aim to work there. Nevertheless, when asked another question about what they actually did at the plot, 16 consumers reported having done things in addition to their subplot management. These 16 consumers mentioned activities (multiple answers were possible) such as resting and meditating (33%), talking with other consumers (24%), picnicking (12%), playing with children (9%), walking around, or nature watching (both 6%), reading a book, sun bathing or taking pictures (all 3%).

Almost all users (24) reported to having received support in their management of the subplot: The partner, boy or girl friend, or husband or wife were the most frequently mentioned helpers (in 15 cases), followed by friends (in 12 cases), children (in 9 cases) and parents (in 5 cases). Several consumers report that several of the persons mentioned helped, but on different occasions. 19 Consumers got help during their work from other consumers at the plot, mostly from their neighbors (12; non-neighbors 7). This help concerned mostly irrigation during vacation periods. During the interviews, some cases were reported where border rules were not explained carefully and consequently, these friends worked at or harvested the wrong subplots. 26 of the consumers reported to having actively invited friends and relatives who were not familiar with the *Selbsternte* concept, to visit the plot.

More than half (14) of the consumers reported "trying something new" at their subplots. The most frequently mentioned innovation for them (multiple answers were possible per person) was growing an unknown species (14 consumers), testing plants as repellents against pests (3), testing effects of mixed cropping, improving the soils with alternative additives (for both, 2), or e.g. testing different sowing dates, while taking into account the influence of moon, mulch, plant extracts and so on.

25 consumers sowed/planted 54 additional plant species or additional individuals of species already sown by the *Selbsternte* farmer. The most frequently introduced additional individuals of already sown/planted species were from iceberg lettuce (*Lactuca sativa* var. *capitata*), dwarf bean (*Phaseolus vulgaris* ssp. *vulgaris* var. *nanu*) and carrot (*Daucus carota* ssp. *sativus*).

The most frequently introduced additional new species were broccoli (*Brassica oleracea ssp. oleracea convar. botrytis var. italica*), basil (*Ocimum basilicum*), ruccola (*Eruca sativa ssp. sativa*) and dill (*Anethum graveolens* var. *hortorum*).

Seeds/plantlets of these additional 54 species were distributed by the *Selbsternte* company (61%), shops (12%), friends (8%) and mail delivery companies (6%) or they came from the consumers' own subplots from previous years (8%). In 5 % of the cases, the source was not reported. Per consumer up to 25, new species were introduced, but the majority introduced between 6 and 15 new ones. 20 consumers reported having bought only organic seeds/plantlets, while 5 of them report having bought organic seeds/plantlets, but having also bought one or the other species from conventional sources.

The most frequently mentioned reasons for sowing/planting additional species (n=25 consumers reported on all additionally sown species) were the preferred taste of a certain species (37%), curiosity (23%), contribution to health (18%), aesthetics (15%), allelophatic effects (4%) and the role in the control of pests and diseases (3%).

6 users related some species to specific events in their youth and 9 users related some species to an experiences in a foreign country. One of them was German and he reported to have introduced chives (*Allium schoenoprasum ssp. schoenoprassum*), peppermint (*Mentha x piperita*), lemon balm (*Melissa officinalis*), savory (*Satureja hortensis*) and dill. One consumer was from Iran and he reported to have introduced chick peas (*Cicer arietinum*). One consumer having been a resident in Japan reported having sown additional Chinese cabbage (*Brassica rapa ssp. pekinensis*), edible crown daisy (*Chrysanthemum coronarium*) and purple shiso (*Perilla frutescens*).

Survey on the Selbsternte farmers

All 8 farmers reported that the consultancy provided by the *Selbsternte* company was helpful in establishing their activities. Farmers reported activities such as obtaining technical information, marketing of the concept, organization of meetings and the provision of organic seeds through their license fees as the main benefits of their participation in the *Selbsternte* company.

5 farmers had contact to the other *Selbsternte* farmers either at the beginning or later on in their *Selbsternte* activities. They reported that exchanging information and exchanging technical equipment were the main reasons for the contact.

When asked what they would do differently if they could begin again, they reported wishing to have made better cost/benefit calculations (2), to have reduced expensive marketing activities (1), to have offered only 80m^2 subplots instead of a choice of sizes (1) and, because it is too labor intensive, to have done the sowing only, leaving the planting of plantlets to the consumers (1). Farmers estimated the value of produce harvested by the consumers as somewhere between "less than 100 $ USD" and "up to 500 $ USD". None of the farmers could give a figure for the value of the subplot output based upon previous calculations of the same.

The motivating factors in establishing *Selbsternte* plots, as reported by all the farmers, were firstly personal ones (direct contact to consumers, diversification of work to be done, fun), and only then economic ones.

Only three farmers reported that the income from *Selbsternte* allowed a satisfactory return on the investments made for *Selbsternte*. The contribution of *Selbsternte* to the income varied at the farms between 0 and 30 % of the total farm income according to the perception of the farmers. Those farmers who sell their own produce from the farm gate (7) emphasized the fact that *Selbsternte* consumers did actually buy produce at the farm gate or from the farm’s own shop and therefore contributed to the income not also with their *Selbsternte* fees but with their weekly spending for produce bought from the farmers.

In total, the farmers sowed or planted 25 plant species. Seeds came from organic seed producers (e.g., the organic seed propagation and retailing company *Reinsaat*). Plantlets originated from organic seeds and were – depending on the species – bought from organic nurseries or raised at the *Selbsternte* farm by the farmers themselves. Criteria in selecting certain species were personal observations on yields, requests by consumers and recommendations made by the *Selbsternte* consultant. Only one farmer made a cost calculation to determine the rental fee of a sub-plot. The other 7 farmers adjusted their prices to the fees charged by the *Selbsternte* company for its sub-plots and according to recommendations of colleagues.

Problems reported with *Selbsternte* are problems currently challenging the management of organic farms as well (pressure of weeds, pests and diseases, supply of nutrients). But more frequently farmers reported specific, technical and social problems. These are:

- The control of EC-Regulation 2092/91, which requests the use of organic seeds/plantlets in subplots, is difficult to manage with consumers that continuously sow seeds / plant plantlets from unidentified sources;
- Lazy consumers that do not weed well may risk weed infestation at other subplots and may cause conflicts between consumers;
- Deposition of garbage at the plot by consumers effects the appearance of the plot;
- Low technical skill and consumer knowledge of gardening practices (e.g. frequent and long irrigation), which then lead to effects that are a source of complaints (e.g. strong growth of weeds);

- Theft of ripe produce or even of tools in a few cases;

All 8 farmers reported that during the course of the vegetation period, many questions from consumers arose and were then addressed directly to the farmers. In many cases, these questions not only covered technical topics matching the farmers' knowledge (time of harvest of certain species, techniques for pest management etc.), but also related to topics such as processing, storage and cooking. In addition, all of the farmers reported that they were confronted with problems concerning the social dynamics at the plot (e.g. consumer anger about the behavior of neighboring consumers).

As a main success factor, all of the farmers reported the intensity of relations between the consumers and the farmers. At one farm, the farmer gave a subplot for free to an experienced consumer, who is present almost every day at the plot and who serves as a kind of representative for the farmer at the plot.

Conclusion

Our results show that consumers who manage a subplot intensively can harvest up to 208 kg of fresh produce with a value of 766 $ USD from a subplot of 80m^2 under like growing and management conditions. This is above the value expected by the farmers who offer subplots and above the value reported from subplots in Witzenhausen, Germany, with 538 $ USD (Wortmann, 2000). This result might help farmers to better advertise the concept. Nevertheless, the germination rate and the juvenile growth (not quantified in this survey) of the plants on the experimental subplots, as also seen in some other subplots at Roter Berg, was lower than expected due to failures in plot preparation by the farmer. Taking into account that other subplots at Roter Berg and subplots at other sites (e.g. Mödling) showed much better developed plants, it is evident that higher yields and higher values of harvested produce can be expected for better growing conditions.

Experimenting with introduced plants is consumers' favorite area of experimentation. Nevertheless, control of the organic origin of seeds and plantlets is a challenge for farmers not easily met.

In managing a *Selbsternte* plot, the farmers involved in the project report the need for close communication with consumers, which not only helps to attract them as clients (marketing), but also provides prior precise and accurate information on necessary technical and social details (e.g. regulations on "the do's" and "don'ts"). Crucial is information that helps to avoid unachievable expectations; secures appropriate social relations between consumers; and secures that substances prohibited in organic farming are not used at all.

During the course of the vegetation period, many questions arise on the part of consumers. Most farmers have, in our observation, only limited experience and training in the handling of these communication processes. In addition, the huge amount of time necessary for consumer relations competes with other activities on the farm. A successful management of *Selbsternte* plots therefore needs a concept of communication, care and consumer education that would reduce the working load for farmers while ensuring good relations with consumers.

The concept of *Selbsternte* needs not only proper social skills but also special technical training for farmers prior to the start of the project. Only one farmer grows vegetables in addition to the *Selbsternte* activities and no farmer has experience with small-scale horticulture. The participating farmers are growers of arable crops and are used to thinking on a larger scale of agriculture than are consumers, gardeners or horticulturists.

At an arable plot measuring one or more hectares, a failure to sow or germinate, which has an impact on only a few centimeters of a row, might have no real impact for the farmer, if at all. At a *Selbsternte* plot the lack of a species or of some plant individuals in a certain part of the subplots resulting from technical errors lead to adverse social dynamics, and can be difficult for the farmer to handle. Therefore, an adaptation of thought, management and of technical equipment to small-scale horticulture is necessary, and farmers must be trained accordingly.

The need for the training of farmers, for the exchange of experiences between farmers, for accompanying consumer education and for advertising are easier to handle on a common or outsourced level rather than on an individual one. To secure proper advice when needed, higher fees for subplots and higher license fees were discussed in the *Selbsternte* company but were not seen as viable. If this cannot be realized, honorary advisors that are nominated on the basis of experience, and referred to as "senior" consumers, might be one valuable solution.

The proponents of *Selbsternte* are convinced that this concept leads to ecological, economic and social benefits, which will help to design a sustainable alimentary system for small, medium and large cities. The data of our preliminary study allows for the prior formulation of an evidence-based hypothesis on which further testing may be based:

Possible ecological benefits

- The high amount of produce harvested and the close distance between the residential areas of the consumers and the plot may help to reduce the duration and frequency of individual tours to shopping malls by car;
- The concept of *Selbsternte* leads to higher agrobiodiversity in the urban area, where this concept is practiced; consumers actively enrich the subplot by seeding/planting additional species. These might be endangered species or cultivars and therefore the concept might be a valuable element for strategies of in-situ conservation of agrobiodiversity;
- The produce so harvested does not need packaging and therefore package production and deposition can be reduced for the quantity harvested.

Possible economic benefits

- The monetary value of the vegetables harvested is higher than the money invested by the plot owner. *Selbsternte* plots help to reduce costs for organic nutrition, compared to consumer purchases at organic produce shops.
- Local organic gardeners, tool retailers and other providers of necessary and allowable substances benefit from the demand of consumers who have rented *Selbsternte* plots.

Possible social benefits

- *Selbsternte* initiates new networks of communication and collaboration between inhabitants of residential areas, who have not yet met;
- *Selbsternte* plots serve as meeting points for people, allowing for the exchange of opinions, information and knowledge (incl. about organic gardening);
- Work at subplots helps participants to relax, meditate and rest after daily business;
- Parents consciously use the work at the subplot to educate their children in horticulture, plant species and related topics;
- Consumers get involved in primary agricultural production. They therefore better understand the risks and challenges that farmers face as well as the pleasure involved.

Up to now only few descriptive questions on *Selbsternte* have been addressed. More quantitative data on the ecological, economic and social impact of *Selbsternte* is needed. *Selbsternte* subplots can be understood as small experimental stations where consumers merge traditional horticultural techniques with urban ideas on permaculture, sustainable land use and participatory farming. The outcomes of this participatory process of innovation have to be assessed at their potential value for the improvement of urban agriculture, but also for the development of organic farming in general.

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Rural landscapes: Case study of Village Plans in Central Portugal ("Network of Schist Villages")

Paulo Carvalho*

Abstract

Recent years have borne witness to the growing reassessment of the importance of the rural world (where it is possible to rediscover new centralities, based on quality), and of the values of country life (and these, too, are changing) in terms of the equilibrium and cohesion of the world system. In (Western) Europe, each territory is drawing back the veil to reveal its specific potential, and trying to base new philosophies for the territorial development of rural regions on concepts such as multifunctionality, sustainability and subsidiarity (Carvalho, 2002).

This reappraisal of the rural does not disregard the core role of farming (in all its aspects: biological, environmental, … and not simply in its productivist version). The farmer thus attains the status of an important player in the task of conserving the heritage and landscape features of the rural world. Farming, indeed, is seen as the heart of the multifunctionality which is intended for the rural areas of Europe. Without this, other functionalities, such as Tourism in the Countryside are not possible. In this logic, the rural landscape, which, as a result of its inclusion in the productivist system, has become rather monotonous (Dewailly, 1998), is (re)placed at the centre of aesthetic worries and in the lives of postmodern peoples, where it is increasingly found to be a factor in the quality of life, something to be preserved (Beaudet, 1999). The involvement of a people with a landscape occurs both with respect to the material elements, and in relation to the immaterial symbols of that landscape.

This article is not presented as a research paper with theory, hypothesis to be demonstrated, material and methods, results. It is a commentary on policy interventions on territories. The contents of this article could be interesting for the WS with more substance and trial to see the role and functions of the agriculture on the rural landscapes (past, present and future).

Rural landscapes as development resource

To ponder on the paths of development, which today are being forged in a more heterogeneous and complex social context, one which is less predictable and perhaps more demanding in the search for creative responses to new challenges, is also to ask how territories are organized and consumed, and what action should be taken in these geographic regions of everyday life.

Rural landscapes in the western world, with their fragilities and particular diffuse features are no longer experienced and regarded solely from the perspective of their productive potential. Thus, in a different context, they may become more complex, increasing their functional diversity and sustainability.

At the same time, the growing importance of the image and identity of the rural territories, and the strategic value of how they are planned and managed are exposed.

Heritage is today recognized as structural element of memory, image and territorial identity, and one of the essential resources for affirming cultural and environmental values against a renewed backdrop of

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new theories on territorial development, specially in the spirit of territorialist theories, those that best respond to the greatest needs of society and participative citizenry.

But the productivist policies certainly left their imprint on contemporary rural Portugal, especially in more isolated regions, more marked by physical constraints and more remote. The cycles of emigration to Brazil and Europe at the end of the 19th and in the middle of the 20th century, respectively, both provide the context for and bear witness to these facts. At first sight, the *raison d'être* of this tide of emigration can be found in the historical, semi-peripheral position of Portugal relative to territories which have led the field in economic growth since the Industrial Revolution. There was a chronic reliance on the 'outside', which corresponded to this relative position. The Portuguese then entered into their demographic and epistemological transitions. But the demographic curve was not accompanied by an economic one. The Portuguese population responded to this difference with spatial mobility, to the outside world, and also to the coast, notably to the large metropolitan areas, particularly Lisbon. This city was increasingly taken as the geo-economic and political centre of Portugal. The interior became depopulated, thanks in part to policies such as the *Campanha do Trigo* (Wheat Campaign) and the *Florestação Estatal dos Baldios* (government sponsored afforestation of the mountain slopes). Another contributory factor was the failure of the procedures of the *Junta de Colonização Interna* (Internal Colonization Board), plus the impotence of the development centres established by the *Planos de Fomento* (Promotion Schemes), and the lack of any clear rural development policy. The ruralist theses of the *Estado Novo* were more often than not restricted to extolling the simple, healthy, traditional bucolic lifestyle of a submissive and poorly educated people.

Most of Portugal's rural local authorities, in a country where distances are still relatively large, and concentrated on the coast, have seen their populations decline and grow old, thus losing any benefits in terms of the location of human resources. Lack of functionality and desertion have left deep scars on the landscape of rural Portugal. An important part of the Portuguese identity has been lost, and a swathe of its heritage has been degraded: the forests, the *montes* (large, isolated estates in Alentejo), the hill villages of northern and central Portugal. Furthermore, the Common Agricultural Policy (CAP) and the entry of Portugal into the European Union (1986) have also made their impression. In terms of farming, policies of short-term gain came to rule the day: "The CAP and the provision of funds led to an increase in investment, but in projects outside the context of Portugal's circumstances and which tend to segregate small farmers, who are the majority, and suffer most harm, which has led to the depopulation and increasing imbalance in the settlement system" (Firmino, 1999: 87).

Recent years have borne witness to the growing reassessment of the importance of the rural world (where it is possible to rediscover new centralities, based on quality), and of the values of country life (and these, too, are changing) in terms of the equilibrium and cohesion of the world system. In (Western) Europe, each territory is drawing back the veil to reveal its specific potential, and trying to base new philosophies for the territorial development of rural regions on concepts such as multifunctionality, sustainability and subsidiarity (Carvalho, 2001).

This reappraisal of the rural does not disregard the core role of farming (in all its aspects: biological, environmental, … and not simply in its productivist version). The farmer thus attains the status of an important player in the task of conserving the heritage and landscape features of the rural world. Farming, indeed, is seen as the heart of the multifunctionality which is intended for the rural areas of Europe.

And so a commitment must be made to the valorization of both the cultural materials belonging to each place and its symbolic cultures, important to the affirmation of self-conception among local people (Reis, 1998). Regarding this, in a context of open competition, the affirmation of a territory or place is also achieved by constructing and disseminating an image of distinction and quality, focused to a considerable extent on the identities and symbolic resources of each place (Janiskee and Drews, 1998). The issue of geographic scale is of no relevance here.

A territory should not be seen merely in the context of its ranking in the international productive system. There is a qualitative "leap" here, which is opening the prospect of a vertical and horizontal placing, in a network of cooperation and solidarity. Globalization, which has gained ground in the last few decades, is undoubtedly a factor of rationality, and diffusion of the neo-liberal model. Even so, factors like new information technologies are also opening up the possibilities of reaffirming participative citizenship and the individual identity of each place. Local development thus emerges as the process of linking the global to the local. An interdependent and pro-active liaison in those of the more tertiarized societies that are conscious of their responsibilities, of their rights and duties.

The new directions taken by European development policies have shown marked changes in the ways of thinking about, and taking action on regions: from an essentially productivist model, launched at the dawn of the 1960s and guided by simple economic criteria (increasing earnings, developing economies of scale, agricultural competiveness, liberalising markets), to a post-productivist model that bestows on the rural world and its people a role that is more environmentalist, ecological and participative (Fernández, 2002). This last aspect requires a multifunctional agriculture: besides supplying farm produce, agriculture also yields public benefits (it cares for nature and the countryside, protects the environment and facilitates land use management), for which the taxpaying citizen has to pay.

The transition from a productivist and economist discourse to an environmental and territorial discourse also means that European rural areas, with their fragilities and individual diffuse properties, have ceased to be viewed and perceived exclusively from the standpoint of their productive potentialities, enabling them to achieve complexity, functional diversity and sustainability, in a quite different context (Carvalho, 2002).

In the case of peripheral rural areas, the dynamics of recent years has generally intensified the processes of desertion and degradation of buildings and rural landscapes. But some of these regions are now organised and possessed, particularly by town dwellers who value the cultural and landscape elements formerly regarded as a sign of archaism, in a genesis of spontaneous processes or public initiatives, the aim of which is to restore these regions and boost their potentialities. The heritage and landscape value is almost always linked to such actions, and it functions as an anchor for projects and initiatives, with one of the main development options being rural tourism (Carrasco, 1998).

And so heritage is today identified as an important resource for rural development, which is why the components of a region are key elements for the tourist valuation of a locality.

Landscape itself is thus interpreted as a tourist asset, in the sense that it can represent a useful development tool, something to be prized and preserved for rural tourism (Carvalho, 2003).

"Landscapes express both the uniqueness and the identity of each locality (geniu loci), reflecting the natural history just as much as the cultural history of a region, at a given time. They are dynamic by nature and are constantly changing, but they are also unique to each place" (Pinto-Correia, 2001: 198).

The interaction between the natural system and the social system lends a landscape a territorial dimension, in which the way the landscape is appropriated by communities varies as much through the natural system as with the values of the society that is influencing it (Pinto-Correia, op. cit.; Leimgruber, 2002).

According to Unesco, cultural landscapes represent the combined work of nature and man, and this body also acknowledges the enormous variety of such interactive manifestations.

The text of the Convention concerning the Protection of World Heritage (Unesco, 1972; 1983) describes cultural landscapes as ones which have evolved organically. Nowadays these landscapes can be a relic (or fossil) of the past, or they can even have an active social role, associated with an evolving traditional way of life.

In the European Landscape Convention (Council of Europe, 2000), signatory countries pledged to regard landscapes as fundamental factors of European identity, incorporating this into their natural and cultural heritage.

It starts from the statement that landscapes are going through an accelerated process of transformation, in a variety of directions, which justifies the need for intervention (defining landscape policies, and including landscapes in sectoral policies).

In the case of cultural landscapes in the rural matrix, what is actually at stake may be summarised in the following questions: How can they be kept functional? How can they be made to evolve harmoniously? As whom? And for whom?

It matters, therefore, that we understand the structuring language, that is, the events and values, and the way in which they are manifested in society-territory bonds, overcoming a phase characterised by a degree of illiteracy (inability or indifference to reading and interpreting landscapes).

This is the context that accommodates the "Program of Schist Villages" in Central Portugal (which arose from the creation of the "Network of Schist Villages" - *Rede de Aldeias do Xisto*), under the "Operational Plan for the Central Region of Portugal" (an instrument for structuring development in the region for the period 2000-2006, backed by funding from the European Union – "Community Support Framework III").

This initiative involves over twenty hill villages (peripheral micro-territories), distributed among thirteen municipalities in the sub-regions of Pinhal Interior, North and South, Beira Interior South and Cova da Beira (Figure 1).

It concerns the "rehabilitation of a group of hill villages (repairing roofs and façades, upgrading social areas, installing urban furniture, repairing road surfaces and footpaths, putting in basic infrastructure systems) to support a network of sites of tourist interest" (CCRC, 2001: 38).

These localities are now integrated into a system in accordance with a (tourist) development scheme, involving the region as a whole, which also embraces the scenic roads that link the villages, and envisages, further, panoramic routes, recreation parks and stopping places with charts describing the landscape, belvederes.

Based on the "Village Plans", a feature of territorial administration that is concerned with micro-territories (peripheral, and exhibiting economic, social and demographic fragilities), the aim is to consolidate and motivate proposals for intervention (with financial support from the European Union and the Portuguese Government), which aim to requalify such regions, improve the life of the people, heighten their self-esteem and foster their potentialities (original and special).

Figure 1. The "Network of Schist Villages" (Central Portugal): a municipal view

The drafting of "Village Plans", on the initiative of the municipalities involved, and following defined criteria, related to a clutch of concerns, which are also methodological steps that can be summarised as follows:

- Characterization of the intervention area, by constructing a narrative of the geo-historical evolution of the regions, including their demographic, social and economic components. The structure built up for each village according to its chief structuring components, from both the urbanistic viewpoint (such as the analysis of the urban morphology and structure), and the architectural viewpoint (for instance, the state of preservation of property, type of roofs and eaves, the outside of the building).
- Diagnosing needs, a stage of the plan depicted at various levels: private property, public facilities, public spaces, population, infrastructures, economic activities, are among the most important; interviews and socio-economic surveys conducted on the local residents are essential here.
- Proposal for intervention, which defines the actions to be carried out and the spaces or components of the village that are to be the subject of intervention. As an example we might mention private buildings (façades and roofs, sheds and storehouses), public buildings (rehabilitation of squares and streets; improving/installing basic infrastructures; urban furniture).

- Finally, the Execution Plan, where the different intervention typologies are budgeted (according to defined parameters) and related to the time envisaged for the intervention (execution programme) and with the economic resources available (financing plan).

This paper will also give a systematized indication of the territorial asymmetries, the problems and the potentialities of the schist villages.

- Differentiating the administrative designations for the localities: small villages, small towns formerly municipal seats (extinguished in the 19th century), which are now parish seats, also correspond to distinct demographic, economic and social cadres. The demographic dimension of the localities in the network, for example, oscillates between two residents and more than one hundred residents. This means that local levels of abandonment are differentiated.
- The structure in terms of buildings is also highly variable: number of properties; state of preservation; typology and architectural characteristics; occupation typology (permanent home, seasonal home, and mixed situations).
- The basic infrastructure systems (water, electricity, drains, rubbish collection) also show territorial asymmetries; but one negative situation they have in common is the absence of public wastewater treatment plants.
- The total investment approved by the CCRC (Central Region Co-ordination Commission) is 10 million euros (53% of the total investment submitted by the municipalities), in accordance with the structural components (private property, public property, public spaces, infrastructures) also reflects the differences highlighted earlier.
- But, the most interesting image of some of these Network villages arises from the enduring outlines of local architecture (with its traditional construction features and the materials used) and from the tightly packed houses with their rough, winding paths (worked from the bare rock), flanked by dry-stone walls, which lead to tiny plots of farmland (Figure 2). These too need the help of stone walls to prevent the land from collapsing and being carried away to the bottom of the valley; the scene is rounded off by what remains of the old deciduous woodland, consisting of sweet chestnuts (*Castanea sativa*), oak (*Quercus pirenayca*; *Quercus roble*) and some species on the water's edge.

In such cases, are we not looking at examples of cultural landscapes? It should be recalled that "Cultural landscapes are collective works, the fruit of specific social organizations. They occasionally represent an optimum state of utilization of endogenous resources. Offering important goods and services to a society as a consequence of their aesthetic quality, cultural richness, capacity to regulate the hydrological and nutrient cycles, their heterogeneity and biological diversity. The landscape is also a language, a perception and a common aspiration in society" (Conclusions and Resolutions of the "I Colóquio Ibérico de Ecologia da Paisagem", 2001).

In addition, the above document also says that "The Iberian Peninsula is home to some of the finest functional cultural landscapes that remain in Europe. Abandonment and rural depopulation are the biggest threat. There is today a strong reason to worry about the loss of heritage resulting from the disappearance of these landscapes".

Figure 2. The village of Candal (Lousã Mountain, Central Portugal)

- The protection status of these cultural landscapes is differentiated, too. At local level, the municipal land use management plans of the municipalities involved in the network reveal very distinct concerns: from defining more or less wider urban perimeters (which means the technical and political intention of allowing more building in the localities, as happens particularly in the older towns and in the larger and better characterized villages), to designing the urban area limited to the consolidated space of the village (in this case the goal is not to allow new building, but rather to rebuild properties that are in a poor state of repair or in ruins, and so provide properties with areas (sq. m.) more in keeping with the needs of the new, essentially neo-rural, users (of urban origin), in the context of second homes. At national and international level, the proposals and procedures for classification as cultural heritage submitted for consideration by the competent national authorities have to be borne in mind, and the results of the national *Rede Natura 2000* sites.
- The drafting (technical responsibility) of the plans is undertaken by various bodies: multidisciplinary teams established for the purpose (Local Technical Offices - GTL, created for a period of two years); outside firms hired by the municipalities, generally with experience in the area of land use planning and urbanism, and, in some cases, it has been the responsibility of the Technical Support Offices (co-funded by groups of municipalities).
- The application of the plans, once approved by the CCRC, is, in some cases, done by bodies that have had not hand at all in drafting them, as in the case of the Lousã GTL, responsible for executing the plans of the hill villages (seven) in the municipality of Lousã. Would it not be legitimate here to question the options in relation to suiting the actions planned (and the financial resources provided in the meantime) to the philosophy of the new team that is going to execute them on the ground? Pursuit of this goal includes the need to sound out the people, who are, after all, the main co-actors in the construction of the hill regions. In other words, we are looking at a process that has to be flexible, and so it should be in a constant state of adjustment and assessment.
- However, these villages should not remain isolated from a network which is territorially very broad. Today it does not make sense, in terms of tourism, to invest according to isolationist principles!

> Within the framework of cultural tourism, but also within other spheres of tourism and cultural activities, there is a tendency to integrate places into networks/itineraries, in which the different territorial components act as a federation. This is the strategy defined by the CCRC for the Pinhal Interior ("Pine Forests of the Interior"), as well as its own work on the *Rede de Aldeias do Xisto*.

By thinking in terms of this type of integrated development, in which various features interconnect and complement each other, we are providing the interior with a powerful tourist attraction.

Final Remarks

The issue of territorial development and local populations has achieved considerable visibility in recent years, on several levels: conceptual plan; documents and texts with strategic guidelines, as a result of the attitude adopted by various national and international organizations; policies and actions on different scales; and the more or less active and clear participation of the diverse actors.

We are interested in the process of territorial transformation and the "construction" of a society that is closer to eco-development, in which the quality of people's life arises from harmony with nature, without significant economic, social, environmental and spatial imbalances, in other words, a society where development is more sustainable, in which there are fewer inequalities and more harmony with the space (Rodríguez, 2003). Because of this, and since today we are looking for "new territories for new societies", the interpretative analysis of the countryside, with input from several scientific areas, should be useful when it comes to developing future policies that focus on the key points of the imbalances between regions and the possible ways of correcting development orientations and policies.

Just as regions vary geographically, their affirmation is also achieved by building up and disseminating an image of distinction and quality, centred on their identities (in a state of perpetual construction) and on their resources (material and immaterial); the knowledge (gained by reading and interpretation) of landscapes is inseparable from the perception of their "genetic code" as a matrix of potential geographical relevance.

The landscape as cultural construct, from the standpoint of understanding its structuring languages, is now also assuming aspects of a privileged framework for conceptual reflection, within the theme of development.

Similarly, it is once again being placed at the centre of the aesthetic and experiential concerns of post-modern populations, and is the kernel of a very significant series of recommendations, conventions, doctrines, instruments and strategic guidelines that span different spatial scales (from the global to the local), and touch on sundry levels of scientific knowledge (Carvalho and Fernandes, 2002).

European rural spaces, with their fragilities and respective diffuse characteristics, are no longer exclusively felt and viewed from the standpoint of their productive potentialities. Furthermore, in a different context, they may be gaining in complexity, functional diversity and sustainability.

Rural landscapes reflect the living evidence of their history and rural culture; they are repositories of heritage (both natural and cultural), indispensable for the new lifestyles in rural regions. Post-modern societies likewise see these values as a substantial part of their heritage (Riva, 2002).

One of the biggest challenges currently facing us is how to maintain and cherish rural landscapes; this will require stimulation and support for the rediscovery and reinvention of the rural (and new ways of experiencing rurality), with dignity, and quality of life.

In this context of change, in which the (re)discovery of the countryside and of its heritage value are today fundamental conditions for constructing new identities, and for identifying development alternatives, it accommodates the “Program for Schist Villages” Based on the “Village Plans”, a feature of territorial administration that is concerned with micro-territories (peripheral, and exhibiting economic, social and demographic fragilities), the aim is to consolidate and motivate proposals for intervention (with financial support from the European Union and the Portuguese Government).

It is an integrating approach, sustained by a series of actions that have been designed to rehabilitate rural areas that are in decline, to improve the living conditions of the local residents, to raise their self-esteem and foster their original, exceptional, potentialities. It is also intended to stimulate their inclusion as authentic cultural tourism destinations.

The future Network, which covers over two dozen hill villages (Portuguese Central Mountain Range), shows the heterogeneity of its structural components and the different actors (hill, neo-rural, urban in relation to second home) which appropriate, invigorate and consume these territories, according to differentiated temporal, spatial and cultural conceptions.

The response (and involvement) of local people (in this heterogeneous spectrum), the invigoration and the visibility of the future Network are open pertinent issues at this first stage phase of the initiative.

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Constructing sustainable agriculture at local level. Insights from small-scale farming in the Alps

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Summary

Our paper presents both results about small-scale farming in the Alps and general information and methods to analyse, implement sustainability of small scale farming.

At alpine level we discuss:

- how sustainability of mountain small scale agriculture is viewed by local groups of actors involved in a participatory project, specially from the point of view of the role of agriculture into rural development
- the solutions elaborated at farm and local levels in favour of sustainable agriculture and rural development
- the consequences of such an approach both in terms of research methods and tools for action.

The general information presented concerns:

- A tool to elaborate local plan of action in favour of sustainable agriculture
- Consideration on relevant scientific methodologies to analyse the functions of small-scale farming and the implementation of actions in favour of sustainability of agriculture
- The assets and limits of the local level as a core level to identify and implement sustainability and multifunctionality of agriculture.

Key words: local governance, small-scale farming, partnership, sustainable agriculture, territorial development, Alps

Objectives and context

Agriculture and society searching for a new social contract

New demands to agriculture are expressed in different fields: quality and diversification of products, environmental management, valorisation of local resources, social and cultural concerns. Those demands have emerged as reasons and solutions to establish a new contract between agriculture and

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society responding to sustainability and multifunctionality challenges. In mountainous areas, the natural handicaps and specific adaptation of practices of small-scale farms make the implementation of these concepts peculiar.

Sustainability and multifunctionality of agriculture are no longer seen as a simple adaptation of agricultural practices. They require construction of a new social and individual rationality[1] for farmers and new forms of governance to handle the relationships between agriculture and society. This search for a new contract between agriculture and society concerns different levels: world-wide, European, national, local, farm. The local level is often seen as a core level to establish new links between agriculture and society: the main and current assumption is that local level could play a prominent role in integrating different objectives and in associating several actors into a consistent development project. Associating the local level and actors' participation appears to be a way to translate sustainability and democracy concepts into actions and to build bridges between agriculture and demands of society.

The objective of our paper is to discuss :

- how sustainability of mountain small scale agriculture is viewed by local groups of actors involved in a participatory project, especially from the point of view of the role of agriculture into rural development
- the solutions elaborated at farm and local levels in favour of sustainable agriculture and rural development
- the consequences of such an approach both in terms of research methods and tools for action.

Our paper is based on two European research-demonstration projects. As for demonstration part, the first project proposed to design a plan for rural development for the coming 20 years and the second project gives the conditions to implement some of the ideas of actions formulated in the first project. As for research, scientists assessed sustainability of small-scale farming in the first project, and in the second one, they will asses the impact in terms of sustainability of processes induced, at local and farm levels, by the implementation of action plans discussed collectively.
The paper is articulated around 4 parts. Part 1 is dedicated to the context, including the theoretical framework, the geographical environment and the methodologies applied. Part 2 will present the problems of sustainability of small-scale alpine farming. In part 3, we will present the multi-actors group and the resulted actions plans targeting a more sustainable agriculture for small-scale farming systems. In part 4, we will discuss the assets and limits of the local level as a core level to identify and implement sustainability and multifunctionality of agriculture.

1. Analytical framework and local context

1.1 The analytical framework

Agriculture and society are searching for a new partnership that responds to challenges posed by the concept of sustainable development. The notion of sustainability in agricultural sector has been translated into or assimilated to the construct of multifunctionality. The multifunctionality was recognised as a key notion in the 1990s and was integrated in the Agenda 21 in chapter 14 entitled "promotion of agricultural, rural and sustainable development".

[1] The term "rationality" is used in the meaning of what is making sense for people.

The multifunctionality as well as sustainability were mainly interpreted and worked out towards environmental protection. The concept of multifunctionality highlights the derived functions of farming, different from productive and technical aspects such as the ecological functions and the social benefits, i.e. landscape upkeep, landscape assets for tourism development, management of habitats where biodiversity is important. These intangible aspects are today considered as reasons and solutions to maintain farming in rural areas where small units dominate.

Sustainable development concept has been also discussed as the basis for establishing participative processes in decision-making and developing new forms of governance. Changing sustainability concept into practice turns to work with inter-sector perspectives and create partnerships. The objective of partnerships is to overcome sectoral views and to allow consensus through participative decision-making processes.

All these concepts theoretically well-defined and broadly admitted in international spheres are hardly implemented. The individual farm level has been a privileged scale to move them towards concrete actions (Abelson, 1995; Commission of the European Communities, 1999; Freret & Douguet, 2001). Individual contracts were tested trough European, national and regional measures (i.e. agri-environmental measures) to draw up concrete implementations responding to sustainability and multifunctionality challenges. However it was acknowledged that the impact of those contracts is limited. On the other hand, collective actions, like LEADER initiative are supported but their effectiveness in terms of sustainable development vary considerably from case to case (Buller, 2000, Esparcia Perez, 2000, Shucksmith, 2000) and the necessary consistency between different levels of intervention (i.e. farm and local territory) are not easily grasped.

1.2. Tthe Alps context: the Alps and its agriculture

The Alps are often considered by local people or tourists as a unique natural and cultural heritage. Similar to other mountains regions, the area has steep environmental gradients (altitude gradient, slopes, exposure). But in a sense, the Alps are specific because these biophysical contrasts have interacted for centuries with a wide range of agricultural, pastoral and forestry land use. Such a complexity of the ecological and human factors coupled with biogeographic factors explain the remarkable contribution of this area to biodiversity in Europe. Their role as mineral and water reserves for low lands is also very important (Messerly & Yves, 1997). Agriculture is often responsible for this high environmental value and many rare species, biotopes with national and European value, valuables landscapes, etc. depend on specific agricultural practices such as mowing, grazing, various forms of fertilisation, maintenance practices concerning hedges, the edges of forests, etc. (Euromontana, 1997; Dax & Wiesinger eds., 1998).

Consequently, the natural and cultural resources so often admired are partly the result of the past and are therefore very sensitive to variations in human conditions (economic and political), specially the current severe decrease of small-scale farming (European Commission, 1995, MacDonald and al., 2000).

In comparison with intensive agriculture in low lands, Alpine agriculture still has *a good public image* (Pruckner, 1995, IUCN, FAO, ICALPE, 1996, Euromontana, 1997, Fleury, 1999) of a low-input agriculture, developed in natural areas, producing high quality products (cheese). But economists and sociologists have pointed out that mountain agriculture is generally a declining sector. The distances involved and physical disadvantages reduce competitiveness and place severe limits on adaptation.

Farmers have difficulties in developing new strategies suited to the changing economic and social environment.

This process could be explained by changing economic conditions and competitive disadvantages compared with non-Alpine regions (Bazin, 1995; European Commission, 1995). Social changes are also underway with a general decrease in agricultural communities which impacts on the social and cultural environment. (Pruckner, 1995).

1.3. the research and action context

Our approach is based on two European projects:

- The first implemented from 1998 to 2000 was a research and development project (Contract FAIR5-CT97-3798). entitled "sustainable agricultural land use in alpine regions" (SAGRI-ALP). During this project local groups of actors in five areas in the Alps (France, Switzerland, Austria, Italy, Germany) and a scientific assessment of sustainability of agriculture were associated. By means of the "future workshop" method (Jungk & Müllert, 1996), the wishes and objectives of local people for sustainable agriculture were determined and their own sustainability points of view were understood. Finally the local groups of actors elaborated action plans in favour of sustainable agriculture and the researchers structured and organised the process in a practical "guideline to formulate local plans of action for sustainable agriculture".
- The second one, a 3-year and on-going research and demonstration project, started in January 2003 (Contract QLKT5-CT-2002-01099) entitled "implementation of sustainable agriculture and rural development in alpine mountain" (IMALP) involves 4 pilot areas across the Alps (Moyenne-Tarentaise in France, Val d'Hérens in Switzerland, Oberes Drautal in Austria and Val di Sole in Italy). This project aims to implement the action plans elaborated in the previous project. Local groups of actors are facing the concrete implementation of actions plans. The scientific team has to produce a set of methods for a permanent assessment of the process. Finally, to establish the conditions of general applicability of such experiments, both scientific and local actors evaluation of the process will be confronted.

1.4. Four study areas in the Alps

The four areas of the project illustrate the specificity and diversity of agriculture in alpine mountains

The "**Val di Sole**" is a territory located in the autonomous province of Trento, commonly known as Trentino, at the North-East of Italy. Part of the territory is included within the Stelvio National Park. Agriculture, the traditional activity of the valley, has been progressively replaced by both winter and summer tourism. Main **agricultural sectors** are, traditionally, livestock breeding and, more recently, fruit-growing sector, almost limited to apples, occupies the low valley and is continuously expanding, mostly among young farmers. During summer, mountain pastures are exploited by pastoral units, the milk is used up to produce "Grana Trentino".

The ***Moyenne Tarentaise*** is located in Savoie in France. Over the last decades, the economy has been more dependent on tourism and winter sports Farmers have exploited since a long time an area where the relief is hilly and the climate harsh, on the basis of collective organisations grounded on the production of a high-quality cheese called Beaufort. About 240 farms exploit grasslands on the valley slopes, and collectively manage pastures that are also used for winter sport resort. The mean UFA in

Moyenne-Tarentaise is 28 hectares and 60% of farms are considered managed by non-entrepreneur farmers.

The ***Val d'Hérens*** is located in the Valais Central near Sion in Switzerland. Magnificent landscapes and proximity with high peaks have attracted tourists since long ago in summer, and more recently in winter. Farming is based mainly on little dairy farms with alpine pastures. The number of farms (207 in 2000) and the number of people employed in farming (431 in 2000) are decreasing (from 1990 to 2000 : number of farms –29%, number of farm employee –37%). On the opposite, the UFA has been increasing during the last 20 years. The average farm size is therefore increasing, but with an average of 9,3 ha per farm in 2000 it is still remaining very small. More than 75% of the people on those farms are not full-time farmers. Among the 207 farms of this territory, 80% are dairy farms with an average of about 7 cows per farm.. The main breed is of the local "*Hérens*" type. In winter, the milk collected is transformed into cheese, mainly of the "*raclette*" and "*tomme*" type. In summer, part of the milk is processed in the high mountain pastures where other smaller dairies are settled.

Oberes Drautal is a valley located in the southern part of Austria and belongs to the district of Spittal a. d. Drau in Carinthia province. The main agricultural land uses are intensive grassland, annual crops and alpine pastures. Forestry contributes to a high degree to the farm income. 75% of farmers are part time farmers. Tourism is today an important factor for the regional economy and an additional income for farms. Because of the importance of forestry the main industries in the pilot area are wood processing and wood working industries.

The similar aspects of the agriculture of these areas are consistent with the general alpine situation :

- The number of farms and the number of people employed in farming are decreasing. The risk of seeing all small farms disappear is high in these areas. Meanwhile, the average farm size is increasing, but the average size remains lower than in plain.
- Part-time farming is developing;
- Links between farming and tourism turn out to be a key aspect through land use and land upkeep, for on-farm sale of high-quality cheese and for part-time jobs linked to tourism.
- Agriculture is mainly based on an extensive use of permanent grasslands and alpine pastures;
- The production of high quality cheese is frequent.

1.5. Methodologies applied

We used different methodologies involving both scientists and local actors in a combined demonstration and research programme consisted in two projects so-called SAGRI-ALP and ILMAP. The methodologies are the followings.

(a) A demonstration phase

The demonstration phase consist in **building-up and implementing action plan in favour of sustainable agriculture based on a team of local actors, in the four European areas located in Alps.**

The first stage is the constitution of a work group representing the diversity of actors concerned by agricultural development (farmers, representatives on the communal level, mayors, economic actors as tourism, forestry industry, ngo's, etc.) and willing to involve themselves in a long-term project. **The use of participative methods** is the general rule for activation the group. They respect essential factors, namely speaking rules, listening to others, expression of ideas, creativity, sharing the same goals and respecting the different members, no judgement of others. One of the main points of the process is to focus on the construction by the actors, rather than by the experts.

A progressive and structured process. The group gathers on a regular basis. The elaboration and implementation of the action plan is organised with the following main phases of the process:

- **Sharing the territorial assessment:** Using the own know-how and scientific assessment of local agriculture and territory the local people analyse the present situation and identify the strengths and weaknesses of agriculture and the territory. The objective of this phase is to specify the main concerns and objectives for sustainable agriculture.
- **Imagination phase:** the group builds up common set of consistent and realistic ideas for sustainable agriculture and land use over 20 years. By means of the « future workshop » method, the diagnosis of problems, wishes and objectives of local people for sustainable agriculture are determined and their own sustainability points of view are understood. The precision of these ideas must be high, taking into account every component of local development, i.e. which kinds of activity, what population and where, which farm types and networks, what local political organisation, which relations between activities, etc. The result of this phase are scenarios for a possible and desirable future for sustainable agriculture, capable of reinforcing the weak points detected in the diagnosis. It is possible to establish and compare different scenarios, reflecting different points of view on the future. After actions plans for sustainable agriculture are designed and implemented by this group.
- **Elaboration phase of a plan of action**: This is the translation phase of the desirable ideas into concrete plans of action. The local group identifies a succession of steps that must be implemented and the means that must be mobilised to realise their "dreams". At the end of this phase, the result is a collective project translated into an operational plan of action.
- **Implementation of a plan of action:** during the implementation phase (on-going project IMALP) the local group is in charge of the management of the actions, the aim is to obtain collegial and consensual decision in terms of specification of the actions, in case of difficulties adjustment of their implementation. Complementary small action groups (4-5 persons) are established to ensure the detailed and practical management of each action.

(b) Scientific evaluation

The scientific evaluation aims at analysing the problems of sustainability of agriculture based on an interdisciplinary research team including the following disciplines : ecology, geography, agronomy and economy. A system approach was retained for a overall diagnosis, a set of indicators of sustainability of agriculture was developed to evaluate sustainability (Fleury et al., 2001), and finally a sociological analysis is being conducted to observe the multi-stakeholders processes provoked by the designing and implementation of action plans. The last two approaches are orientated towards the analysis of changes and processes.

- **The system approach** allow a detailed diagnosis of sustainability of farms and territory at local level. It encompassed :
  - a standardised investigation of abiotic and biotic conditions (general geographical characteristics (altitude, climate), geological conditions, hydrology and water resources, type of land cover (Corine land cover), altitudinal zonality, surface in protected areas (national park…). This diagnosis consists in collection of existing data, maps, *etc*.
  - a description of agriculture from a socio-economic perspective. Three levels were considered: (i) Regional structure (economic, socio-economic and demographic situation and evolution, socio-economic function of agriculture and relationships between other activities, recent

evolution of agriculture); (ii) Agricultural product markets (evaluation of marketing value of agricultural products, potentials for new orientations).
- a farming system analysis. It informed the diversity of farming systems through a typology of production systems, with data on strength and weakness of farm types, relationships between types of farming system and patterns of land use and agricultural practices. This work is based upon on the analysis of existing data, interviews of local stakeholders and a survey in a sample of representative farms of each area.
- an evaluation of land use and analysis of environmental states. Landscape was subdivided into area units according to the land use and landscape ecological criteria. For this step we used cartographic analysis and landscape survey.

- **The evaluation of the impact of the implementation of the action plans associates two approaches:**
  - A set of indicators is being developed as a quantitative or semi-quantitative measure in terms of sustainability of the local agriculture. The objective is to track sustainability progress through a set of indicators that will be interpreted in relation with the analysis of processes.
  - An analysis of the processes (characterising changes in progress and the role of action plans within process of change). This analysis is based on 2 methodologies:
    - sociological analysis of actors processes in terms of governance and sustainability at local and territorial level. The objective is to evaluate the capacities of the local group members to negotiate in a collective way a broad agreement about the goals, the rules, and the means of change towards sustainable agriculture.
    - a farming system analysis : assessment of farm sustainability according to (i) farmer's objectives, constraints and assets (characterisation of farmer's strategic choices) and (ii) territorial objectives; characterisation of the process of change on the farm (links between strategic choices, actions, context and consequences). The on-farm survey is conducted as a semi-directive interview with room for the farmer to express himself/herself and explain his/her practices and choices.

2. Problems of sustainability of small-scale farming in the Alps

2.1.sustainability of alpine agriculture today

According to the debates in the local groups of actors and to the scientific diagnosis in the SAGRI-ALP project problems of sustainability in Alpine agriculture could be sum up as follow:
- the agricultural income remains lower to plain agricultural income in each research area (about 30 to 40 percent in average according to Eurostat data). These differences can be explained by a lower size of farms in comparison with the plains, and over-costs in equipment in case of comparable levels of modernisation (Bazin, 1995). In mountain areas, physical disadvantages place severe limits on technical and structural adaptation and reduce competitiveness of agriculture.
- In the Alps, agricultural environmental problems are clearly related to two trends in the evolution of agricultural land use, namely intensification and land abandonment. Few areas are affected by either abandonment or intensification alone. The process of agricultural land-use adaptation to socio-economic pressures is an abandonment/intensification phenomenon: intensification on accessible and better quality land and abandonment elsewhere. The environmental impact of intensification identified are due to: local over-use of organic fertilisers, the occasionally use of pesticides and herbicides, and overgrazing or grazing near water catchments in Alpine pasture. All these practices

have negative impacts on biodiversity and water quality (bacteriology especially). Land abandonment affects negatively biodiversity (especially for species living exclusively in open biotops like grasslands), landscapes and soils. The ecological processes involved are encroachment of vegetation onto old field sites and loss of grassland areas to scrub and forest.

- The social impact of farmers is now low, being closely linked with the decrease of agriculture. The economic development of the Alpine valleys is bringing new residents, with high exigencies on quality of life conditions largely based on quality of the near environment. For example, survey on local stakeholders have complained again farm buildings with bad smells inside the villages. This shows that farmers have some difficulties to find a new position in the new sociological context. Whatever this position cannot be as dominant as in the past and the current evolution of the social recognition of agriculture by local people is one of the major concern of farmers.
- In general, the increase of the size of farms and/or the decrease of the number of AWU by farm, are at the origin of the increase in time of work. This high work time corresponds to a gap in comparison with the rest of the local society. The social relations with other populations (high celibacy rate among farmers for example) can sometimes be very weak because of this problem. And today, farmers long to new way of living (holidays, social life, etc). For farmers the problem is more related to lack of holidays and week-end, periods of work overload than to the average annual duration of work. From the direct point of view of the farmers, this problem of work time is one of their first constraints, in term of liveability which is an essential aspect of sustainability.

These general problems could be specified and concerning sustainable agriculture we identified three major perceptions, characterised with difference in the balance between the environmental, economic and social components of sustainability:

1 – Economic factors are the primary concern : the maintaining of farms requires sufficient income. Today the major threat is that agricultural income in mountain remains lower than the one in plains regions. Present-day farmers feel more and more like producers of goods and business managers. Such an attitude is common among young farmers, who clearly separate meadows with high agronomic value for production, from poor, difficult fields which could be maintained for landscape reasons with financial support from society.

2 – The quality of rural life is the secondary factor of concern. The social impact of farmers is now low and still declining. Farmers have some difficulties in finding a new social position which could be a problem in founding a family and taking part in the decisions of the community. The frequent work overload on certain farms is also a major concern. Such an attitude is common both among farmers and representatives of communities.

3 – The environmental topic is rarely mentioned by farmers (except positive landscape impacts of agriculture or locally some problems referring to water quality). We can summarise a common point of view of farmers concerning the relationship between agriculture and the environment in the following sentence: "The landscape and the rural area are the result of our work, environmental quality depends on agriculture, so the balance between the negative and positive impacts of agriculture is always largely positive". Such an attitude, common in the different Alpine countries, is more pronounced in regions with Latin culture than in regions with German culture, where from an historic point of view “wild nature” is more important. However, for NGOs involved in environmental protection, the reduction of negative environmental effects by agriculture and the promotion of environmentally friendly practices are important.

Whatever the perception, **three major limits for the implementation of sustainable agriculture are stressed by the rural world:**

1 - **On the agricultural level,** external factors, more than territorial aspects, exert considerable pressure on production management, namely world trade and prices, industrial and marketing strategies, consumer demands, sanitary standards, etc. Because of the consequences on their income, such topics are the major concern for farmers. National and European policies are interpreted as being increasingly focused on liberalisation of markets and exports, resulting in price decreases and the increased size of farms, and are also often mentioned as a limitation for sustainable agriculture.

2 – **On the rural-development level,** some communities are not able to take into account medium- and long-term considerations for sustainable development. The short term is considered so difficult that it is the single priority.

3 – **The lack of consistency between objectives of political tools targeting sustainable agriculture and their administrative implementation.** Time perspective of subsidies is in general to short according to the context of long-term planning of farm activities and investments and administrational constraints are increasing to obtain subsidies.

So in the Alps implementation of sustainable agriculture is clearly related to integrated rural development and local negotiation between different conceptions and objectives. Two general aspects have to be considered:

- a state: natural and cultural richness (landscape) of the Alpine ecosystem in Europe, the high level of aspirations of environmental and landscape qualities for the Alps related to tourism, local inhabitants, nature protection institutions and NGO's ;
- a worrying trend related to the evolution of agriculture. In the majority of the areas we assist to the end of the traditional farm and farmer (closure of farms, increasing of livestock number and hectares per farm and worker). The farmers facing the end of a social rationality based on handing over family heritage and on an economic rationality that usually lies in increase of volumes produced.

2.2 Goals for a sustainable development of alpine agriculture

From the participative discussions held during Sagri-Alp project, different goals of sustainability came out as presented in Table 1. The local groups have defined first collective objectives (Table 1) to improve sustainability and then have prepared local action plans. In each area, In each pilot area, measures to promote sustainable agriculture are combined at 3 levels usually considered separately (table 2).

Table 1: Local goals of sustainable development of agriculture

Economic concern	• To remunerate adequately the work of farmers compared to other workers (Austria, France, Italy) • To increase income of small livestock breeding farms (A,F,I) • To create synergy between agriculture and other activities (services, tourism, etc.) (A, F, I, Switzerland)
Social concern	• To reduce the difference of living standards between farmers and other groups of population (A, F, I) • To solve work overloads in farms based on milk production (A, F) • To enhance exchanges and mutual understanding between farmers and other stakeholders (A, F, I, S)
Territorial and environmental concern	• To maintain an opened landscape; preserve natural and cultural heritage (A,FI,S) • To promote shared objectives and common projects between farmers and land planners (A,F,S,I) • To promote integration between agricultural and tourism activities (I) • To ensure a balanced distribution of farms on the territory (bottom of the valley and slopes) (A, F) • To Increase awareness of farmers about land management and preservation of local resources (A, I, F)

Locally, the action component of SAGRI-ALP and IMALP projects are experiments bringing together actors establishing new ways of exchanging information, sharing a common view on the long term evolution of local territories and their agriculture and making decisions collectively. The challenge is both to define and implement solutions to strengthen the contribution of agriculture to sustainable rural development and to construct a new rationality for farmers. This is why we can consider the local partnerships established for these projects as lab for sustainable agriculture both in terms of action, research and elaboration of tools.

3. Local partnerships established as a 'lab' for sustainable agriculture

To implement an action plan in favour of sustainable agriculture and rural development, the IMALP research and demonstration project is organised as follow:

- In four pilot area, a local group involving farmers, elected officials and civil society is constituted.
- Action plans for sustainable agriculture are discussed and designed by the local group and the smaller action groups, then implemented. The groups gather on a regular basis. They are motivated by a local activator using participative methods.
- The impact of action plans is evaluated by an interdisciplinary team of scientists.
- Methods and tools to disseminate the results are proposed.

In the framework of IMALP research-demonstration project, action plans are currently designed and implemented in four European areas. The key and innovative aspects of these projects are the establishment of local groups involving all stakeholders and run on the basis of participative methods. The actions designed by those groups have to be an answer to current difficulties, should be innovative solutions and address the third components of sustainability (environmental, social, economic), there is room for anticipation on future thanks to prospective methods.

3.1. Action plans in favour of sustainable agriculture

The action plans are addressing agricultural issues at three levels (see Table 2). The first level, the farm level, is usual scale when dealing with agriculture. However, the new role of agriculture in land use planning is requiring actions at territory level. Moreover, farmers are facing common difficulties to sell their products at a good price or for doing their job during work peak periods. For such problems, to organise themselves as a group or to establish a structure of mutual help have been raised as possible solutions. So the level of farmers' group is as well a key level for action plans.

Table 2: Three-scale action plans in favour of sustainable agriculture

In each area, the local group will implement demonstrative actions (see examples below) :

- *AT FARM LEVEL*: **BY ADAPTING FARMING PRACTICES AND SUPPORTING MULTI-FUNCTIONALITY**:
  - Integrate farmers' knowledge to the project through meetings, including project monitoring;
  - Encourage diversification of agricultural activities (sale on farm, farm visits, accommodation for tourists)
  - Sign contracts between farmers and local administration to supply services for landscape up-keep and environment preservation.
- *A FARMERS'ORGANISATION LEVEL* : **BY OFFERING COLLECTIVELY SUPPLY FOR SERVICES**
  - Create a labour bank between farmers to solve over-work loads
  - Promote valorisation of local high-quality productions
  - Establish a network among innovative farmers within the region and contacts with other regions;
  - Develop marketing infrastructure for regional agriculture and forestry products
- *AT TERRITORIAL LEVEL:* **BY DEVELOPING NEW PARTNERSHIPS BETWEEN AGRICULTURE, COMMUNITIES AND LOCAL SOCIETY**

- Mobilise a group involving farmers, local administration and local society at a long run
- Support communication and debating between farmers and local stakeholders
- Support the social acceptance of farming activities
- Prepare with stakeholders a scheme regarding rural and regional development

To go deeper into details, we will give examples of the actions designed in the different field areas by the local group and the action groups established locally.

In the Italian pilot area, Valle di Sole, the action plans concern the renovation of formerly cultivated land currently abandoned, in the framework of a partnership between municipalities and farmers. Other action plans address the problem of manure management. A turning machine for manure curing will be experimented in order to have a better agronomic management of fields and reduce odour nuisance. Action of communication have been designed especially orientated for scholars audience, to promote a better knowledge of agriculture and its role. The local products marketing is going to be developed and supported for better income. The marketing will especially concern sheep meat and local cheese, little known by consumers. In the area's lower part, where the production of golden apple, developed since the 1980's has strongly shaped the current landscape. Most of trees cultivated match to one variety of apple and are managed intensively, an action will be dedicated to the collective cultivation of marginal and fragmented orchards.

In Austria, in the area of Oberes Drautal, action plans address five main problems. First, the protection of groundwater is targeted through the change of cultivation and the reduction of livestock units. Secondly, the evolution of farming systems towards the development of agri-tourism activities is envisaged and will be concretely experienced by the designing and settling of a new track from Spittal up to East Tyrol, involving farmers in the process. The marketing of products is also a key issue in the area. Fourthly, it sounds crucial to activate discussion groups and mobilise stakeholders. A clearing group has been established to promote ideas for Regional development. The last target is the building up of new partnerships between agriculture and society through an “Oberdrautaler manifest”.

In France, in the area of Moyenne Tarentaise, actions are scheduled at farm level to address social sustainability that is jeopardised by the overloads of work that make farmers life difficult and make them feeling a deep gap between their status in society and the other workers. An exploration of means to reduce work loads are investigated. Actions at farm level concern also the diversification of farm productions that consists in offering environmental services such as landscape upkeep or tourism services (on-farm visits, meals, *etc*.). The level of farmers' group has been identified as a key level, allowing exchanges between different types of farming and farmers, and making farmers able to envisage solutions coming from their own neighbourhood, for example by organising themselves with other farmers. The concrete action could be the building up of a structure such as labour bank that will allow mutual help and might be able to offer services (in equipment, in work) to municipalities or other farmers. Finally, actions have been designed at territorial level for communication activities on agriculture and farmer job, to establish contracts between municipalities and farmers for adapting their practices to new demand of society or environmental objectives. To sustain the activities initiated during project implementation, efforts will be put to urge the design of a development scheme on the basis the project multi-actor group debates.

In Switzerland, in Valais area, four action groups have been constituted. One is dealing with meat food chain for typical and labelled products little developed in the Val d'Hérens territory. Another group is designing actions to support milk supply for local dairies. The objectives are both to stabilise and then to increase the dairy collection in summer and to improve the marketing of the dairy products. A third action group is dedicated to tourism and educational activities on farm (development of a network of farmers who already offer tourist services on their farm). A fourth group is discussing land upkeep, maintenance of the surfaces and collaboration between farmers. This group is designing concrete actions targeted the management of areas in abandonment and the way to implement agreements between farmers about farm work tasks.

3.2. Analysis of actors processes observed during the designing of action plans for sustainable agriculture

The first stage of the project was the establishment of a local group constituted of actors intervening in the territory: farmers, elected officials representatives of municipalities of other administrative level, representatives of economic branches concerned by agriculture (tourism sector, refinement industry e.g. dairy), representative of environmental sector and interested private persons, along with a project manager (local activator) and a researcher (member of project management committee-scientific team).In the different field areas, the local groups are composed from 15 to 20 members. The aim of this local group is to reach collegial and consensual decisions about the precise implementation and management of action for sustainable agriculture. Key aspects in the group functioning are based on the participation of volunteers, everybody is equal and free to express individually, there is no chairperson, the important decisions are taken by voting. For the action plans running and their implementation, smaller groups so-called “action groups” have been constituted. They are groups of 4-5 participants who ensure all practical and technical aspects.
After one year of project implementation, we could propose outlines of current processes regarding actors relationships observed during the specification of action plans by the local group and the early concrete tasks identified by the action group.

- **Local group composition**

The local group has been constituted on a voluntary basis. Accordingly, the composition varies from one field area to another. This composition is also shaped by the usual relationships between agricultural sector and other sector, and the general administrative and political organisation of each country. Weaker are the relationships between agriculture and one sector more difficult to get their participation to the group is. For example, winter resorts and services linked to winter sports have few relationships with farmers and their representatives. Their involvement is hard to get. Municipalities representatives are members of the group. They are strongly motivated for example it is the case in Val d'Hérens. However, as the group has no institutional role formally assigned, in some areas municipalities representatives might not maintain their participation steady. Local activators have urged women to participate to the group. However, as men are already involved in professional network or structure , they were more willing to be member of the group. In the case when men were the only ones running the farm, it was proposed to their wife to join the meetings, but they refused. The women participating are all working in farms and, in the local groups, the balance between men and women could not be reached.

- **Differences in participation between local group and action group members.**

In some smaller action groups, the participation of women is stronger. In one dealing with diversification of activities (tourism, on-farm sale, development of new food products, educational activities) men are fewer than women. Women are more frequently in charge of these on-farm activities such as welcoming tourists, making cheese, etc.. So the composition of action groups is slightly different. Usually in those smaller groups, people express themselves more freely in comparison with the local group meetings that might sound for some of them more formal depending on the attending members. The size of the group is a key factor. Bigger is the group more formal the stakeholders’ participation tends to be.

It was retained that the composition of the group could be flexible, to keep the exchanges opened. However, a core group of members has to participate to all the process.

- **Analysis of actors relationships in the first local group meetings**

Opposition and differences in opinions were expressed between different type of farmers during the first meeting. We noticed these differences between: dairy farmers and goat and cheese breeders; farmers selling their milk to the dairy or making themselves their cheese in alpine pastures; innovative farmers versus more traditional farmers; full-time farmers and part-time farmers who have different views of what farming as a job is. We could identify other opposite opinions as expressed during the meeting, for example between rich and poor municipalities. Municipality representatives, non-farmer inhabitants, representatives of collective structure, or representatives of other economic sector have adopted different views on agriculture and its role. Despite differences in opinions and the constitution of group of interests, participants took decisions regarding action plans in a consensual manner. As a major result of the local group members' interaction, it could be stated that the priority was given by the stakeholders to an agreement for common objectives. However when people have started discussing how to reach them, which means to use, what concrete actions to enterprise, more diverse opinions and views were expressed.

The above data still need to be completed and further analysed on the basis of the coming meetings and implementation of action plans during the coming year.

4. Limits and assets of the local level to identify and to implement multifunctional role of small-scale farming in rural development

Local group of actors is a way to construct a new social rationality for farmers.

Incorporation of sustainability in agriculture requires deep changes in the farming profession and better identification of the expectations and demands of local society. This cannot be achieved by a top-down approach, which is difficult to understand and to communicate to both the farmers and the local population. Debates involving farmers and local actors could be an efficient way to help farmers in the progressive elaboration of a new social rationality based on activities integrating not only food production but also environmental concerns.

Local groups of actors facilitate self-reliance but global components of sustainability are not easily grasped. Local group motivated by an activator could be seen as a learning process which create new common meaning beyond individual experiences: each actor explains its conception of agriculture, territories, and the group could agree on one common (or partly common) conception. Local group with relevant methods of activation could promote self-awareness and confidence of local people. This helps the local group to be aware of the matters they could have control over, consequently to think over their future and take action accordingly. This is also why global components of sustainability are not easy to grasp: **:** i.e; air, climate or water change, and some aspects of biodiversity (e.g. a species that is rare on European level and abundant on the local level) are not easy to discuss in local groups. These topics are seldom significant for local actors, even they can consider that there is no need for them to take action, for instance when they said: "reducing water pollution is not an objective for sustainable local development, it is a law that we have to apply".

Local groups of actors facilitate mutual learning and is a way to find innovative solutions in terms of sustainability of agriculture. In France for example, the project to develop multifunctional farms associating food production, environmental and tourism services aims at avoiding the increase of farm size on one hand

and the decrease of number of farms on the other hand. This is an idea raised during debates between farmers and elective representatives. Data acquired through the observation of local group meetings tend to show that farmers in the local group are assigned to a new role that is not so easy to understand and fit with. Usually, ideas, technical solutions are coming from agricultural technical services. Being in a group where it is possible to express but as well to determine actions is a new situation for them that needs time to be assimilated. However, through the group members' exchanges, participants are in a situation of mutual learning where they are confronted to the views of colleagues or neighbours and this could change the way they perceive their job and their role in local society. Thanks to new partnerships between agricultural sector and other economic sector (tourism) and other stakeholders such as municipalities or environmental NGO's the innovative solutions concern both the technical and organisational aspects of agriculture.

The local level and even more a participative and citizen local group could not work alone. Despite the great confidence and motivation obtained in a local group during the elaboration of an action plan, the implementation of action needs close contacts with local, regional, national administrative and political institutions and their representatives. The necessity of such a network is not always easily catched by a local group. Communication within but especially outside the group members could be a way to cope with those difficulties, by getting a recognition and facilitating the appropriation of results by local officials.

But the major limit of a local group lies in the principle of participation and the common idea that a local group has to obtain a consensus. This objective, sometimes implicit for local actors, but very often present (we have to debate into a democratic way to create a common point of view and a consensual action plan) could be an obstacle to discuss conflicting topics: i.e. competition for land between large farms and small farms, competition for land between agriculture and urbanisation, biodiversity management, etc. To face conflicts could be a way to make progress together by overcoming them (Callon et al. 2001). We observe that such types of debates could be missed by local actors and activators to limit the risk of failure during the process of co-operation. For sure, avoid such a debate is not a sustainable way to have common action for a common future.

Conclusion: research and action towards sustainable development

To associate scientists and local actors towards sustainable development modify the limits between action and research. As to researchers, the project presented and its results are at the interface between science and action. Moreover, to obtain a good analysis of the processes and to establish the conditions of generalisation of such an experiment, scientific evaluation and local actors' evaluation will be crossed. This means that we have to manage both the involvement of researchers in action and the border between research and action. This is another way to practice research with a specific joints between action of social groups involved in the management of the action plan and the researchers involved in its scientific assessment. To manage this we refer to an attitude of "intervention-research model" (Hatchuel, 2000; Hubert, 2002). Producing knowledge is also a way of being actor in the world. The researcher is in interaction with local actors, scientific knowledge (scientific diagnosis of the territory, scientific assessment of the implementation of the action plan) is presented, discussed in the local groups and confronted to local knowledge and understanding of the same situation. So scientific knowledge will be produced in a complex process: observation of action, and interaction between researchers and actors. We will have to prove at the end of our project that something of new appear with such a process. Currently we have also to manage the limits between research and action and we decide to maintain clear limits: the local group is free to decide the actions, the researchers observe the process, take part to the local discussions by giving their analysis and point of view but do not interact in the decision. This limit considered as theoretically clear is not always so easy to stick to in action, accordingly we could refer to the classical problem between expertise and action (Roqueplo, 1997).

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Flexibility of suckler cattle farms in the face of uncertainty within the beef industry: A proposed definition

S. Ingrand*, H. Bardey and J. Brossier****

Summary

The aim of this study, carried out in association with stakeholders in farming development, is to explore the capacity of farms to adapt, from a techno-economic point of view, to both structural changes in consumer demand for beef products and recent market disruptions (sudden drop in beef consumption due partly to media coverage of new cases of mad-cow disease, industry paralysis during the foot-and-mouth crisis of winter 2000/2001,…)

The flexibility concept was adopted in order to examine how farms reacted to the winter 2000/2001 crisis, and was based on several technical and economic surveys. A series of variables is proposed and several hypotheses formulated regarding their respective impact on cattle farm flexibility. Five groups of farms have been identified using different combinations of the degree of importance of these variables, with technical, economic and marketing flexibilities specific to each group. Analysis of results has revealed the different combinations of flexibility types possible (technical, economic, marketing) and thus explains why cattle farmers reacted as they did.

Techno-economic analysis of farm flexibility also reveals situations where these technical, economic and marketing flexibilities are complementary, or on the other hand, are incompatible. For traditional livestock farmers, high flexibility from both technical and economic points of view allowed them to weather the crisis unscathed. In other cases, low flexibility either induced inertia, or led farmers to react by seeking solutions outside the cattle farming system. Only farms in which incompatibility between high technical flexibility and low economic flexibility was observed, reacted by changing the production system. Flexibility can be an indicator allowing stakeholders in farming development to pinpoint and predict necessary action.

Introduction and socio-economic context

Adaptation of cattle production farms to uncertainty in this industry is a major challenge for farm sustainability and consequently for maintaining ecological, economic, and demographic equilibrium in the Charolais suckler cattle area in Burgundy, France. Changes in consumer demand for beef products[1], the CAP reform and successive crises in 1996 and 2000, have contributed to market disruption, thus rendering vulnerable or even at times imperiling farms specialized in the production of Charolais beef

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1 It is not the aim of this paper to study changes in beef consumption practices, but two important trends in consumer habits can be recalled: i) progressive on-going decrease in beef consumption due to changes in consumer habits and to nutritional guidelines (Combris, 1996); ii) increase in consumer requirements for product quality and safety, particularly since the mad-cow crisis of 1996.

cattle. Two crises during the winter 2000/2001[2], revealed the vulnerability of the Charolais beef production system, and caused a major turnabout in awareness on the part of the different stakeholders involved (farmers, sales intermediaries, development agents responsible for giving technical back-up and advice to farms…) convincing them of the necessity to transform the industry, both for production organization and animal marketing. This crisis was also for the chance for local authorities to reiterate their support for diversification of livestock farmer product lines, and specifically, for the development of cattle fattening and involvement of livestock farmers in official quality sub-sectors[3]. It is a fact that the Charolais system is currently experiencing difficulties in adapting its products to market demand, in terms of adjusting product volume by category and by quality, but also in terms of informing consumers of the quality of their products. This difficult and slow adaptation can be explained by numerous historical and/or cultural factors. Livestock farmers of the Charolais suckler cattle area have not felt the need to improve industry coordination because they drew their strength from the intrinsic and well-renowned quality of their products, as well as their extensive production practices[4]. Nevertheless, since 1996, a few attempts to adapt have been undertaken and have in particular taken the form of a multitude of management initiatives in quality sub-sectors, often poorly coordinated and at times competing with each other. The limitations of these different measures were revealed by the winter 2000/2001 crisis, and the farmers reacted in different ways and to different degrees, which contributed in the medium term (specifically during the following campaign) to deregulating the market even further[5]. Thus, we consider that the steps taken and the signs given by farms during this crisis reveal either the vulnerability of certain types of farm, or the resilience of others. These factors would appear to be good indicators of the attempts made by farms to adapt to market uncertainty since 1996. This uncertainty, plus the technical and economic situations in which farms specialized in cattle production find themselves today, justify the search for solutions aiming to increase farm flexibility.

The objective of this paper is firstly to define the flexibility concept, as well as other connected concepts, and to justify the use of these concepts in reporting on the production processes used in suckler cattle farming. Techno-economic determinants affecting this flexibility are then proposed. In the first section, we define the flexibility concept and present various technical and economic variables that can define it. In the second section, we present various types of flexibility, as a result of a corresponding factor analysis (CFA) carried out on the techno-economic variables observed in a sample of 14 farms specialized in beef production. We will give our observations as to how these farms reacted during the winter 2000/2001 crisis as compared with the theoretical types of flexibility defined in this section. Lastly in the conclusion, we will give a few indications concerning the difficulties that stakeholders in development confront in supplying advice and taking action in a crisis situation, given the difficulty in determining the nature and degree of farm flexibility.

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2 Two successive crises affected the beef industry during the winter 2000/2001 : the second mad-cow crisis then the foot-and-mouth crisis which necessitated the adoption of health measures prohibiting animal movements and thus imperiled the farms specialized in lean cattle destined for export to Italy.

3 Several reports including the Delaunoy Report (1998) requested by the Chamber of Agriculture in Saône-et-Loire, France, and the Mordant Report (2000) requested by the Ministry of Agriculture, Forestry and Fishing, emphasizing the necessity of developing animal fattening.

4 See Cavailhès J. (1986), Soufflet (1989) for a presentation of the organizational specificity for production and marketing of Charolais beef compared to other breeds.

5 The winter 2000/2001 crisis, with the halt in exports to Italy of store animals, caused grave difficulties during that campaign in terms of market outlets for "birthing" farmers who had not yet sold their animals. These difficulties had repercussions during the following season due to an increase in the proportion of fattened animals.

Section I Farm flexibility and market uncertainty

1. The flexibility concept in farming

Unlike other concepts frequently used to define and/or explain changes in farming : change, adaptation[6], development, sustainability, resilience[7],…, flexibility as a term is not (to our knowledge) often used in agricultural research. It is nevertheless associated to a greater or lesser degree with all these notions, and given the conceptual and associating connotations that we attribute to this term, the use we make of it needs to be justified and defined. In our research programme "Farm flexibility confronted with beef crises"[8], we consider flexibility to be the **capacity of the livestock system to adjust quickly to a wide range of economic, technical, marketing and climatic constraints, whilst allowing the livestock farmer to cope with his production plan in the medium term, or even the long term**. In accordance with this definition, our study aims to describe and evaluate the technical, economic and marketing leeway that helps livestock farmers to weather the storm created by these crises, and thus perpetuate their systems[9]. However, in the face of radical uncertainty (Knight, 1921) and the successive shock waves experienced by the beef market, the production plans of farmers are in a perpetual state of change. In other words, the flexibility concept purports to express the idea that a company, as an ongoing procedure, seeks to restore its equilibrium which can be redefined at a moment's notice. It is highly connected with the structural and operational capacities of companies to react quickly to changes in demand. Thus, flexibility can assume multiple forms given the diversity of farms in terms of production choices and techniques, but also in terms of economic, financial and marketing objectives and strategies.

2. Variables defining livestock farm flexibility

We present here the variables that we consider apt in defining farm flexibility. These variables, either qualitative or quantitative, can be grouped in four categories : technical variables, economic and financial variables, variables relative to farmers' marketing practices and strategies, and lastly structural variables. They were set down during three surveys in 14 farms specialized in Charolais cattle farming situated in the Saône-et-Loire department in Burgundy, France. For each category the 13 established variables were selected from a larger number of variables (n=25). Selection was made according to their differentiating role within the sample. We describe them below.

A – Technical flexibility of farms

Herd management in the 14 farms in the sample was pieced together for a one-year period (between 2001 and 2002 turnouts to grass). This exercise covered the practices used for managing animal diversity via identification of the different batches composed by the farmers: drafting,

6 Several years ago, the team of management economists in Dijon, France, developed the general theory of adaptive behaviour in order to explain the techno-economic decisions taken by farmers. This theory is based in particular on the coherence hypothesis and supports our analysis here (Brossier et al., 1997).

7 Resilience is the process of adapting well in the face of adversity, trauma, tragedy, threats, or even significant sources of stress. It means "bouncing back" from difficult experiences.

8 This research programme, co-financed by INRA and the Regional Council of Burgundy, associates researchers from INRA and stakeholders in farming development (Chamber of Agriculture, Institute of Livestock Farming, Regional Bureau of Ministry of Agriculture, Producer groups, Livestock farmer associations, Regional Chamber of Agriculture in Burgundy).

9 The paper given by H. Bardey (Bardey, 2002) at the last European IFSA symposium is based on the same overall research programme and presents the contract policy adopted between farmers in the area and marketing co-operatives.

replacement/culling of cattle, product orientation towards different marketing categories (Ingrand et al., 1993). After this exercise, the farmers were interviewed concerning the technical aspects of their system which they perceived to be vulnerable. To deal with this problem, two types of strategy can confer flexibility on the livestock system :

i) very strict control strategy for zootechnical matters, especially reproduction (grouped calving, artificial insemination, synchronization). Adjustments and reaction to uncertainty are above all the result of management choices (regulation through feeding and reproduction practices), requiring close monitoring (indicators) by the farmer which protects him from drifting from his objectives),

ii) A « laisser-faire » strategy, meaning lower requirements for supervision, intervention and indicator collection. Tasks are not concentrated within a set timetable according to their type. The hypothesis here is that animal heterogeneity is perceived less as a handicap but rather as an opportunity for adaptation to uncertainty on the herd level (Tichit et al., 2002). Adjustments and reaction to uncertainty are above all due to biological regulation rather than to the farmer's management practices.

The calving season

The calving season affects the quantity of winter food to be stored and also the way in which tasks are organized. When calving is early (autumn and early winter), cow lactation lasts for the greater part of winter incurring high food needs, and reproduction management takes place inside the buildings, with varying degrees of constraints according to whether the cows are in loose housing or attached (as is frequently the case in the Charolais area). On the other hand, when calving is late, the cows spend their pregnancy during the winter (low food needs) and reproduction can take place on grass. In the first case, the farmer is in control of system adaptation, and reproduction is usually strictly regulated (synchronization, insemination, pregnancy diagnosis). In the second case, adaptation is more biological. Consequences affect for example early selection of cows to be culled and thus selling periods.

Food management: diversity of winter fodder

Diversity of food stocks, particularly in making up the winter ration, strikes us as being a source of flexibility regarding potential animal categories to produce (e.g. : maize silage for fattening young trough-fed bull calves), and a source of security connected with cropping and harvesting conditions. This greater diversity of food stocks is thus connected with the production system (categories sold). It allows for adaptation where necessary regarding the allocation of forage resources.

Livestock numbers and stocking rate

Livestock numbers and technical stocking rate are very much up to the farmer, even if they are greatly affected by the subsidy system (premiums). Co-related with building capacity and field pattern, adjustment of animal numbers allows fairly high flexibility regarding food resources, but also task organization. The stocking rate per hectare is an interesting technical factor linked with intensification, and also with the search for CAP support. This is a differentiating factor in our sample and leads us to distinguish two groups.

B – Economic and financial flexibility

In traditional economics, these are variables easily adjustable in the short term by economic actors and considered to contribute to company flexibility. Given the scope of external constraints weighing on the farm itself (CAP constraints, Territorial Farm Contract commitment (CTE), marketing commitments,…), we also explore the degree of farmer autonomy in his decision-making, as the factor which describe and explain not only economic and financial flexibility but also farm marketing flexibility.

Recourse to current account overdraft

Use of current account overdraft (CAO), authorizing an agreed overdraft for farmers by their banks, is characteristic of the low level of cash-flow leeway enjoyed by farmers and their dependents (bank charges between 13% and 15%). Two levels of flexibility were selected: high flexibility when farmers use this solution seldom or not at all and low flexibility when CAO is used highly and regularly, even continually up to the limit.

External revenue

Farmers who have complementary external revenue, either spouse revenue, or a family situation in which parents contribute revenue (single man living with retired parents), have higher leeway compared with those who only have revenue derived from the farm. On the other hand, farmers who only dispose of farm revenue register a low flexibility for this factor.

Level of savings

In considering the household savings level as a potential resource to be used to compensate loss of earnings incurred in a period of crisis, we can examine different corresponding levels of flexibility. However, we do not possess much precise information for this variable, given the reticence of certain farmers in revealing it.

C – Farm marketing flexibility

Sales profile

The categories of animals produced determine the sales profile of farmers. The more the farmer produces distinct categories of animals, the more he is capable of adapting to fluctuations in market demand. On the other hand, a farmer with a narrow range of animals produced will be dependent on market rate and outlets for that category[10]. Thus, we consider the « diversified product range » factor as a variable having a positive effect on farm flexibility.

Proportion of finished animals in total sales

Farms that fatten animals on site resisted better to the crisis than those just selling lean animals. Over and above the existence of a large number of outlets, farms having chosen the fattening option are considered to enjoy flexibility because they possess the necessary food resources for dealing with long production cycles, whilst farms having chosen the "lean" production option do not necessarily have the technical potential (buildings, economic constraints due to additional food expenditure) to bear the effects of non-sales. Flexibility of «fattening» farms should however be put into perspective given the specificities inherent to the sale of finished animals they must be sold quickly, or risk quality deterioration (excessive fattening) and economic depreciation (food costs).

10 The systems specialized in "birthing" (autumn store animals) depend in part on the Italian market.

Proportion of animals sold with quality labels

This factor allows us to examine the actual adaptation of farmers to quality sub-sectors, and reveals the degree of mutual cooperation between farmers and purchasers. Two levels of flexibility have been selected: high when the volume of animals marketed under these labels is higher than 10%, low when this proportion is less than 10%.

Sales schedule (yearly breakdown of sales months)

Regular breakdown of sales throughout the year is a source of flexibility in that i) it reveals the farmer's capacity to produce throughout the year and thus respond to industry demand (regular supplies), ii) it means that farmers are less sensitive to price variations, especially to price drops during sales peaks, with higher returns (higher prices) during slack periods.

Purchaser diversification

A large number of purchasers are able to leave a certain leeway to farmers in terms of negotiating power. Two levels of flexibility were examined for this factor: from 1 to 2 purchasers, flexibility is considered to be low; with more than 2 purchasers, it is considered to be high[11].

Member of Producer group or Farmer Association

We assume that the choice to belong to a producer group or farmer association is a question of differing viewpoints regarding the animal marketing function. In the first case, this function is entirely the responsibility of the producer group and the farmer considers that it is not his job. In the second case, the farmer wishes to retain some leeway in order to negotiate prices and make sales choices.

D – Structural variables

Usable farm area

This is a standard factor for differentiating livestock farms, even if it is less representative for assessing farm endurance or their degree of leeway. When co-related with herd size, the stocking rate is obtained which we feel is highly connected with system adaptation capacity (especially climate uncertainty). Farm area provides leeway not only for accumulating stocks (type and quantity) but also for organizing grazing.

Building constraints

Buildings can be a considerable source of constraints depending on their layout in relation to one another, their capacity, their practicality. For farmers, these constraints are such that they determine certain aspects of management strategy (reproduction period, categories of animals produced, type of food).

[11] This analysis can be disputed since a strong and trusting relationship with a producer group could have helped the farmers to weather the crisis, but this was not actually the case.

Section 2 «Theoretical» flexibility and reaction to crisis

1. Identified types of Flexibility

In this section, we propose to describe the different types of flexibility, which result from the combination of technical, economic, marketing and structural variables presented above. In order to analyze the different combinations possible, we used a corresponding factor analysis, complemented by our knowledge of the farms. We have thus identified 5 groups of livestock farms (Figure 1 and Table 1).

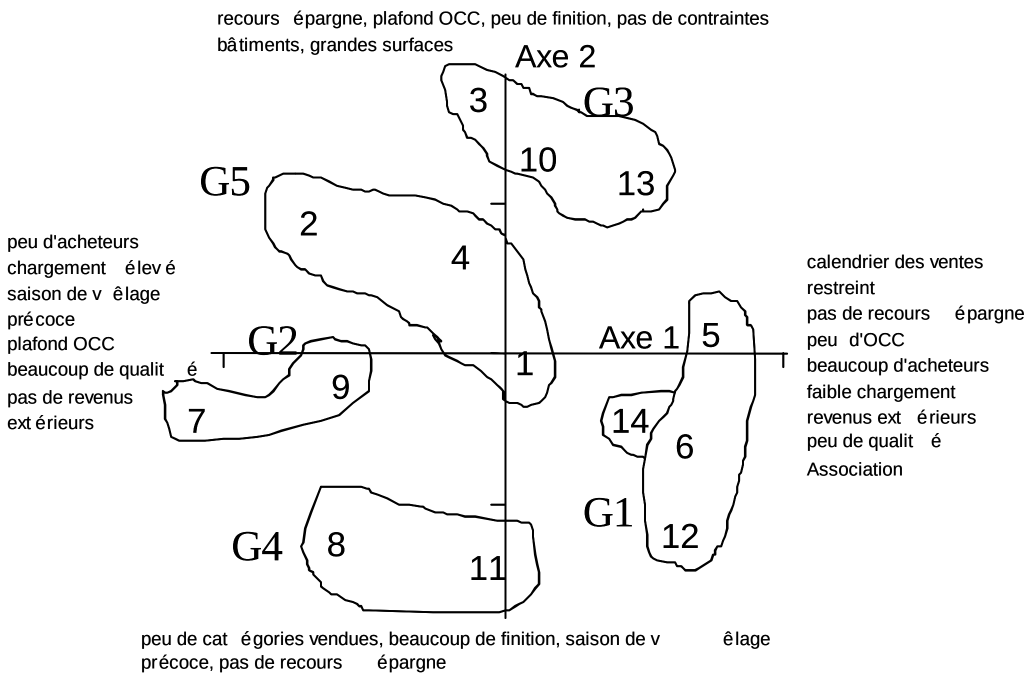

Figure 1: Factorial plan of the two first axes resulting from the corresponding factor analysis, allowing 5 groups to be differentiated among the 14 farms, according to the combination of values of technical, economic, marketing and structural variables

<u>Description of the 5 groups</u>

Group G1: Farms enjoying good overall flexibility. From the technical, economic and marketing points of view, these farms are relatively autonomous not only with regard to the marketplace but also technically speaking. The farmers consider that their system has performed well in the past and should allow them to confront future uncertainty. This autonomy, backed up by the "structural" potential of the farm allows them to make short-term adjustments without major consequences on routine functioning, nor on their medium or long-term plan. With one exception, there were no specific reactions to the crisis.

Group G2: Composed of farms enjoying high technical and marketing flexibility but low economic flexibility. From a technical point of view, these farms opted for a strategy controlling zootechnical processes (genetic selection of animals, batch management, feed supply[12]). These technical achievements allowed these farms to produce animals in line with market opportunities. High sales rates

[12] Concentrates are given to calves before weaning, practices typical of high technical requirements.

in official high quality sub-sectors have been observed in these farms. However, they do not have much leeway from either structural or economic points of view. This group was able to react to the crisis.

Group G3: This covers livestock farmers who can be qualified as opportunists, with a system associating high economic and marketing flexibility, but low technical flexibility. This low technical flexibility can be observed in the production choices made by these farms, mainly lean animals, despite high structural (farm area, buildings,…) and economic leeway. These farms did not react to the crisis.

Group G4: This covers farms enjoying high flexibility in three areas (economic, marketing, technical). Compared with Group 1 which has the same characteristics in terms of flexibility, this group is more committed to activity intensification, particularly animal finishing. These farms developed their fattening activity after the crisis.

Group G5: This represents farms with low flexibility in all areas. They have high structural constraints. These farms are vulnerable and, with the exception of one, did not react to the crisis because they lacked the means to do so.

2. Relationships between reaction and flexibility

Overall flexibility of farms is analyzed regarding three aspects: economic, technical and marketing, as set out in Table 1. "Low" and "high" levels are assessed by analyzing the combination of the different modalities of each category (i.e. technical, economic and marketing) of variables presented in chapter 2.

Table 1: Technical, economic and marketing flexibility qualified according to the identified groups of farms. Reaction or non-reaction to the beef industry crisis of winter 2000/2001

Group	Farms	Flexibility			Reaction to winter 2000/2001 crisis
		Technical	Economic	Marketing	
G1	**5, 6, 12 (14)**	High (natural regulation))	High	High	No except 14
G2	**7, 9**	High (zootechnical management)	Low	High	Yes
G3	**3, 10, 13**	Low	High	High	No except 3
G4	**8, 11**	High	High	High	Yes
G5	**1, 2, 4**	Low	Low	Low	No except 1

Confronting farm flexibility (versus non-flexibility) and farm reaction (versus non-reaction) regarding the crisis is an interesting exercise. Thus, when overall farm flexibility is either high or weak (Groups 1 and 5), no major reaction to the crisis was observed. In the first case, this absence of reaction can be put down to high ability to absorb shock without needing any specific measures to adapt. In the second case, this reflects on the contrary an incapacity to react. The case of two farms in Group 4, presenting high overall flexibility, and who reacted to the crisis, shows that the relationship is not systematic even though it can be explained[13].

[13] This can be illustrated by several examples: Farmers 7 and 8 decided to go into direct sales, even though their marketing flexibility is high. These are enterprising farmers who do not wait for problems to occur but anticipate them. Having acquired technical expertise (high technical flexibility of practices), henceforward they are aiming to acquire sales expertise. Farmers 9 and 11 reacted by increasing the proportion of fattening in order to maximize added value on site. These farmers had also acquired high technical expertise in farm management and the crisis endorsed their conversion to exclusive fattening. For farms 1 and 14, it appears that the changes (stalling construction, heifer fattening) were planned in any case, echoing the reactions displayed by farms 9 and 11. Farmer 3 is an opportunist, and reacts systematically. His reaction to the 2000/20001 crisis is therefore not singular.

Conclusion

This analysis of farm flexibility has revealed different combinations of technical, economic, marketing and structural factors. It provides information on the complementary and/or incompatible nature of certain technical and economic factors, and consequently on the choices made by livestock farmers. In some cases, presenting either a weak or lack of reaction to the crisis or the search for external solutions, a certain coherence or correlation exists between technical and economic flexibilities of farms. For "traditional" farmers, high technical or economic flexibility enabled them to cope unscathed with the crisis. In other cases, low flexibility compelled them either not to react, or react by seeking solutions outside the "production" aspect of the cattle farming system (versus marketing). Farms where incompatibility between high technical flexibility and weak economic flexibility was observed, reacted by modifying their production system.

We feel, on the basis of these preliminary results, that it is important to pursue this work by testing the pertinence of a livestock farm flexibility index which could combine some or all of the variables presented here, as well as others revealed by other surveys, currently under analysis, carried out in farms within the sample: i) task organization, ii) perception of the livestock farming profession, perception of the meaning of change for the farmer.

Short-term reactions to the crisis are not necessarily the sign of a satisfactory flexibility level for some farms and certain difficulties can be predicted for the farms in question in perpetuating their systems. However, these reactions are often the result of recommendations given by development stakeholders, anxious to help the farmers find solutions that they can implement rapidly. This result calls into question the way in which industry partners perceive and interpret the short-term reactions of farmers and *in fine* raises the question of sustainability for farms who, according to industry partners, set a "good example" by reacting. Since the sources of upset in general, including crises and uncertainty, are likely to increase, further research work in collaboration with different development organizations, will focus on the type of advice to implement and more generally, on the attitudes to adopt as suggested by this analysis.

Preliminary discussions have already taken place with development structures on the pertinence of the variables selected and their connection with farm flexibility. These connections need to be validated using a larger sample of farms, and so one research idea is to test them within a specific production system (calving, calving-fattening). These discussions open up a wider field of thought as to which farm estates should be encouraged to pursue the different farming systems explored, given that the capacity to adapt to uncertainty has become crucial, to the same extent as productivity, and represents a factor of efficiency in its own right.

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How to Model Work Organisation in Livestock Farms Implementing a Combination of Economic Activities?

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Abstract

The viability of mountain livestock farms often involves the implementation of combinations of economic activities (farming, farming diversification or services, non agricultural activities), which raises other problems, notably of work organisation. Starting i) from contributions to work analysis by livestock research and ergonomics ; ii) from 15 cases of livestock farms surveyed in the Northern Alps, we are seeking to model work organisation as a system of activities. For this, in reference to Knowledge Engineering, we formalise i) a model of the domain or ontology, which defines the concepts used (activities -task/workers entities-, relations between activities…) and their relations to each other ; ii) a model of reasoning to qualify forms of work organisation from the data of a case (who does what, when, where). Here we detail the approach at the scale of the period, an interval of time characterised by a particular form of work organisation. The study of the different forms of daily work organisation is the basis for the qualification. Three forms of work organisation at period level are described using case studies: a stable form of organisation over the period, a variable form on a day-by-day basis, a variable form according to a weekly rhythm. The identification of the factors playing on these forms of organisation adds to our understanding of them.

Key Words: work organisation, modelling, livestock farm, combination of economic activities

Introduction: sustainability of mountain farms and the challenges of modelling the work organisation in livestock systems

Many mountain farmers have developed systems based on combinations of activities: i) farming activities (one or more); ii) farming diversification or services associated with the farm; iii) non agricultural activities (employment in ski resort for example) (Blanchemanche, 2000). Such combinations are encouraged because they are seen by politicians as the way to sustain small farms. They do provide acceptable incomes for households, while settling a minimum of economic activities in rural areas, and allowing land to be maintained in the least productive areas (Laurent et al., 2000). However studies concerning these complex systems emphasize that their sustainability can be brought into question for reasons of work. If the duration of work is one of the first points touched, farmers discuss also problems of work organisation. Beyond the changing content of the farming tasks and workforce all over the year, the farming households express their difficulty in articulating within periods:

- tasks that follow different rhythms (daily, weekly, seasonal rhythm);
- tasks that are either imperative or able to be postponed at a later date (Dedieu et al., 1999);
- fluctuations in the composition of the work group, which could in no way be reduced to «farm worker units».

Analysing and qualifying the various forms of organisation implemented by farmers to face the different work situations during a year constitute an essential line of investigation into the sustainability of small

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farms. In this paper, we introduce the main elements of a qualitative modelling of *work activities systems* in livestock farms, we are working on. The purpose of the modelling is to serve as an exploratory tool with a view to integrating the « work organisation » dimension into diagnoses of the functioning of farm systems (specialised or not) and to help advisors in their accompanying of technical or organisational changes in farms. As the tasks to be done and the manpower are not the same all the year, our modelling must enable work organisation to be analysed taking into account the various forms of organisation per period. We will present and illustrate the modelling framework and results at the scale of a period of the year.

I- Modelling framework

The data used to construct our modelling come from two sources of information: fifteen cases of mountain livestock farms where we carried out surveys ; existing theoretical frameworks that we adjust to take account of the concrete work organisation in the cases studied.

1- Disciplinary contributions to work analysis

Work is studied by several disciplines (Dedieu and Servière, 2001). Our proposal places two of them in relation: livestock research into farming systems and ergonomics.

Livestock research into farming systems proposes a temporal characterisation of tasks and a cutting up of the farming year into periods

Echoing Valax (1986), livestock farming systems researchers consider that studying the temporal management of activities requires a typology of tasks not in relation to the nature of the work, but to their temporal characteristics. Dedieu et al. (2000) distinguish i) obligatory routine work (TA for "*travail d'astreinte*") - work that has to be done every day, repetitive from one day to the other, not easy to postpone or to concentrate, such as the daily care of animals (milking, feeding, cleaning out…); ii) seasonal work (TS for *travail de saison*), that can be postponed and/or concentrated over a given period, such as work in the fields, or handling animals…, iii) interstitial work that is defined as not imperative (it doesn't concern directly the management of the herd or of the land). Laurent et al. (2000) proposed an extension of this categorisation to other economic activities. This led them to specify that obligatory routine work, that by definition cannot be deferred, can be of two rhythm types : daily obligatory work (such as milking) has to be distinguished from non daily obligatory work (such as selling on the market twice a week).

To take account of the linking up of different work periods, associated with ways of organising plant and animal production cycles together, Dedieu et al. (2000) also propose to cut up the farming year with reference to obligatory routine work. A period is an interval of time for which the TA is of constant duration. Then the TS are positioned in the calendar, which situates periods of strong competition between tasks and specifies how combinations of farming tasks to be done at each period evolve.

Ergonomics places the activity at the centre of work analyses

Tasks take on a different meaning according to the context in which they are carried out. For example, the task of maintaining the farm areas is interstitial for some farmers: it is carried out when they have the time. It becomes a structuring feature of work organisation when farmers have hired a worker to carry out this function (Chabanet et al., 1999): slots in the worker's timetable are reserved for it. So for a same task content, the temporal characteristics allotted by the farmer differ because of the association he makes between the task to be carried out and the workers available. What is more, farming work is subject to hazard, notably climatic hazard and availability of manpower, causing frequent adjustments to the work organisation. This is why we were interested in ergonomics and especially i) in their concepts of work activity, system of activities, and regulation; ii) in representations of relations between activities.

The subject of ergonomics is how people function at work, with work analysis as its method. The theoretical foundations of work analysis are based on the distinction between: i) the task, which is the work to be done; ii) the activity, which is the work actually done. The non correspondence between the two comes from the intervention of an operator or a work team, who with their own characteristics, will adapt the work to be carried out to the situation (Leplat, 1994). Assuming this concept of activity enables us to understand how a combination of economic activities is implemented via a system of *work activities*[1] (Curie and Hajjar 1987), in other words, via a set of entities [task*team], relations between these entities and regulations. The relations between activities concern orders of priority, temporal orders (succession,…) at different scales of time. Regulation is considered as the making up of perturbations by the search of new balances. Benchekroun and Weill-Fassina (2000) differentiate regulations of an i) individual type: substituting one activity for another, postponing it, anticipating it, modifying the operating mode…; ii) inter-individual type: new distribution of tasks between individuals.

2- Modelling approach

Constructing a conceptual model

The purpose of modelling is to qualify forms of work organisation. From data of a livestock farm case, how do you take account of the way tasks and workers are linked all over a year? It is in fact a question of knowledge enabling such a representation to be constructed. Knowledge Engineering (KE) for action (Teulier and Girard, 2001) proposes «to construct a set of concepts, theories and tools to analyse and model human activity in a set of organisational arrangements». By mobilising KE, we propose a conceptual model that, from case studies, makes it possible to understand the diversity of forms of organisation, and make them intelligible by going further than just a simple description of the cases. The knowledge used is structured in i) a model of the domain or ontology which defines the concepts of the domain (here work organisation in livestock farming) and their relations ; ii) a model of reasoning which consists of defining the actions to be implemented to arrive at qualifying forms of work organisation from case study data.

Survey data

The principle of the survey was to collect data on work practices at the scale of a farming year. We proceeded in two phases. The first visit consisted of collecting information on i) the structure and present functioning of the farm, the other economic activities of the household, ii) the usual work practices: in general, who does what, where and when. Processing the data served to cut up the year into work periods. The objective of the second visit was to discuss with the farmer this cutting up and organisation by period, then to deal with variations in relation to these forms of organisation (which occur regularly enough to be integrated into the functioning). We took into account the activities associated with organisations internal to the farm system and to the family, or external organisations important enough to have an impact on the organisation of farming work at the scale of the period. The

[1] From now on, the terms activity and work activity, if not otherwise indicated, are meant in the ergonomist's sense.

observation units are, on the one hand, the farm system and on the other, the basic group and its combination of economic activities. The basic group corresponds to the members (the farmer, the couple, associates...) who organise the work on the farm. It is indispensable to know the combination of their economic activities to understand the work organisation of the farm, and their margin for manoeuvre, in order to define possible ways of development.

The survey is based on 15 cases of livestock farms (principally dairy cattle, but also sheep and goats) situated in Maurienne (French Northern Alps). They were chosen according to a hypothesis of diversity of cases in relation to combinations of economic activities and work groups (number of permanent workers, seasonal workforce...) (table 1). Our sample is considerably marked by pluriactivity, the use by the animals of summer mountain pasture, and by family participation that is still significant in the form of helping out.

Table 1: diversity of farms surveyed

Combined activities / Number of persons in the basic group	1	2	3 and over
One or more livestock activities (cattle, sheep, goats; milk, meat)	2	1	
Livestock activity (activities) and diversification or service activity (activities)	1	2	
Livestock and non farming activity (activities)	5	2	1
Livestock diversification and non farming activity (activities)		1	

II- Results: modelling work organisation at the scale of a period

1-Model of reasoning to qualify forms of work organisation of a period

The general approach for modelling work organisation at the scale of a period is based on 5 stages (figure 1). We focus here on elements that enable the way between stages 2 and 3 (identification of the forms of daily work organisation, delimitation of the periods) and stage 4 (qualification of the form of organisation of a period). That is to say we will present the concepts used to extract and analyse the different levels of organisation: from the activities to the forms of work organisation. The stage 4 will be presented through an illustration: three different types of work organisation met in farms during late spring. The stage 4’ (the identification of factors playing on the work organisation) will just be introduced.

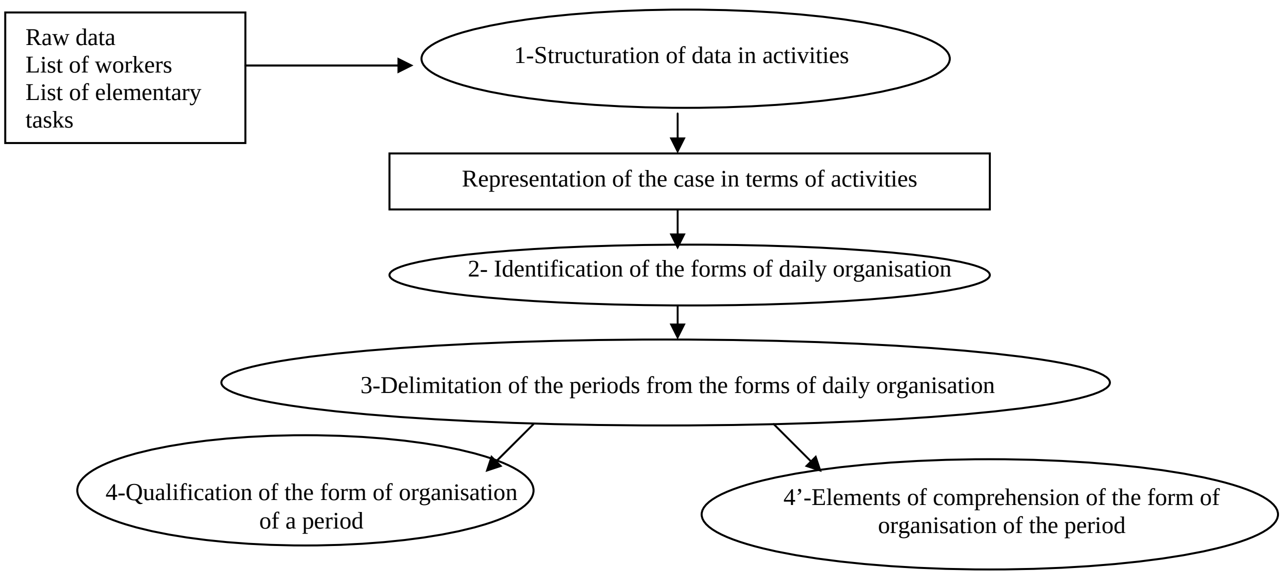

Figure 1: model of reasoning to qualify the form of work organisation of a period

2- Ontology relative to work organisation in livestock farms

2.1- The elementary concept: activity and relation between activities

The activities: characterisation by a task, a team of workers and a temporal characteristic

We define an activity as an association between a task, the team which has the responsibility for carrying it out and a temporal characteristic. The content of each task is specified from a list of elementary tasks. This list was constructed on the basis of the smallest common level of breaking the work down into tasks in the cases studied. As far as the work team is concerned, we specify the characteristics of the workers according to i) their type of involvement on the farm, as in Dedieu et al. (2000): the basic group, help (family or other), mutual help between farmers, employees, service providers; ii) their rhythm of involvement : i) permanent (the worker is present every day, except for days off, over the unit of time considered) ; ii) regular (he is present with a certain frequency (defined or not), but not daily). We note in particular weekly rhythms, such as the presence of children at weekends (WE); iii) occasional (this concerns people with no regular rhythm : asked for help or lending a hand). The type and rhythm of workforce involvement enable us to specify the profile of the work group and the type of help to which the basic group has recourse in the management of its system of activities.

To understand the systems of activities, we were led to specify the activities by the temporal characteristics of their tasks (table 2). The characteristics are the combination of different temporal critreria :

- the rhythm, daily or not. A daily rhythm refers to the repetitive nature of the task from one day to another, that cannot easily be concentrated. Here we find characteristics of the TA: care of animals, activity on a ski resort monopolising members of the work group every day;
- the character of being deferred. It can be expressed in the day (daily task whose completion time can be adjusted, such as monitoring batches of easily managed animals, for example), or in the period, over an interval limited by deadline dates (DD). The capacity for being deferred in the period expresses the possibility of putting off to another time a task even though all the conditions for carrying it out are right. For example, for certain farmers, haymaking, a non daily task (because dependent on the climate) cannot be put back: as soon as conditions are right, they do it. For others, it can be deferred : even if the conditions are right, they sometimes put it off to another day, because other tasks take priority, such as sorting and selling mountain pasture lambs, or they never work on Sundays and consequently will not mow on a Friday.
- the capacity for postponement to another period;
- the predictability of its positioning (in the day or in the period);
- the temporal extension: task of limited duration (the tasks correspond to occasional interventions which last one day or less) or task of an «interval» type (the tasks are spread over several days in a possible interval of work).

Table 2: types of activities according to the temporal characteristics of their task

<table>
<tr><td rowspan="3">daily task → daily activity (DA)</td><td colspan="3">the position of the task is fixed, and cannot be deferred in the day → fixed daily obligatory activity (e.g.: milking)</td></tr>
<tr><td colspan="2" rowspan="2">the position of the task is not « fixed » in the day</td><td>the position is free, can be deferred in the day → free daily obligatory activity (e.g.: taking water to animals in the paddock)</td></tr>
<tr><td>the occurrence of the task is not predictable and the task can't be deferred when the conditions are gathered → activity of a «fireman» type (e.g.: direct sale that varies with the presence and number of customers)</td></tr>
<tr><td rowspan="7">non daily task → non daily activity (NDA)</td><td rowspan="3">task of limited duration</td><td rowspan="2">repeated limited duration task</td><td>repeated limited duration task that cannot be deferred in the period→ non daily obligatory activity (e.g.: work in the resort 5 days/week)</td></tr>
<tr><td>repeated limited duration task that can be deferred in the period → activity of a «repeated manipulation» type (e.g.: visit to animals in mountain pastures once/week)</td></tr>
<tr><td colspan="2">single limited duration task → activity of a «manipulation» type (e.g.: prophylaxis)</td></tr>
<tr><td rowspan="4">task of an interval type</td><td colspan="2">defined start and finishing deadline dates (DD), and during this interval: accomplishment of the task to its completion. Task that cannot be postponed → activity of a «worksite» type (e.g.: spreading work)</td></tr>
<tr><td colspan="2">defined start DD from which accomplishment of the task to its end. Task that cannot be postponed → activity of a «harvest» type (e.g.: hay-making, harvest)</td></tr>
<tr><td colspan="2">accomplishment of the task to its completion before a defined finishing DD. Task that cannot be postponed → activity of a « preparation » type (e.g.: preparation of paddocks, equipment…)</td></tr>
<tr><td colspan="2">start and finishing DD and during this interval, the farmer accomplishes what he can of the task. Task that can be postponed to another period → activity of a «maintenance» type (e.g.: harrowing fields, clearing scrub)</td></tr>
</table>

The examples are indications only. They do not imply that the spreading task, for example, is always of a "worksite" type, it can also be of a "maintenance" type in some farms…

The relations between activities

To understand how a combination of economic activities is implemented, the structuring of the activities must be explicitly taken into account. Among the relations between activities, we distinguish, according to Javaux (1996), orders of priority between activities; relations of a temporal order. To understand the structuring of activities with different rhythms, we specify these relations at a daily scale and at the scale of the whole period. They can also be unspecified (boxed text 1).

Boxed text 1: relations between activities **(x, y, z)**

Daily relations

Subordination: y takes place at the time left available by x;
Interstice: if there is some time left on some days, once x has been done, then y is done;
Parallel working: x takes place at the same time as y;

relations at the scale of the period

succession: y follows x as the period progresses ;
conditional connection (CC) : in defined conditions x is implemented, otherwise y. The CC enable alternative ways of carrying out the tasks to be specified. They are often associated with the climate;
priority: x takes priority over y in the period;
interruption: x becomes a priority over y and z when the conditions are right for its being carried out. Its implementation interrupts y and z for the day, or defers y and z in the day.

Unspecified relations: no order of priority or temporal order is specified

These relations enable priorities between activities to be specified. For example, if a farmer works in a resort in the winter and is subject to set hours, then the farming activities in which he is involved take place in the time slot left available by the skiing activity. In other words, the farmer will take care of the animals before and after the skiing: the farming activity is subordinate to the skiing activity. Other farmers are free in the organisation of the resort activity at a daily scale (e.g.: packing down the slopes when it has snowed), in this case it is the non farming activity that is subordinate to the farming activities.

The characterisation of the system of activities is not based just on the technical viewpoint

The activities and the relations between them depend on the way the farmers see them. Our goal, starting from the farmer's expression on who does what, is to identify the specific features of his system of activities. The allocation by a farmer of temporal characteristics to his activities and relations between them translates the way he positions an activity (manages time and constraints) in his system of activities. This represents the importance of each task in his eyes (which tasks are daily, which tasks he accepts to delegate, postpone, order of priorities...), in association with the workforce available and its characteristics. So an activity is not defined a priori, it is determined in each case from what the farmer says.

2.2- The concepts at the different levels of organisation: from the activities to the forms of work organisation of a period

The forms of daily work organisation

To express the temporal management of activities, especially the articulation between daily (DA) and non daily activities (NDA), we consider the daily scale as an elementary scale of work organisation. Each day leads to a particular combination of activities according to the meteo, the present workers and the tasks to be done. We call *form of daily organisation* (FDO), a synthesis of several possible daily combinations of activities in which the DA and the relations between DA and NDA are the same whereas the NDA can vary (figure 2).

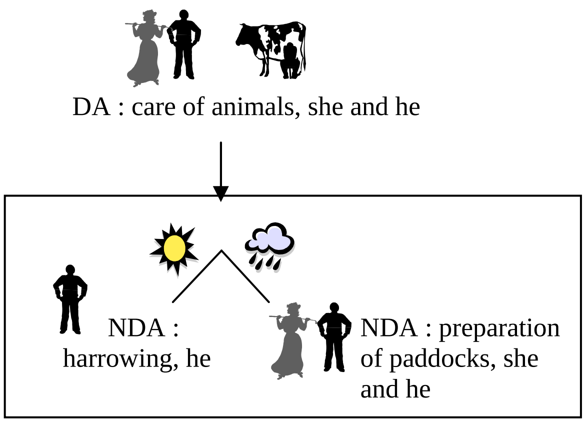

Figure 2: two daily combination of activities for a same FDO

In this example, there are two possible daily combinations of activities: when it's sunny and when it's rainy.

In each case, the form of the DA is the same, and the NDA are subordinate to the DA. Thus, we represent these two combinations in a single FDO.

Thus, there are as many FDO as different forms of DA (described by their task, team and temporal characteristics) and relations between DA and NDA.

Alternation of FDO

Within a same interval of time of the year, several FDO can alternate. Two basic rhythms of alternation between FDO have been identified:

- *a day-by-day rhythm*. This case is linked with the implementation of particular activities which result in modifying the form of daily activities and their arrangement. For example, if it's sunny a worker carries out in priority non daily tasks in the fields whereas he participates in DA (care of animals) when it's rainy and can't go in the fields.
- *a weekly rhythm*. Daily activities can take different forms depending on the days of a week in relation to: i) the intervention of regular workers on daily activities (children at WE for example). Their presence brings about a redistribution of tasks and therefore a redefinition of daily activities; ii) the occurrence of non daily obligatory routine activities (work in a ski resort in winter 5 days/week for example), modifying the daily activities.

The different forms of organisation are our expression of *regulations*. Indeed, the livestock farmers adapt their organisation to face the different work situations of the period (tasks to be done, present workers, meteo…). It exists other regulations that are more occasional, of an «exceptional» nature (punctual absence of workers, fluctuations in the conditions for carrying out tasks…), but they are not taken into account in the qualification of the work organisation at this stage of the study.

The periods: characterisation by a combination of FDO

Over an interval of time, the FDO can be superimposed if they alternate with a day-by-day or weekly rhythm, or they can follow each other (one FDO when the animals are inside then another FDO when they are outside). A *work* period is an interval of time, characterized by a single FDO or several FDO alternating on a day-by-day or weekly basis (figure 3).

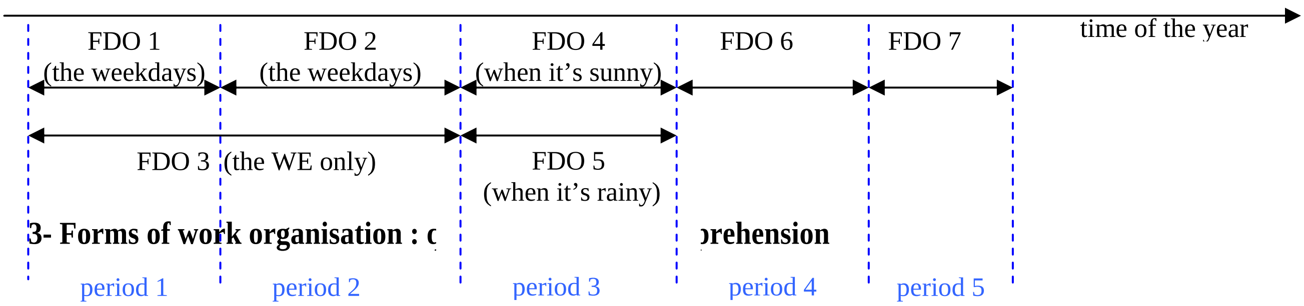

Figure 3: delimitation of the periods

3.1-Qualification of forms of work organisation in three farms at the scale of a period

The alternation of FDO is one of the terms for the qualification of work organisation at the scale of a period. The way the work is divided and coordinated into subsets of activities is another one, which won't be detailed here. According to the number of FDO and their rhythm of alternation (in the case there are several FDO in a period), different types of work organisation can be defined: i) *a stable form of organisation over the period* when the period corresponds to a single FDO ; ii) a *variable form of organisation in the period* when the period corresponds to several FDO alternating (on a day-by-day or weekly basis).

We illustrate below three different work organisations set up by farmers at a same period (late spring).

A stable form of organisation over the period

The daily organisation is founded on the same principle over the whole period (one single FDO). The organisation changes with the change of period (boxed text 2).

Boxed text 2: a FDO stable in the period – case of JCG
For this farmer, producing milk all year round with 20 dairy cows (VL) in the Beaufort area, the tasks to be done from mid May to mid June consists of caring of the animals outside, keeping on with work on the land areas, while preparing the summer mountain pasture and hay making, and also collecting milk every day for the cooperative on his sector (1 to 2h every morning). This farmer benefits from the help of his mother, permanent in this period, to milk the VL in the animal housing. For daily travels of animals and other tasks he is alone. For significant animal travels, he tries to wait for the WE to have help from his nephew or his sisters. The daily organisation of activities is stable over the whole period (one single FDO): he milks with his mother, then takes the VL to the paddock and goes to collect the milk. Before the evening milking (when his mother is present again) and depending on the weather, he carries out work, mechanised (end of spreading, harrow around the alpine chalet…) or not (preparation of fields, of the alpine chalet, of the hay-making equipment…). Occasional regulations can occur concerning situations when he is behind with his work, solved by postponing tasks between periods.

In the case of JCG, *the occurrence of non daily activities is always subordinate in this period to the unfolding of the daily activities.* If there are regulations, they are of the occasional type (but they are not integrated in the qualification).

A variable form of organisation in the period on a day-by-day basis

Several FDO alternate in the period, linked with the setting up of particular activities which cause the form of daily activities to be modified. The daily organisation is subject to conditions, in other words it is defined from one day to another (boxed text 3).

Boxed text 3: two FDO alternate according to weather conditions – case of LV
For this farmer, the only member of the basic group, who produces milk all year round with 30 VL, we find the same tasks to be done, from late May to late June, than in the previous case (minus the milk collection round): care of the animals outdoors, while carrying out work on the land areas, and preparing hay and summer mountain pasture. At this period, the farmer benefits from the permanent presence of his brother, and with whom he is interchangeable. LV reserves 2 tasks for himself: preparing the high pastures, because he will be there in the summer, and the transport of manure he gives to the owners of fields he uses. One FDO is when LV is busy with the daily tasks around the herd with his brother. In the time left available, non daily tasks take place, which they carry out together or separately according to the nature of the task. Another FDO is defined when the brother carries out work on the fields: slurry spreading, harrowing… In these cases, LV deals with the daily work alone and with his brother's herd (slaughter cattle and goats). In other words, according to the conditions of the day (suitable or not for spreading…) the organisation of daily activities varies.

In the case of LV, there are two FDO: one form corresponds to a division of work between the daily tasks (including at the brother's) carried out by LV and the work on the fields carried out by his brother. The other form (when the work outside is not possible) is that they work together for the daily tasks and share out the rest. The alternation between these two forms is linked to weather conditions. *The definition of daily activities is dependent on the occurrence of non daily activities.*

A variable form of organisation in the period according to a weekly rhythm

Several FDO alternate in the week, in association with the presence of regular help on a weekly rhythm (boxed text 4) or with the occurrence of non daily obligatory activities.

Boxed text 4: two FDO alternate in the week because of the presence of children at WE – case of the JD and VD couple

With this couple of farmers, producing milk all year round with 50 VL, goat's milk cheeses with 30 goats and high pasture lambs with 100 ewes, the tasks to be done from mid May to mid June are similar to the previous case : care of the animals outdoors (except that there are three herds), with in addition the making and sale of goat's cheeses, while carrying out work on the fields, and preparing for the period of summer mountain pastures and hay making. The tasks are distributed differently according to the farming units. They carry out together the care of the VL and goats, but he (JD) looks after the ewes and she (VD) makes the cheeses and sells them. JD can do everything on the farm, whereas his wife cannot milk the VL alone and she does not drive the tractors, so it is he who sees the tasks on the land areas. They also benefit from the help of their children at the WE. The children are not able to do everything. The son can carry out work on the fields and look after the VL, the daughter works more with the goats. As soon as they arrive on the Friday evening, the work organisation is changed. She sees to the goats and cheese with her daughter. He looks after the VL with his son, and they divide out the rest. JD will see to everything concerning the herds and his son the fields. All the same, JD reserves for himself the work with slopes and the spreading of fertiliser for the commune. Thus, the daily organisation of activities varies according to the time of week. Certain tasks requiring manpower are carried out preferably at WE when the children are there. If they cannot wait for the WE, like sometimes the change of paddocks for the VL, then the task is carried out during the week, which requires another organisation solution, which correspond to an occasional regulation: JD and VD call on neighbours for help.

In the FDO of the week JD and VD carry out a group of activities together and each one has activities reserved. In the FDO of the WE a division of the work operates between men and women. *The definition of daily activities is dependent on the weekly rhythm of presence of regular workers.*

3.2-Elements of comprehension of the form of organisation

The system of activities of a period is our way of representing the organisation produced by a set of decisions taken by livestock farmers. They also express : i) the way in which the farmer has « negotiated » the constraints on the long term for carrying out the activities ; ii) the possibilities for the farmer to mobilise a network of help and to delegate tasks to others. It is interesting to identify these factors, and establish their relations with the forms of work organisation observed. The factors can be linked with the social environment (workforce, family, group farming organisations…); to biological cycles, to weather conditions; to the buildings and equipments; to contractual commitments. What is more, the farmer can fix constraints for himself (dates, preferred times for carrying out certain tasks).

For example, in the case of JD and VD, there is a constraint on the time of milking the cows due to the milk collection system. Thus they deal with the cows before the goats since they do the cheese themselves and are free with it. Other constraints associated with the social environment concerning carrying out a task for others, whether the owners for LV or the commune for JD, are translated by the fact that the corresponding task is reserved for the farmer himself, while the same task, when it is for the farm, can be carried out respectively by the brother or the son.

Discussion - conclusion

The pursuit of this modelling approach is in progress and concerns two aspects:

- to qualify work organisation at the scale of the period, not only in relation to the alternation of FDO, but also in relation to the division and co-ordination of activities;
- to qualify work organisation at the scale of the agricultural year, on the basis of the periods and their linking up.

The prospect for this work is that it may serve as a basis for considerations about technical or organisational changes, and their consequences on work organisation. For this we have chosen to situate ourselves where [the farm and the farming work group] meet [the households and their combinations of economic activities]. Then we were led to propose an ontology of work organisation in livestock farming and a model of reasoning. This makes it possible to take account of farming activities and the other activities in the same way, and allows us to treat the capacities for evolution of livestock farms involved in complex systems of activities.

In the case of modification of the combination of economic activities or of the work group, as for the adaptation of livestock management to the issue of sustainability, the approach of transformations in the work organisation could be identical. It would be a question of determining i) in what way the delimitation and expression of each period is modified ; ii) in what way the forms of daily organisation risk being disturbed in their content (the activities and the relations between activities) and in their occurrence.

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WORKSHOP 3

Natural resources management and farm functions in landscape construction

Towards multi-functional agriculture – what motivates German farmers to realise biodiversity conservation?

A. Knierim and R. Siebert*

Abstract

Multifunctional agriculture is a political concept used to validate the farmers' services for society. With regard to the provision of ecological goods through biodiversity conservation and enhancement, factors influencing the farmers' participation in the respective policy measures are investigated. Results of a desk study show that German farmers participate in biodiversity-related agri-environmental measures mainly for economic reasons. However, long-term farm viability and farm development plans play a considerable role in the farmers' decision-making. Under these considerations family values and a stewardship attitude towards the land are taken into account. The activities of neighbours and peers are usually closely watched and – in the case of successful policy adoption – serve as a guiding example.
However, especially in the case of biodiversity protection via regulation and restriction, opposition is strong among farmers and diverse fears are forwarded. Successful policy approaches stand out for their interactive design and their regional flexibility.

If biodiversity conservation on agricultural land shall be strengthened, not only economic incentives have to be developed. The fundamental discrepancy between farmers' self-perception as 'the best nature conservationists' and the actual effects of farming practices has to be overcome in a dialogue both at the individual level and at the societal level via appropriate policy programmes and procedures.

1 Introduction

In the EU common agricultural policy (CAP), there has been, over decades, a joint understanding that food production is agriculture's most prominent destination. This main-stream discourse has coined policy making in the agricultural sector until the eighties, focusing nearly all measures and most of the expenditures on food production. With the emerging awareness of environmental problems caused by agricultural practices in the nineteen eighties, this focus widened. Thus, environmental protective goals and also structural support for rural areas were incorporated by means of the so-called accompanying measures (regulation EEC 2078/92). This shift was accompanied by the development of the concept for a multi-functional agriculture which had been adopted – although with differing accents and perspectives - by several international institutions such as the FAO, the OECD or the European Union (cf. reg. EEC 1257/99) (Wiggering et al. 2003:8ff).

The OECD concept considers multi-functionality of agriculture mainly under the economic perspective of the provision of goods. Here, the still not satisfyingly solved problem of the market integration of externalities and public goods is of major concern (OECD 2001:13). However, this approach is considered as 'narrow' with regard to e.g. social services provided by agriculture for a sustainable regional development (Barkmann et al. 2003:20). In the FAO perspective, the focus is not only on different functions of agriculture, but 'land' is mentioned explicitly as a second basis for multi-

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functionality. Thus, it is not only by human activity but in combination with a given resource basis that goods and services (here: functions) are provided (FAO 2000). From the European Union viewpoint, the multi-functionality of agriculture concept fits into two purposes: its application supports the negotiations at WTO level, where subsidies of agricultural land users have to be justified, and it legitimises these financial transfers also at the national level with regard to tax payers.

One of the services warranting financial support to farmers is the maintenance and enhancement of biodiversity in the landscape (part of the ecological function). In Germany, the ‘reward of ecological services’ provided by farmers is a widely discussed issue among natural scientists and economists (e.g. Knauer 1988; Rat für Landschaftspflege 2000; Hampicke 2001) and at the political level (e.g. Güthler 2001). It is commonly supposed that the identification of appropriate ecological indicators and the development of political institutions, preferably markets, will lead to the internalisation of negative ecological effects and the provision of the desired ecological goods. These assumptions are obviously based on the idea that economic incentives are the best choice prompting farmers to do something for biodiversity and that the best regulatory means will be the establishment of an appropriate market. First political steps in this direction have been taken by the introduction of biodiversity-oriented agri-environmental measures in the frame of EEC 2078/92 and EEC 1257/99.

In Germany, it is generally measures or activities of farmers for the enhancement of biodiversity that are rewarded. The principle of ‘rewarding services’ (outcomes or products) within agri-environmental policies has only been implemented so far in one federal *land* (Baden-Württemberg). Hence, we do not yet have examples of how this new concept is perceived, accepted and adopted by farmers. However, any discussion about the possibility of providing more public funds to reward ecological services or the production of ecological goods by farmers has to start with an evaluation of the experience gathered in this field. What do we know about the factors motivating farmers to participate in biodiversity conservation schemes and to foster wildlife and landscape protection?

It is generally accepted that profit maximisation most strongly determines decision-making by farmers (cf. e.g. Ahrens et al. 2000). As a consequence, policies based on this assumption are conceived predominantly as an economic incentive. In the following this assumption is challenged and a wider perspective is adopted in order to identify additional influencing and determining factors.

2 What are the factors influencing farmers’ consideration for biodiversity protection?

The intention of the IFSA workshop N° 3 is to discuss the farmers’ role and contribution in natural resources management against the background of a multifunctional agriculture. As scientists from various disciplines assemble, there is a need to develop a common language and a framework expected to support the process of building interdisciplinary communication and understanding. Before presenting results of a broadly framed, interdisciplinary desk study[1], we propose, as a first step, to reflect on the research preconditions. “Nothing is more fundamental in setting our research agenda and in forming our research methods than our view of the nature of the human beings whose behaviour we are studying.” (Simon 1985:303 quoted in Williamson 2000:600) Actually, the research findings have to be interpreted on the basis of the underlying concepts of human behaviour. Under a constructivist paradigm of

1 The project BIOfACT “Assessing factors that affect farmers’ willingness and ability to co-operate with biodiversity polices” is carried out by a scientific team uniting members from the Netherlands, Finland, UK, Spain, Hungary and Germany in the frame of the 5th EU research framework , key action 5 (cf. www.ecnc.nl/doc/projects/biofact/index.html). In the here presented paper, some results of the German project team are included.

knowledge generation and dissemination, we acknowledge that our notion of human beings is a consequence of our explanatory concepts, in this case of human behaviour (Glasersfeld 1992:29ff). Economics, sociology, psychology and further related social sciences make use of several concepts and theories encompassing a variety of factors that are decisive for human behaviour. Therefore, an exchange and an adjustment of the existing presumptions needs to be possible. Thus, it is important to have a joint framework that allows the integration of different theories and concepts.

For the analysis of the available publications on biodiversity protection and enhancement by farmers, which necessarily stem from different disciplines based on diverging theoretical concepts, a broad heuristic framework had to be developed. The here presented framework unites four key issues which comprise (i) farmers actual behaviour, (ii) acceptance and adoption of policies, (iii) policy instruments and political actors and (iv) the societal environment (cf. figure 1). Farmers' actual behaviour is shaped by both their willingness, meaning their internal disposition, as well as their ability to implement measures, which is a consequence of (more) objectively assessable conditions and requirements. This behaviour is expressed in the form of co-operation with or acceptance of specific policies that are promoted by different institutional actors. Policy adoption occurs within and is influenced by a given societal environment, consisting of a particular political and economic climate and socio-cultural habits, norms and rules. The societal environment can be divided into a micro-level - the immediate social surroundings - a meso-level - for example, the community or a professional association etc. - and the macro-level - that is, legall, political and socio-cultural framing conditions. Adoption of and co-operation with policies may, in turn, lead to results such as uptake, attitudinal change and environmental benefits etc. with respect to the conservation of biodiversity, habitats, landscapes and wildlife.

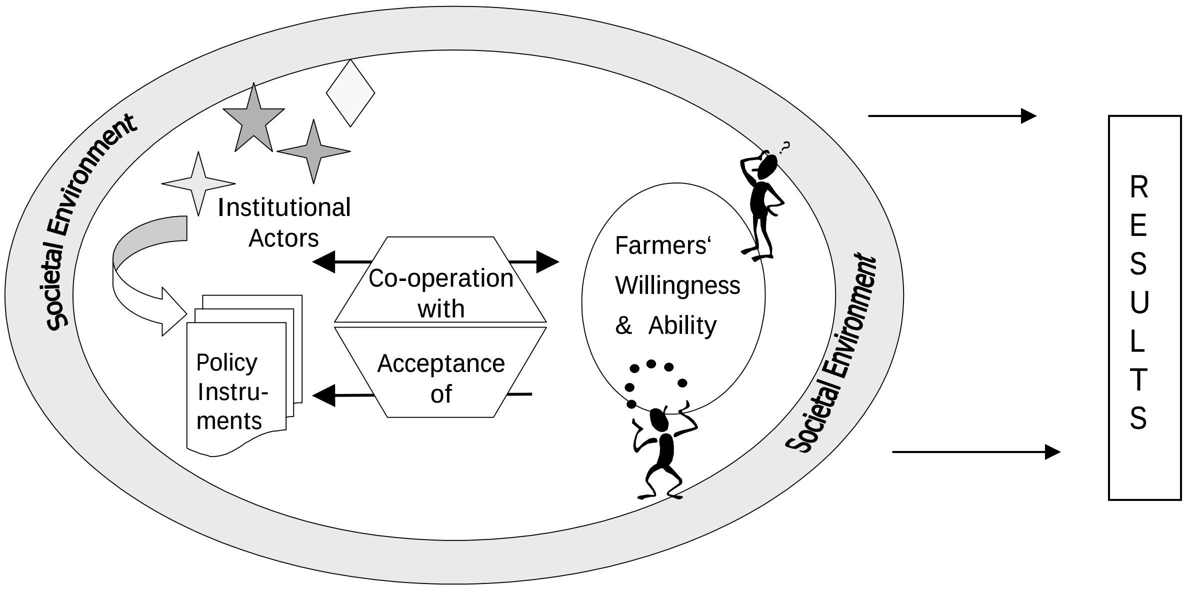

Figure 1: The key issues in the conceptual framework

The challenge of integrating research results from various disciplines therefore consists in the aggregation and valuation of such diverse information. The study presented here attempts to assemble information on the above mentioned key issues in a qualitative way and to develop contrasting and conclusive images of farmers (chapter 2.3 and 2.6). A discussion of the implications of these images and conclusions are presented in chapter 3.

2.1 Structural preconditions

What do we know about German farmers who participate in biodiversity enhancing programmes and measures? Are there specific farm conditions or personal characteristics of the farmer that shape a positive disposition for the adoption of these schemes and measures? Recently, a tendency has been observed that full-time, large modern farms participate rather than part-time, small-scale or declining farms (Kazenwadel et al. 1998; Weis et al. 2000). Still in the mid- nineties, the contrary observation had been made by Nolten (1997:81). While these findings result from studies at regional level, there is a representative national study about the adoption of agri-environmental measures. That study revealed that these measures are mainly adopted in regions of relative extensive land use by agriculture (Osterburg 2001). This is in line with comparative studies across European countries (Buller 2000). Summarising the findings, Osterburg (2001: 18ff) asserted that between1989/90 and 1998/99:

- Participating farms increased their grassland area comparatively more than non-participants;[2] consequently, livestock density was declining more strongly in participating farms.
- Milk production per hectare (not per cow!) increased less or dropped in participating farms.
- Cereal yields per hectare increased less in participating farms than in non-participating ones.
- Expenditures for fertilizers were generally going down, but more so in participating farms. While expenditures for pesticides were found to decrease in participating farms, they were increasing in non-participating farms.

Decisive structural characteristics of farmers, enabling them specifically to participate in biodiversity enhancing measures, have not been confirmed by research. In particular, there was no clear correlation between age and participation. Age made no difference, according to Kazenwadel et al. (1998), but younger farmers were more open to biotope-related measures and to landscape care than farmers older than 50 years (cf. Lettmann 1995). Similarly, formation did not prove to be an unambiguous indicator of participation: Nolten (1997) found among farmers participating in nature conservation measures fewer people with a higher professional formation than among non-participants (33% to 50%) and, on average, more with a higher age (55% with 45 years and above, while 54% of non-participants were younger than 45 years).

With respect to the questions raised above, there is no evidence that German farmers' willingness to participate in biodiversity-enhancing measures is related to structural personal characteristics. Likewise, there is no information if the natural conditions themselves play an influencing role (e.g. if farmers with aa high degree of biodiversity on their land are more sensitive and positive to biodiversity protection and enhancement). However, farm type and structure play a role and here a change seems to have occurred: While in the early nineties these measures were considered as support to a smooth ending of the farm, it is now considered by some as a promising strategy.

2.2 Interests, values and norms

What do we know about the farmers' personal attitude and willingness? Without doubt, the prime factor for farmers to adopt a policy measure aiming at the protection of biodiversity is the economic incentive. The analysis showed that economic interests are of eminent importance when farmers think about participation in environment and biodiversity enhancing measures. However, it has to be noted that economic interests are expressed in various terms, such as profit maximisation, long-term farm viability and / or risk minimisation (Schramek et al. 1999a; Lettmann 1995; Lütz and Bastian 2000; Weis et al.

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[2] This differs from data in North Rhine-Westphalia, where farms participating in nature preservation and conservation measures increased their grassland less than non-participating between 1985 and 1993 (Nolten 1997:81).

2000). Another decisive criterion for the judgement of a measure is finding out whether it fits into one's own farm development plans (Lettmann 1995:98; Weis et al. 2000). Although economic reasons are mostly put forward in interviews, they are accompanied – provided that the interview techniques allows so – by other reasons and explanations. E.g. ecological arguments like the 'wish to promote environmental conservation' are endorsed (Schramek et al. 1999b:27ff) or 'maintenance or improvement of the natural environment' (Drake et al. 1999:99) are supported. And equally, social reasons often play a role in the decision making process, such as keeping the farm for future generations. Hence, it is frequently a combination of interests that we observe when investigating farmers' decisions and behaviour.

However, not only concrete interests seem to be relevant for the farmers' attitude regarding nature conservation. Studying farmers' self-perception, there are two contradicting observations: farmers see themselves as 'the best nature conservationists', as 'protectors of the land', but at the same time, they feel to be the scapegoat in the public opinion because of negative environmental impacts of agricultural land use (Oberbeck and Oppermann 1994; Retter et al. 2002). Several studies confirm that this self-perception as a victim has been persisting over the last decade (Schur 1990; Pongratz 1992; Retter et al. 2002), which leads rather to a defensive attitude of farmers (Oberbeck and Oppermann 1994:265 name it 'deep injuries, depressions and bitterness') than to a pro-active strive for more social recognition. Still in the late nineties, farmers predominantly have seen themselves as food producers, linked to a positive attitude towards the (regionally prevalent) extensive land use system. However, this attitude does not imply a positive appreciation of nature conservation in general! Unalterably, farmers see themselves in a defensive position because of a critical public image (inducing fears to subsist - 'Existenzängste') and they link nature conservation usually with restrictions, interdictions and limitations of farming activities (Retter et al. 2002).

2.3 A static picture from the individual level

The overall static image we obtain when summarising findings at individual level, is that of a man (for we have no gender-differentiated results), who gears his decisions to the economic viability and profit of his farm. There is no indication that biodiversity as such is of special interest nor that ecological values act as activity-guiding factors. However, it becomes also clear that the farmers' decision-making frequently involves more than one reason or one interest – i.e. social as well as ecological values are taken into consideration when opting for a new farming practice. Thus, the initial assumption, i.e. questioning the single-factor determination of the farmers´ behaviour can be endorsed by several examples. The phenomenon of combined interests as influencing factors is also called 'polytely of human action', a psychological concept for environmentally relevant decision-making (Lantermann 1999:9ff).

Directing the research perspective to the individual level, we found an economy-oriented reasoning to dominate which is usually embedded in multi-factorial strategic logics and influenced by an emotionally loaded self-perception. Looking from a more sociology-oriented point of view, based on social systems concepts, we find several results corroborating social interaction as influencing factor.

2.4 Social interaction

According to farmers' own statements, direct contact and interaction with family members, friends and colleagues have a clear influence on the farmers' decision-making process. Neighbours and colleagues are usually closely observed and their farming practices are continuously watched and judged (Retter et al. 2002). Thus, a kind of 'common sense agriculture' is established at village level in the course of time – which might support or prevent a community-level trend towards a more biodiversity-friendly agricultural practice. Farmers name their family members (Wehinger et al. 2002) or peers and friends (Drake et al. 1999) as the most important people whose opinion or behaviour is taken into account. Luz (1994:195) found that a negative quality of the relationship between farmers and non-agricultural villagers had a bad impact on farmers' attitude towards agri-environmental services. A major role in this is assumed by local public actors such as mayors etc. whose opinion serve as a public reference system (Oppermann et al. 1997:38ff). Their positive or negative attitude fosters or hinders the project development and the energies committed.

But the role official advisors and extension agents play, should not be underestimated either. The influence of advisors or those in charge of the programme as social partners on the farmers' acceptance of a measure had been underlined by a series of publications (Luz 1994; Mantau 1999; Mährlein 1993a/b; Nolten 1997; Weis et al. 2000). This influence depends on

- The confidence and understanding established between the advisor and the farmer (Weis et al. 2000);
- The advisor's ability to adapt information and measures to the special conditions and requirements at farm level ('flexibility in programme application' Nolten 1997:193; Weis et al. 2000:113ff); and
- The ability 'to translate' the landscape protection objectives into practicable, economically reasonable agricultural activities (Holst 2001; Luz 1994: 205; Lütz and Bastian 2000; Oppermann et al. 1997).

However, the advisory people do have a negative impact when farmers perceive deficits and paternalism in the communication, e.g. with representatives of environmental programmes (Mährlein 1993a/b; Heiland 1999). This observation has already transcended the individual relations and there is an extended foe image among farmers at a corporate level of the environmental authorities. Normally, this image has to be overcome before the individual actor is open for interaction at a partnership level. As a whole, the effects of direct social interaction can go either way, they may promote the farmers' approval of biodiversity enhancing measures, likewise they may reinforce their opposition and resistance.

2.5 Policy Design and Implementation

Lettmann (1995) summarises his results on biodiversity related policy acceptance among farmers as follows: the striking factor for farmers' acceptance of policy instruments is the voluntariness of participation. This observation is corroborated by the results Schramek et al. (1999) obtained in two Hessian regions. They revealed the farmers' preference for voluntary measures supported by financial incentives. Both findings are valid for agri-environmental measures, aiming at nature and environmental protection via extensification.

Mährlein (1993a), discussing with farmers, was surprised of the multitude of non-economic reasons forwarded for both options, participation or non-participation in grassland extensification measures. The fear of losing the land ('expropriation') was one of the strongest arguments against co-operation with nature conservation agencies in protected areas. With those who are farming land inside protected areas, Mährlein (1999a:184ff) investigated preferences regarding compensation options. He found out that 63% of the interviewees preferred to sell restricted areas if substitute lands were offered. Two thirds of these farmers would like to rent their former land and to tend it under restrictions. Others ranked compensation options lower, including the distribution of milk quotas and regular compensation payments. The question if flat-rate or farm specific compensation payments should be made, was dealt by farmers with political wits and social consciousness: a majority voted for flat-rate because unequal and intransparent calculations when distributing the milk quota had caused envy and irritations among farmers at village level. The inequality of the farmers' involvement with restrictions in nature protection areas was considered as a similar situation.

Several studies at regional level show that the top-down introduction of nature protection by the establishment of protected areas (national parks, biosphere reserves, FFH-areas etc.) cause usually resistance and protests among the concerned land users (Stoll 1999; Knierim 2001; Rentsch 1988; Siebert und Knierim 1999). Even though there is a legally defined process of public and organised participation when selected protected areas are to be established, this does usually not meet the people‘s concerns and expectations. It can be summarised that a top-down approach does not offer a basis for the farmers' acceptance and co-operation. In contrast, if a dialogue is opened in which people representing nature conservation aims enter into a co-operation and negotiation process about biodiversity conservation on equal terms, satisfying results can be obtained. Examples are available at regional level from Brandenburg, e.g.

- a land user working group in a biosphere reserve resolving grassland use conflicts (Knierim 2003)
- round tables of land use stakeholders for the regional adjustment of agri-environmental programmes (Arzt et al. 2002)
- single farm co-operation to promote biodiversity protection on set-aside farm land (internal field segregation – Berger et al. 2002).

2.6 A dynamic concept of farmers' behaviour

Integrating the findings concerning social interaction and policy design and implementation, induces us to develop a dynamic image of farmers: they adjust their decisions also to those taken by other farmers and might get convinced by friends or peers. Communication during an innovation adoption or policy development and implementation process plays a major role in farmers' decision-making process (cf. figure 2). In particular, biodiversity conservation needs clearly more efforts from officials and extension agents in terms of explanation and promotion than agri-environmental measures. By this way, farmers can be convinced by a rather non-committal attitude to active participation. Especially joint processes of environmental and agricultural stakeholders for the development of biodiversity enhancing measures have promising features.

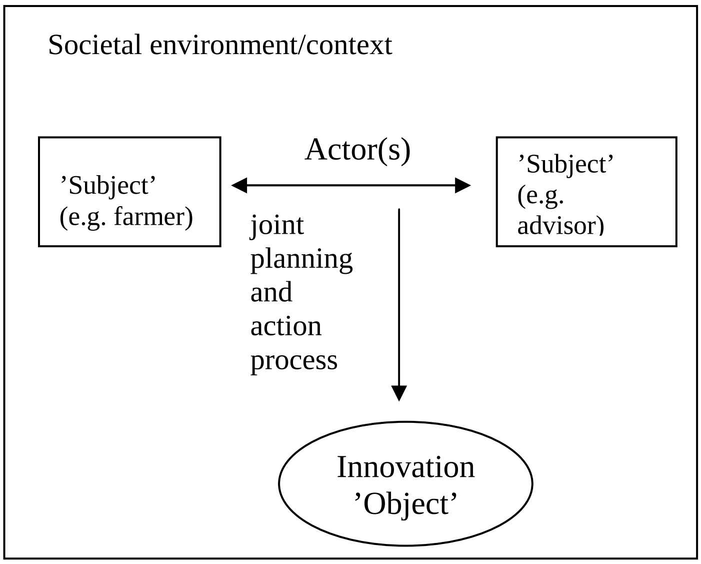

Figure 2: The co-operative approach of policy development and implementation

At a methodological level, this dynamic concept somehow questions and challenges the formerly developed static image: If biodiversity conservation by farmers is conceptualised as an interactive, co-operative process, than knowledge about typologies or common characteristics of farmers are of low importance because it is assumed that farmers might change their mind during the co-operation process and might become active partners. Hence, this approach requires scientific instruments and tools for a long-term monitoring and evaluation study of social, economic and ecological processes.

3 Multifunctional agriculture needs the 'pro-active' farmer

Both, the OECD as well as the EU concepts of multifunctional agriculture have in common that the provision of agricultural non-food products shall be promoted by valuation and remuneration. The preferred means from a governance point of view to reach this objective is the creation of markets or quasi-markets (Hampicke 2001). The inherent assumption says that utility-optimising farmers will perceive their opportunities on the market and discover or create biodiversity goods which can be produced and "sold" with a financial gain. The above presented findings on farmers' typical behaviour do not reveal a corresponding attitude. On the contrary, farmers' self-perception with respect to nature conservation in general is ambiguous and often not very realistic.

These mental barriers have to be overcome before farmers will be in the position to actively use and profit from the chances of a multifunctional agricultural land use. Obviously, the so far implemented policies in this field of action did not contribute substantially to raise farmers' interest in, and concern for biodiversity enhancement. How can this be done in future? From organisational development, we know that reluctance to behavioural change is often an expression of fears, anxieties und vague expectations and that these obstacles can only be put away in a genuine communication process (Doppler and Lauterburg 1994).

Hence, the rationale that economic incentives are determining the farmers' participation in biodiversity enhancing measures is misleading because it hides the possible existence of other interests, values or influencing norms. Policy development based on a co-operative approach is open to a great variety of objectives and purposes that guide the farmers' decisions. A respective programme would first investigate the farmers' interests, the farm development perspectives and eventually local or regional land use visions before creating and assigning a financial reward for ecological services. The establishment of 'environmental co-operatives' in the Netherlands is one example how, through empowering policy measures, farmers can be convinced to engage in biodiversity and landscape protection (cf. Slangen and Polman 2002:69ff). In Germany, positive examples are limited to the regional level (cf. examples in paragraph 2.5). Here, there is still some way to go politically until German farmers will become active partners promoting biodiversity enhancement in a multi-functional agricultural landscape.

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Landscape Prototyping: towards an integrative approach for the design and analysis of multifunctional agricultural landscapes

André Jellema*, Walter A.H. Rossing1 and Paul F.M. Opdam**

Abstract

Multifunctionality is seen as one of the solutions to society's demand for new functions in the rural areas and the problems with the unsustainability of the agricultural sector in the European Union. In contrast to the traditional functions of income, labor and food production these new functions can not be provided by a single field or a farm. Planning and production of functions like: Nature Conservation, environment and landscape esthetics can only be achieved when the landscape is considered as a whole.
We present an outline of a methodology based on concepts and insights from production ecology and landscape ecology, that should enable us to explore the opportunities for multifunctional agriculture, balancing objectives at three spatial scales: field, farm and regional level. The focus of this paper is on the integration of the agricultural production and nature conservation. However, the methodology aims to be easily adaptable for other services.
In this paper the concepts of explorative design and habitat networks are explained and integrated to design landscape prototypes. Landscape Prototypes are spatial explicit images of multifunctional agricultural landscapes based on scientific insights and indicating quantitatively the services provided within these virtual landscapes. An important output of the approach are trade-off curves between the different services provided by the landscape. We discuss the implications of our approach for landscape ecological and agronomic research which is on-going in our research program.

Keywords:
Multifunctional Agriculture, Design, Habitat Networks, Linear Programming, Biodiversity

Introduction

Multifunctionality is seen as one of the solutions to society's demand for new functions in the rural areas and the problems with the unsustainability of the agricultural sector in the European Union (Vos and Meekes 1999, OECD 2000, EC 2000).

In answer to this demand agriculture can provide different kind of services in addition to the traditional functions of the production of food, fibers, labor and income. Farmers and agricultural production systems can contribute to a healthy environment, biodiversity and landscape esthetics (Vereijken 1998). In contrast to the traditional products of agriculture, these additional services cannot be provided at a single field or farm, but need to be considered on a landscape level.

To restore the natural, environmental and esthetic values in the agricultural landscape, the landscape as a whole needs to be considered. For example it has been shown in an evaluation study that biodiversity protection on single farms does not enhance the biodiversity (Kleijn et al. 2001), but modeling studies show that the spatial clustering of these protective measures do (Geertsema 2002). Water levels, tables

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and quality can only be managed at a regional (catchment or polder) scale (Barendregt et al., 1993). Spatial coherence is one of three factors determining the quality of landscape experience in agricultural area's (Hendriks et al. 2000). Therefore policy makers, planners and individual farmers interested in the multifunctional concept have to consider the land-use on field and farm level within the total spatial configuration of the landscape.

In this paper we present a framework with which we aim to explore the opportunities for multifunctional agriculture by balancing objectives at three different spatial scales: the field level, the farm level and the landscape level. The framework is based on the concepts of explorative design and ecological networks and focuses on objectives related to agricultural production and nature conservation. The methodology is aimed at easy adaptability for other services. By presenting the conceptual basis, as yet without proof-of-concept, we aim to stimulate thinking on methodologies to bridge the agriculture-nature divide that are urgently needed if we are to support discussions on multifunctional agricultural land use.

Explorative Design

The explorative design methodology is a modeling approach to identify and engineer future-oriented land use systems based on how crops use resources and how a farmer may manage production systems (Dogliotti 2003). In this approach an optimization technique, usually linear programming, is used to select and quantify the 'optimal' combination of land use activities for a certain area, matching a set of predefined land use objectives and constraints (Figure 1).

The explorative design methodology starts by generating a large number of alternative land use activities at the field scale in a systematic manner. Each of these land use activities is then quantified in terms of input-output coefficients. An input-output coefficient is the quantitative description of the relation between the necessary input for the land use activity, for example kg fertilizer-N, kg water, h labor per ha, and the expected outputs, kg product, N-emission per ha (Ittersum and Rabbinge 1997) and has to match the specific physical conditions of the area. Alternative production methods can be used to cultivate the same crop, each production method resulting in a different land use activity, with different input-output coefficients. Through the input-output coefficients, land use systems can be evaluated in terms of objectives of land use. In addition, input-output coefficients define the demand of land use systems on resources.

Land use activities may be derived from current agricultural practice, but new activities can be defined using expert knowledge or models. In this way innovative land use systems can be developed and evaluated. Evaluation may take place at the farm or regional scales, depending on the purpose of study, and often linear programming has been employed to identify optimal land use patterns. An important output of the approach has been to benchmark discussions on various options of land use by calculation of trade-off curves. Technically, these trade-off curves are created by systematically varying the different objectives for the study area and re-running the linear programming model that is used to select optimal combinations of land use for the farm or region. Started in the Wageningen group (De Wit et al., 1988), the approach has meanwhile been taken up and extended for conservation issues by Zander (2003) and co-workers.

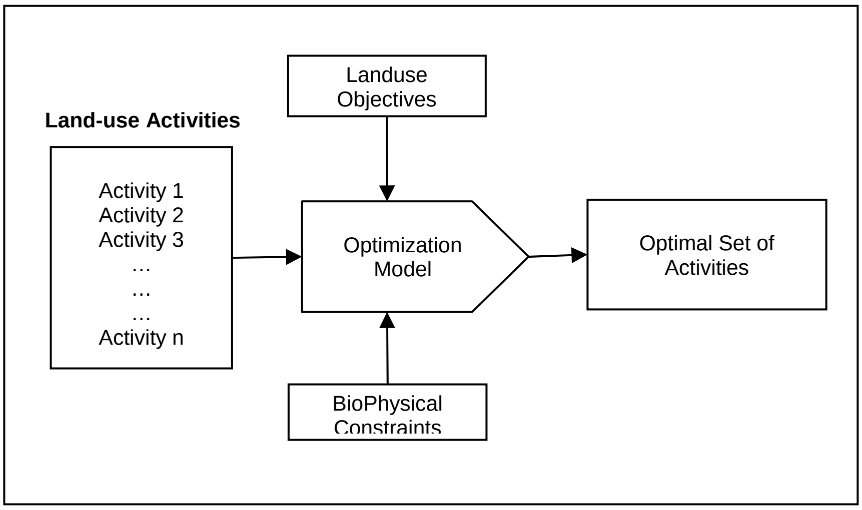

Figure 1: Schematic representation of the Explorative Design Methodology

Habitat Networks

A collection of suitable habitat patches embedded in a matrix of non-habitat linked by the movement species dispersal is called a habitat network (Opdam 2003). These habitat networks are an important concept for species conservation in a fragmented landscape. The basic notion of this concept is that the population can survive through time within the network, due to the process of dispersal. The habitat network is effective only if the habitat quality, as well as the spatial arrangement of the patches and the resistance of the landscape matrix allow the persistence of the target species.

Rules for the design of habitat networks are difficult to establish. Measuring the population dynamics in the field is very time consuming. Further more every studied landscape will provide only a single observation for the establishment of generic rules for habitat network design (Vos et al. 2001). A better way to develop such rules is the usage of spatial population dynamic models (Opdam 2002). Spatial population dynamic models are computer models that calculate the population dynamic behavior of a species in a virtual landscape by simulating the key species characteristics. To obtain reliable results these models should be calibrated using field observations. By systematically altering the network configurations, the relation between the population dynamic behavior of the model and network configuration can be studied. Examples of such an approach are Verboom et al. (2001) and Frank and Wissel (1998). In literature a wide variety of spatial population dynamic models is available (Czárán 1998), the best models to evaluate the configuration of habitats are spatial explicit individual based models (Wiegand et al.1999).

Synthesis

To integrate the concept of habitat networks into the explorative design methodology two important steps need to be taken.

1. The explorative design methodology has to be made spatially explicit.
2. And the relation between land use activities and the survival of the population has to be expressed in input-output coefficients.

Making the explorative design methodology spatially explicit can be realized relatively simply by linking the optimization model to a GIS environment. By introducing every landscape element in the GIS environment as a separate variable in an optimization model the land-use type for each of the landscape elements can be determined. Because the locations of all the land elements are known, the locations all land-use types are known.

To describe the relation between land use types and population survival in input-output coefficients is more difficult. In general the land use activities in a landscape element will determine the habitat suitability for the species. However as explained above the number of individuals inhabiting that landscape element is not only depending it's own the quality, but also depending on the spatial arrangement and quality of the other habitat patches and the characteristics of the surrounding landscape matrix. Therefore the contribution of a land use activity to the survival probability of a species is strongly non-linear and cannot be expressed in simple input-output coefficients.

In landscape ecological literature heuristic optimization algorithms are used to solve this problem. In these algorithms a spatial rules or simple population dynamic models are used to evaluate the complete habitat configuration for each optimization step. Examples can be found in Cabaza 2003 and Groeneveld 2003 both founding their evaluation rules on the Incidence Function model (Hanski 1994). In this model the chance of survival for a species in the habitat network is determined based on the extinction and colonization chances of the populations in the network. In the model it is assumed that each of these populations is semi isolated having its own internal independent population dynamics, interaction between populations only consists of relatively rare colonization events.

In agricultural landscapes semi-isolated populations are difficult to identify. In these landscapes small landscape elements like single trees, hedgerows, field margins and canals are the main carriers of biodiversity (Kleijn 1997, Grashof-Bokdam & van LangeVelde 2004). Many of these elements will be too small to support a population in isolation. However several small landscape elements elements located close to each other might support a population by constantly exchanging individuals. The population dynamics of such elements are not independent at all. Other elements, like linear habitat patches may be so elongated that they contain several semi isolated populations. To evaluate these type of habitat networks more mechanistic are needed, for example spatial explicit individual based models. However the usage of this type of models in an iterative process of network design will be far to complex and time consuming.

Therefore in this paper we propose a different approach, combining an optimization model and a network generator. The network generator will be used to generate a large number of habitat networks differing in habitat configuration and ecological value. The optimization model will be used to select one of the habitat networks and to optimize this network for agricultural production. Which of the generated habitat networks will be selected and how this network is optimized depends on the predefined land use objectives. The selected habitat network will be used as a constraint for the selection of appropriate land-use activities. In the section below this approach will be explained in larger detail.

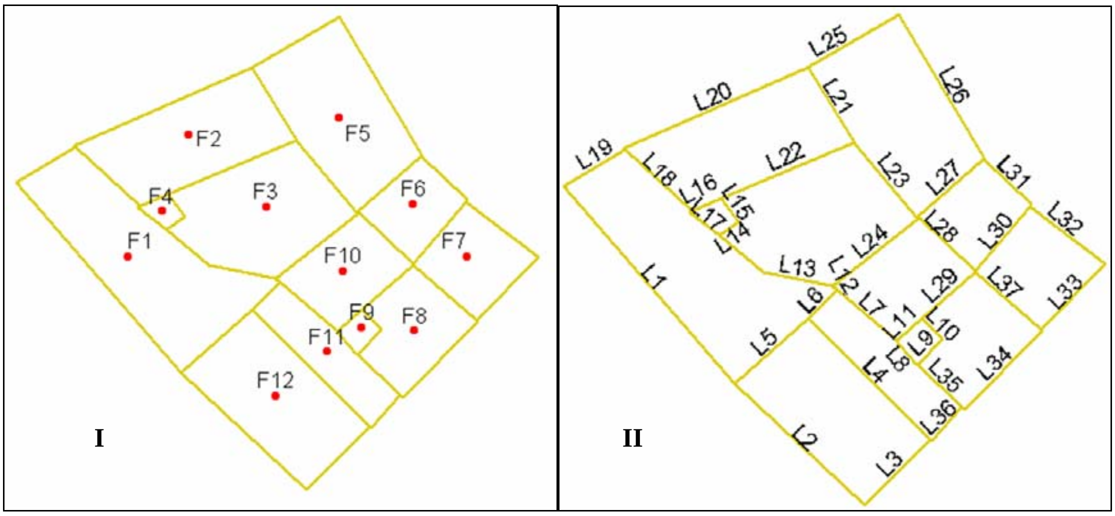

Figure 2: Conceptual Landscape Model: I Polygons representing agricultural fields, II Lines representing linear elements like hedgerows, field margins or canals.

Landscape Prototyping

The landscape prototyping methodology consists of three components:

1. A GIS environment
2. A Network Generator
3. And an Optimization Model

The GIS Environment

In agricultural areas the dominant landscape features consist of production fields and linear elements like hedgerows, canals and field margins. Therefore we have conceptualized the landscape in the GIS environment by polygons and lines, the polygons representing the fields (F), the lines representing the linear landscape elements (L) (Figure 2). In our conceptual model of the landscape 3 spatial levels are recognized (Figure 5):

1. The Field level consisting of the individual fields and linear elements.
2. The Farm level consisting of the agglomerations of those landscape elements belonging to the same farm.
3. The Landscape level consisting of all elements in the landscape.

Within each of the landscape elements different land use activities occur. A land use activity can be a particular crop rotation or a meadow, but also a windbreak, a hedgerow or a channel. Each of the land use activities can be described in terms of habitat quality for a particular species. We assume that all land use activities can be divided into a limited number of habitat quality categories. In our conceptual landscape model a land use activity can have an effect, positive or negative, on the habitat quality of neighboring landscape elements. For example the application of fertilizer can have a negative effect for the habitat quality for certain plants in a neighboring hedgerows, on the other hand the growth of a wheat crop can have a positive effect on the habitat quality of the same hedgerow for mice. This conceptual landscape forms the basis for the design and optimization of multifunctional landscapes.

The Network Generator

The concept for the development of a network generator can be found in production ecological literature. In Dogliotti et al. 2003b, it is described how a software tool 'ROTAT' is developed to generate alternative crop rotations based on agronomic criteria. The program combines crops from a predefined list to generate all possible rotations. The full factorial number of possible combinations of crops is limited by a number of filters controlled by the user. These filters are designed to eliminate crop successions that are agronomical unfeasible or for farm-specific reasons not practical or desirable. Selection criteria for the filters are based on timing, sequence and frequency constraints for crop cultivation techniques and farm-specific feasibility and applicability. These filters represent expert knowledge in a quantitative and explicit way.

Habitat networks can be generated fixing the topology of a landscape and by systematically varying the habitat quality of the different landscape elements. Ecological rules can be used to filter all unfeasible or undesirable combinations. For ecological networks these criteria could be expressed in total habitat area constraints, connectivity constraints, patch size constraints, habitat quality constraints, etc. Using a network generator in this way a large set of habitat networks can be generated varying in ecological value and habitat configuration (Figure 4). The generated network configurations are input for the optimization model.

However the proposed network generator can produce a very large number of habitat networks. For each landscape element, habitat class or land use activity added to the generator, the number of possible combinations increases manifold. Therefore it is important that not all but only a representative selection habitat networks will be generated.

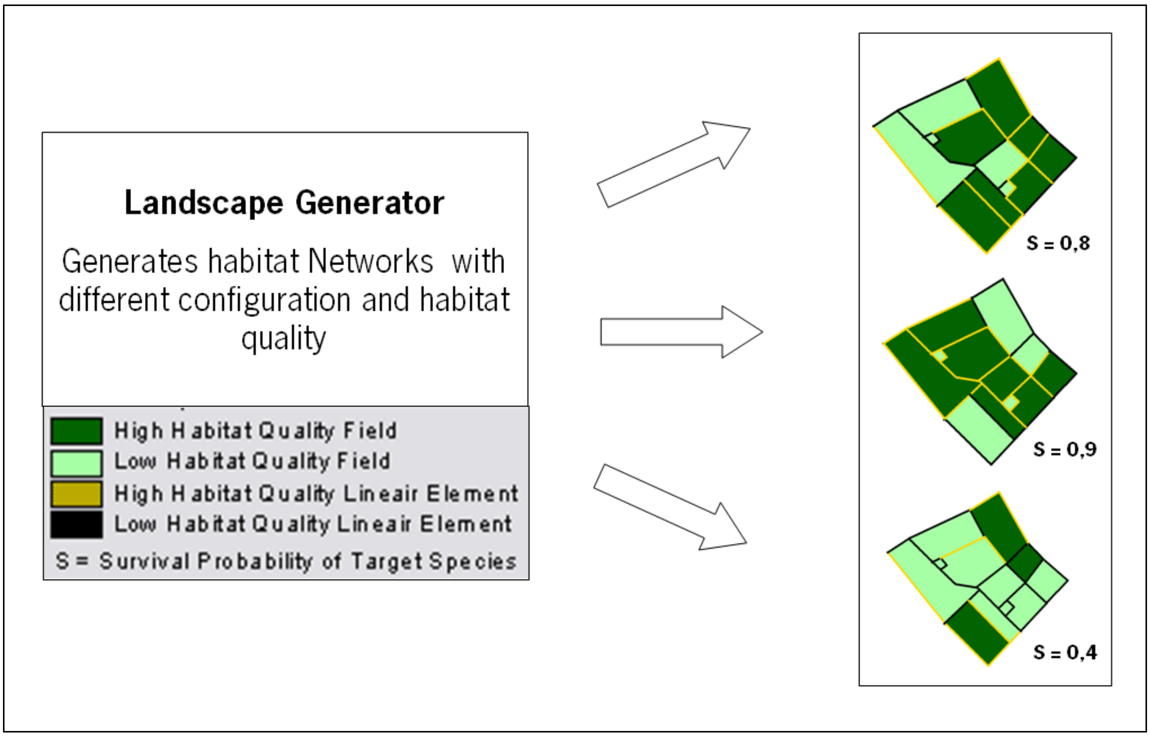

Figure 3: In step 1 a network generator is used to configure all possible network configurations for predefined set of parameters

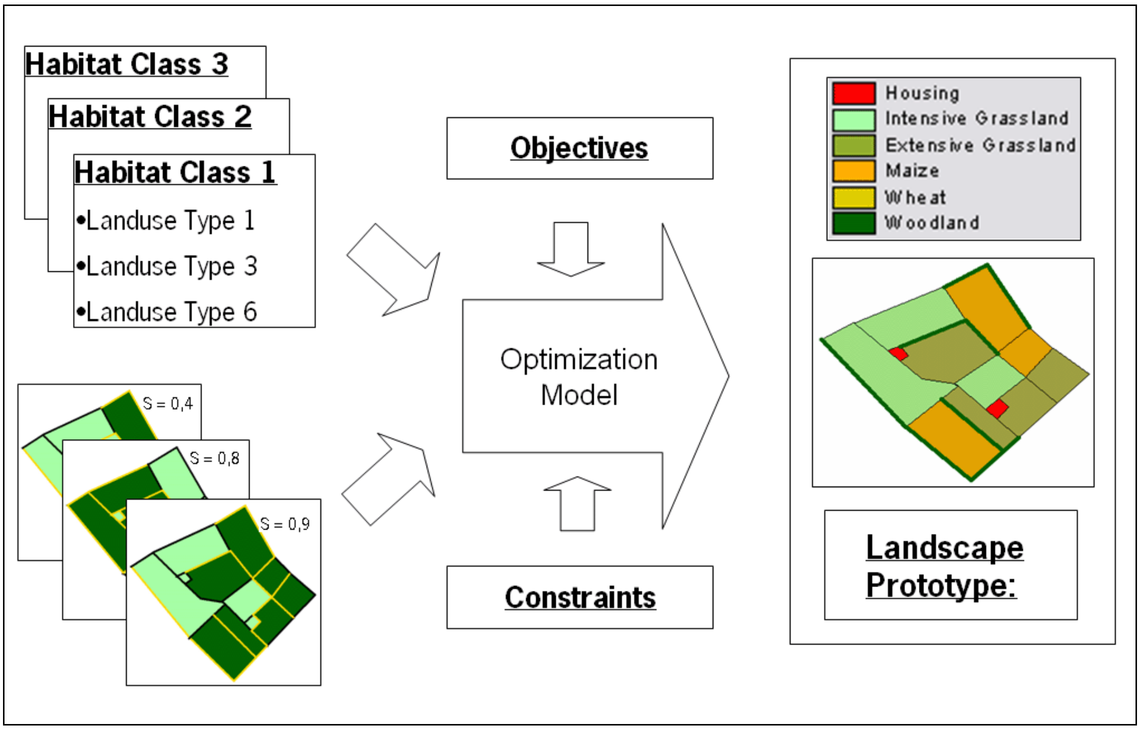

Figure 4: In step 2 an optimization algorithm is used to select one of the habitat networks and to optimize the agricultural activities. Which network is selected and how the agricutural production is optimized is depending on predefined opjectives and constraints

Optimization Model

In the second step of the landscape prototyping methodology the optimization algorithm is used to select one of the habitat networks and to optimize the land use within this network for agricultural production (Figure 4). The habitat network is used as a constraint for the optimization of the land use. All the land use activities are divided in a limited set of habitat classes. Within each of the habitat classes the land use is optimized. Which of the habitat networks is selected and how the production is optimized depends on the predefined objectives and constraints

In the optimization model four types of constraints will be formulated: Landscape Constraints, Adjacency constraints, Farm constraints and Field constraints (Figure 5).

- Landscape constraints are constraints at landscape level, for example the minimal ecological value of a landscape.
- Adjacency constraints are constraints on the land use in the neighboring landscape element, for example on the usage of pesticides or the cultivation of a certain crop
- Farm constraints are constraints at farm level, for example the minimum income of a farm or the maximum labor use.
- Field constraints are constraints at field level, for example the minimum habitat quality of a land use activity in a specific landscape element.

The basis for such a model can be derived from existing farm optimization models (ten Berge et al. 2001, van der Ven et al 2003, Dogliotti 2003a).

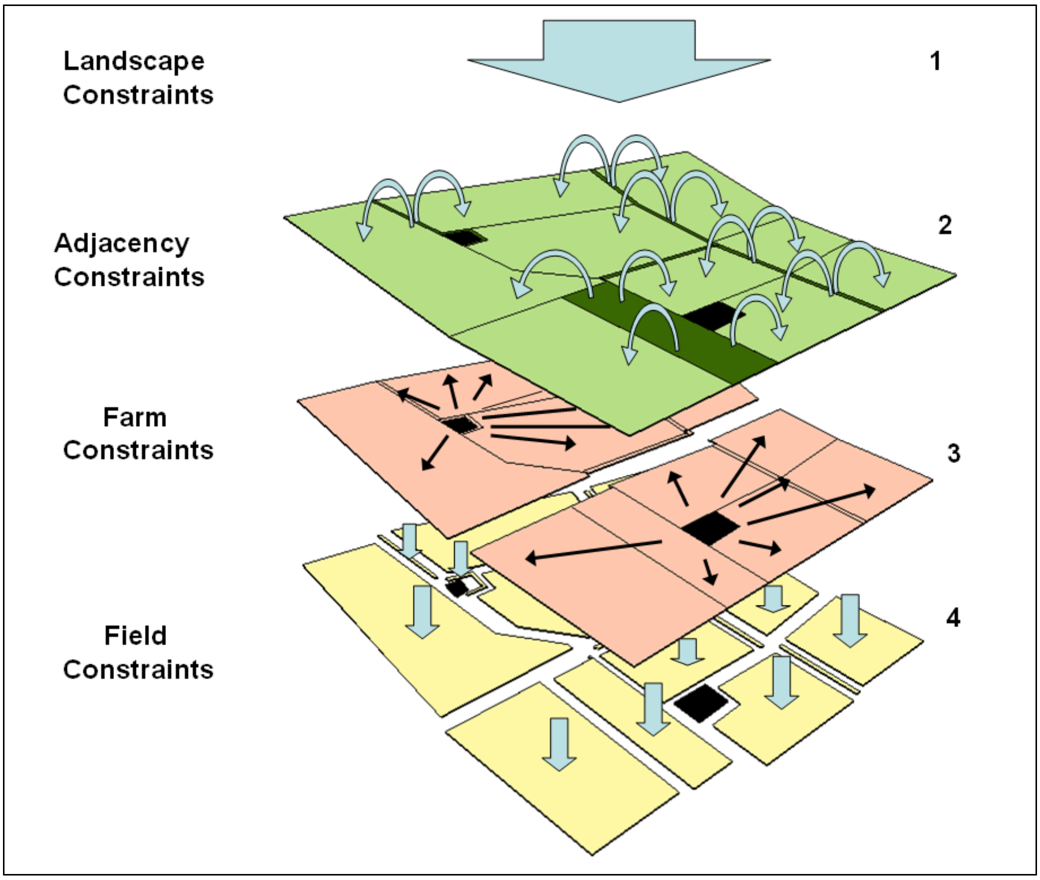

Figure 5: In the optimization model objectives can different type of constraint will be formulated, 1 Landscape constraints, 2 Adjacency constraints, 3 Farm constraints and 4 Field constraints

Expected Results and Perspectives

The expected results of the methodology are landscape prototypes and trade-off curves (Figure 6). Landscape Prototypes are spatial explicit images of multifunctional agricultural landscapes based on scientific insights. These images can be used to facilitate the discussion about multifunctional agriculture by visualizing and illustrating different types of multifunctional landscapes. Because landscape prototypes are based on landscape ecological and production ecological knowledge, these illustrations are more then an artistic impression of the landscape.

Trade-off curves can be created by systematically varying the different land use objectives and re-running the optimization model. In this way the contours of the window of opportunities for multifunctional agriculture can be revealed.

In this paper we have focused on combining the services of agricultural production and nature conservation. Multifunctional agriculture can provide more services like landscape esthetics or environmental functions. Many of these functions also have a spatial component. These functions can also be included in the landscape prototyping methodology, by using insights from other scientific disciplines to adapt the filters in the network generator or the constraints in the optimization model. Therefore we believe that landscape prototyping can be a promising approach to study multifunctionality.

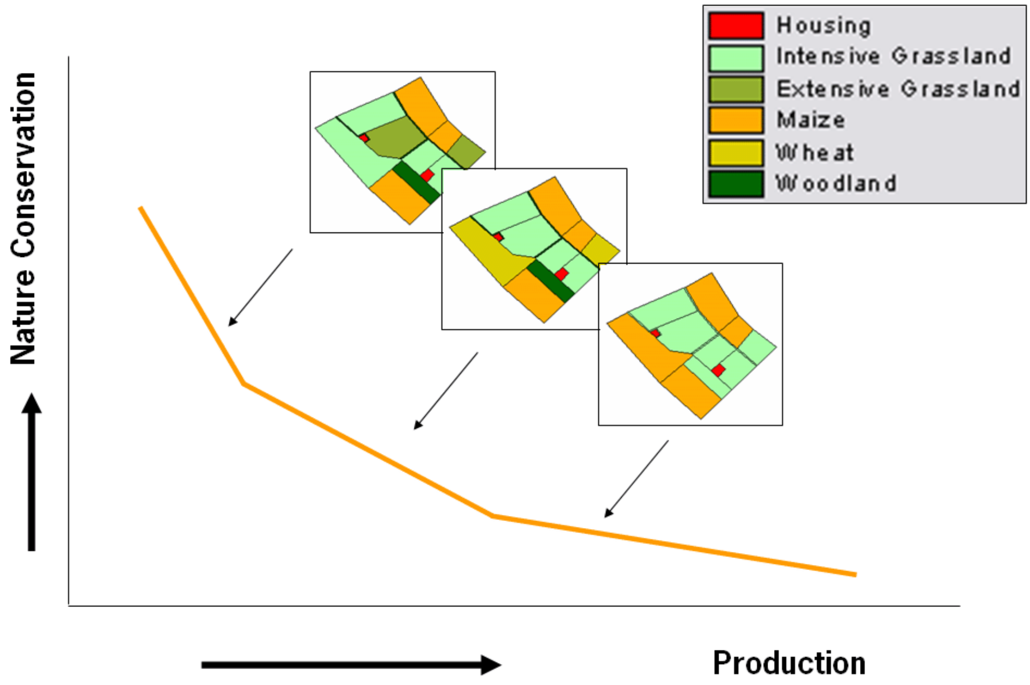

Figure 6: Imaginary trade-off between production and nature along with selected landscape prototypes. The figure is meant to illustrate the approach proposed in the paper

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Water and wildlife on a commercial farm: multifunctional management of set-aside and other natural resources in lowland England

C. Stoate*

Abstract

Natural resource management on farmland can often be multifunctional. At Loddington, the Allerton Project's research and demonstration farm in Leicestershire, England, the set-aside area necessary to qualify for Arable Area Payments is used to achieve environmental benefits. These include planting of crops for wildlife, and the creation of a riparian buffer strip that protects watercourses from pollutants from arable land while also providing a wetland habitat. These habitats are exploited by wild gamebirds, as well as other wildlife. At Loddington, a management system integrating commercial farming, set-aside obligations, game management and other environmental objectives has also resulted in increases in numbers of nationally declining songbird species. This principle could be applied more widely in Europe. Objectives and implementation vary from field to farm and landscape/catchment scale, requiring varying levels of collaboration between farmers, according to farm size in different regions. However, this project demonstrates that a range of environmental objectives can be integrated into a farm business, satisfying current Rural Development objectives for multifunctional management and use of natural resources.

Introduction

There is an increasing recognition of the need to integrate the various aspects of natural resource management on farmland in order to meet the economic, environmental and social objectives of rural development. This is reflected in the EU Rural Development Regulation (1257/99) and in the legislation and funding frameworks in individual EU countries, such as England's Rural Development Programme. The latter "identifies those activities which will contribute to more than one objective, for example, agri-environment schemes not only lead to environmental protection and enhancement but can also generate new employment opportunities directly - through land management activities - or indirectly - by providing an attractive environment as the foundation for other activity e.g. tourism" (DEFRA, 2001).

"Given the innovative nature of a number of measures in the Programme, and the importance of encouraging use of measures which will improve the competitiveness and sustainability of farm and forestry businesses, pilot or demonstration projects will be needed" (DEFRA, 2001). There is currently little research and demonstration at this level of integration at the farm scale in Europe. This paper describes a research and demonstration project in lowland England. The project is thought to be unique in Europe in terms of the combination of a farm business with environmental management, applied scientific research, and farmer involvement at the same site.

Management practices and objectives vary from field, to farm and landscape scales. Because farm size varies considerably across Europe, the potential benefits of management at the farm scale also vary and there is a need for collaboration between farmers where farm size is small and where management objectives are at the landscape scale (e.g. water quality within a catchment).

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The study area

The research has been carried out since 1992 at The Allerton Research and Educational Trust's 333 ha mixed arable and livestock farm at Loddington in Leicestershire, England. A flock of 284 sheep grazes permanent pasture. The soils are mainly clay and the altitude is 105 - 185m. The arable crops (248ha) are almost all autumn-sown and comprise wheat, oats, oilseed rape and beans. Set-aside comprises 10% of the arable area, in compliance with the Arable Area Payments Scheme. Small woods (19ha) are distributed across the farm and there are small field ponds and watercourses, including a stream along the southern boundary which feeds into a reservoir 6 km to the south east of the farm. The area is rural, with only one major road and no major settlements. Table 1 shows percentage cover of the three main land uses at Loddington and in four adjacent zones in the surrounding landscape up to 6 km from the centre of the farm.

Table 1. Percentage land use cover at Loddington and four adjacent zones in the wider landscape (from Stoate, 2002a)

Site	Arable	Grass	Wood
A	25	64	11
B	67	32	1
C	61	36	3
D	58	33	9
Loddington	78	13	9

The farm is managed primarily as a commercial farm business, employing two full time staff and occasional seasonal help (e.g. at lambing and harvest). 1992 was a baseline year in which cropping was not changed and monitoring of some wildlife groups was carried out. From 1993, the management of the farm was adapted to accommodate habitats for wildlife. Songbirds and gamebirds have been the main wildlife groups to be monitored. More recently, other environmental objectives have received a higher profile, especially soil management and the maintenance, and where possible, the improvement of water quality.

Three examples of integration

1. Set-aside compliance and wildlife habitat

Payment of Arable Area Payments is conditional on putting 10% of each farm's arable area into set-aside (5% in 2004). In England, set-aside is generally allocated to whole fields or blocks of fields. These may be permanently sited, in which case they tend to be on less productive land, or incorporated into the arable rotation, in which case they are used to control grass weeds by the application of broad-spectrum herbicide in summer. At Loddington, set-aside is permanently sited in the form of 20m wide strips distributed across the farm. This makes the habitat associated with set-aside more readily available to territorial birds during the breeding season.

The set-aside is further enhanced by planting crops specifically designed for wildlife.

Crops grown on set-aside as 'Wild Bird Cover' include kale (*Brassica napus*) and quinoa (*Chenopodium quinoa*), grown in combination, and cereals such as triticale (*Triticum x Secale*) and wheat (*Triticum aestivum*). These crops can produce a high seed yield that is used as a source of food by farmland birds in autumn and winter. Birds make significantly greater use of these seed-bearing crops, relative to their availability) than they do commercial crops (Figure 1) (Boatman et al., 1999).

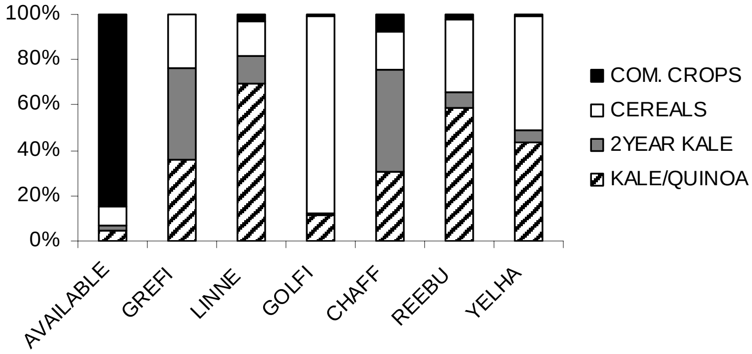

Figure 1. Percentage occurrence of six passerine species (Greenfinch (*Carduelis chloris*)- GREFI; Linnet (*Acanthis cannabina*) - LINNE; Goldfinch (*Carduelis carduelis*) - GOLFI; Chaffinch (*Fringilla coelebs*) - CHAFF; Reed Bunting (*Emberiza schoeniclus*) - REEBU; and Yellowhammer (*Emberiza cirinella*) - YELHA) in commercial crops and three seed-bearing crop types (cereals, first year kale with quinoa, and second year kale), relative to their availability on farmland

2. Water quality and wetland creation

The clay soils and autumn cultivation at Loddington result in soil erosion and transport of sediment and nutrients, especially nitrate and phosphorus to watercourses. Phosphorus, in particular, can cause eutrophication of inland waters, including streams and ponds within the farm at Loddington, and in the Eyebrook Reservoir downstream of the farmed area. One measure to mitigate the problem of nutrient and sediment transport to watercourses at the field or farm scale is the implementation of riparian buffer strips (Haycock et al., 1997).

At Loddington, riparian buffer strips take the form of sown grass or naturally regenerated vegetation along the streamside. At the base of the longest arable slope, a 80 m wide buffer strip has been created. Water from adjacent arable land has been diverted into the buffer strip from a ditch and from field drains. Water is therefore held in a series of shallow pools and does not enter the stream directly.

Water from field drains and pools has been sampled at monthly intervals and analysed for phosphorus, nitrate, nitrite and total N. Levels of both P and N are lower in the buffer strip pools than in the water entering from ditch and field drains, as illustrated for P in Figure 2. The shallow pools are used by mallard (*Anas platyrhynchos*), teal (*Anas crecca*), common snipe (*Gallinago gallinago*) and jack snipe (*Lymnocryptes minimus*) in winter, and the pools and rank vegetation around them are used by moorhen (*Gallinula chloropus*), whitethroat (*Sylvia communis*) and reed bunting during the summer. Commonly occurring invertebrates include *Laccophilus minutus, Sigaria nigrolinecta, Hesperocorixa sahlbergi, Corixa punctata*, *Notonecta glauca*, and *Sigaria* spp.. A number of plants have also colonised the buffer strip from seed delivered during winter flooding (e.g. *Juncus* spp., *Myriophyllum spicatum*, *Scrophularia auriculata, Scutellaria galericulata*). As well as protecting the stream from nutrient pollution from arable land, the buffer strip therefore also provides a habitat for wildlife.

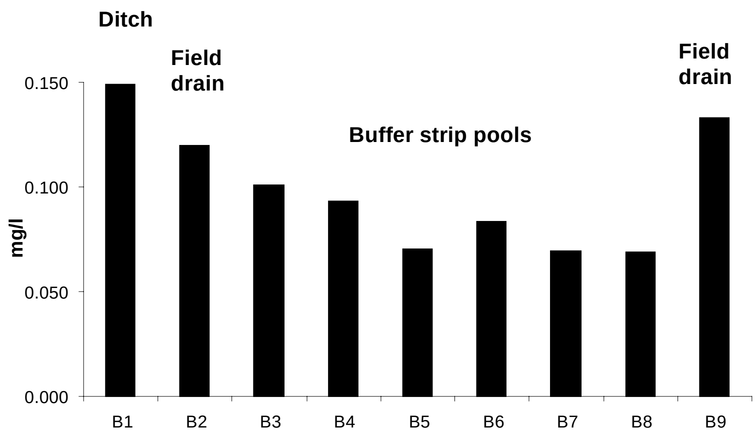

Figure 2. Phosphorus levels (mg/l) in ditch and field drains as they enter a buffer strip, and in shallow pools within the buffer strip. Values are means derived from monthly sampling. Some monthly values are maxima because of constraints imposed by methods of nutrient analysis, and standard errors are therefore not given

3. Bird conservation and game management

Shooting of gamebirds is a major social, and in some cases economic activity in lowland England. In most cases, gamebirds are artificially reared and released into woods and other cover in late summer for shooting in winter. However, wild gamebird populations can also be managed by providing suitable habitats that might also benefit other wildlife species. Particular attention has been given to the numbers of songbird species that have been declining nationally since the 1970s (Siriwardena et al., 1998) and are targeted for conservation by the UK government. This has been the policy at Loddington since 1993.

Habitats created for wild gamebirds include Wild Bird Cover (described above), conservation headlands (Sotherton 1991), beetle banks (Thomas et al., 1991), and grass field margin strips. Of these, Wild Bird Cover and beetle banks are within the set-aside area. Woodland has also been managed to improve the internal structure for wild pheasants (*Phasianus colchicus*). In addition, nest predators such as fox (*Vulpes vulpes*), brown rat (*Rattus norvegicus*) and magpie (*Pica pica*) have been controlled during the nesting season (April – July), and grain is provided as food during the winter. Together, these form a system that is designed to meet the ecological requirements of wild pheasants at all times of year. Pheasant shoots were held each year. Very few female pheasants were shot, so as to leave adequate breeding numbers for subsequent years. Wild pheasant numbers were monitored each autumn and spring by counting from a vehicle in the first three hours of the day. Songbird numbers were monitored by walking a 11.5 km transect four times in May and early June.

Both wild pheasants and nationally declining songbirds increased in numbers during the early part of the project, with numbers stabilising at a higher level in the second half of the project (Figure 3). Nationally declining songbirds were twice as abundant at Loddington as on surrounding farmland by 1997.

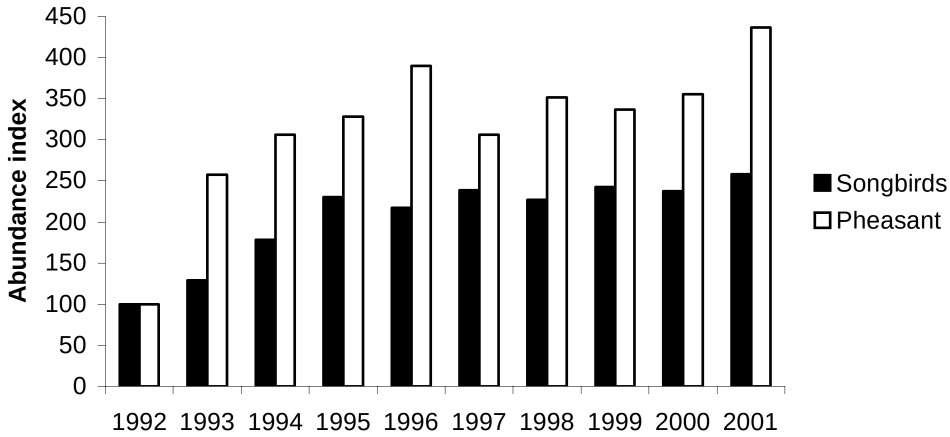

Figure 2. Relative abundance of pheasants in autumn and nationally declining songbirds in spring at Loddington, Leicestershire. A different abundance index is used for the two groups

Wider implications

Spatial considerations

The work at Loddington demonstrates that multiple objectives can be integrated in the same area at field and farm scales. Allocation of a set-aside area is a prerequisite for Arable Area Payments, but fields, or parts of fields in set-aside can also be managed positively to benefit wildlife. Wild Bird Cover provides an example of this. The riparian buffer strip described here was also set-aside land that was developed to perform the environmental functions of providing a wetland habitat and mitigating nutrient pollution of watercourses. Benton et al. (2003) argue that landscape heterogeneity at a range of scales is 'key to restoring and sustaining biodiversity in temperate agricultural systems'. Both Wild Bird Cover and riparian buffer strips contribute to such heterogeneity at landscape scale and can be managed to create similar structural and ecological diversity at much finer scales if conservation objectives are defined.

Adoption of a game management system, designed primarily to perform a social function within the rural community, can also benefit wildlife species that are targeted nationally for conservation action. This *systemic* approach must be adopted at the farm scale in order to be successful, and is most likely to succeed if adopted at the landscape scale. Where farm size is smaller than that at Loddington, collaboration will be necessary if the objectives of game and songbird conservation are to be achieved. This principle applies to an even greater extent where water management within a catchment is concerned. Here, soil management, creation of riparian buffer strips, and other steps to mitigate the impact of agriculture on watercourses, need to be adopted at the catchment scale. Such an approach is adopted in southwest England where a commercial company, 'Wessex Water', provides financial incentives to farmers to manage their land in a way that ensures that water treatment costs are minimised. However, willingness to adopt measures to mitigate impacts of farming on watercourses can vary considerably between farmers, as illustrated in the French Garonne catchment by Amigues et al. (2002), and in Upper Normandy by Mathieu and Joannon (2003).

In terms of wildlife conservation, Loddington is an exceptional demonstration of how a systemic management approach can benefit game and wildlife species at the farm scale. In the Netherlands, where farm sizes are generally smaller and drainage has a greater environmental influence, government incentives directed at the conservation of wading and other birds have encouraged farmers to collaborate in meeting conservation targets. In Devon (southwest England), farmers managing land occupied by cirl buntings (*Emberiza cirlus*), a nationally endangered species, have been encouraged to adopt an agri-environment scheme targeted at the conservation of this species (Peach et al., 2001). In this case, the landscape approach to conservation was successful. Application of an agri-environment scheme across farms in the Netherlands has been claimed to be unsuccessful (Kleijn et al., 2001), while in Portugal there is some indication that such an approach has been successful (Borralho et al., 1999). Such a systemic landscape approach is likely to be very dependent on the interests and cultural, and socio-economic background of participating farmers (Stoate, 2002b).

Economic implications

There are other examples of integration at Loddington. For example, pesticide use is restricted on wheat and oats (*Avena sativa*) fields in order to increase abundance of arable invertebrates. This practice currently attracts a 16% premium on crop sales as these cereals can be sold as 'conservation grade'. Minimum tillage has recently been adopted at Loddington in order to reduce crop establishment costs, but this is likely also to result in improvements in aquatic and terrestrial ecosystems. Low-grade timber, produced during woodland thinning operations can be sold for fuel, thereby paying for the cost of this habitat management for wildlife.

In these latter cases, habitat management is combined with income generation. However, wildlife conservation is more usually a net cost to the farm business. In the case of a game management system, this cost can be substantial, and only applicable where farmers are interested in shooting and where their incomes are relatively high. Management of wild gamebirds is considerably higher than that of artificially reared and released gamebirds, but there is currently no established premium for the sale of wild gamebird shooting.

In the case of Wild Bird Cover management, habitat creation can be carried out on set-aside land so that there is no crop yield penalty, but the costs of seed, cultivation, drilling and subsequent costs must be borne by the farmer. Where these crops are grown on the same land for more than one or two years, inputs in the form of fertiliser and herbicide are required in order to achieve the objective of high seed production (Stoate et al., 2003). These costs are increasingly difficult to bear as farm incomes fall. For example, Figure 4 shows farm profits for the business at Loddington, reflecting the regional trend. Current legislation specifically states that income generation from management of set-aside land is prohibited, so that no opportunities exist for funding such work within the farm business.

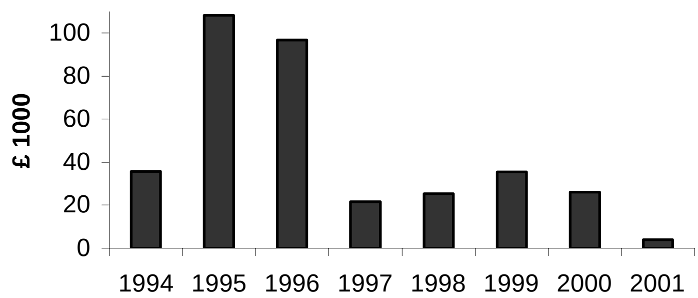

Figure 4. Loddington farm profits (1994 – 2001)

An opportunity exists to fund such environmental work under agri-environment schemes that are currently being reviewed within the UK. Agri-environment schemes such as England's Countryside Stewardship Scheme provide income for management of such habitats on farmland. However, these very rarely completely cover the costs of habitat management, so that there is still a net cost to the farmer. Because CSS agreements are for ten years, many farmers who entered the scheme when farm profits were high are now struggling to pay for the commitments within their agreements.

Current agri-environment policy is generally against rewarding farmers for conservation work that has already been carried out. However, this policy penalises farmers who have been managing land in an environmentally sensitive way, while rewarding those who carry out new conservation management. Recognition of this is resulting in a relaxation of this policy so that existing landscape features can be entered into CSS agreements. This has been the case with the riparian buffer strip at Loddington. However, this newly emerging policy diverts payments from creation of new habitats. Future policy should encourage farmers to explore potential for market led environmental management, while also adequately supporting the maintenance and creation of habitats for which there is no potential for income generation.

The set-aside area on farms could have a role to play here. State-funded environmental management could also be developed on set-aside land as the opportunity costs, and therefore necessary payments to farmers, would be lower. Many of the environmental problems associated with agriculture in lowland Britain are also experienced in other parts of Europe (Stoate et al., 2001). The results presented in this paper could therefore have considerable relevance to agricultural areas and policy elsewhere in Europe.

Acknowledgements

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Struggling for Rural Environment: Conflicts between *desires* and *needs* in Portuguese rural areas

Elisabete Figueiredo*

Abstract

Rural areas are increasingly valued, in the contemporary societies, for their environmental functions. Due to the changes in these societies and the widespread growth of *environmentalism*, rural areas (particularly the most *remote* and marginalized by the development processes of urban-industrial type that prevailed until some decades ago) acquire a new symbolism and social meaning as objects of consumption, above all on the part of the urban populations.

In this sense, we intend to discuss the passage of a rural identified for decades with the agricultural activity to a rural increasingly assimilated by its environmental function, without the necessary time to reflect on and to analyse the consequences of a rural space without agriculture. The social identification of the rural with the environment occurs in a moment when rural populations seek to accede to socio-economic development in so-called *urban* terms. This uncoincidence between the *desired* and the *lived* rural environment tends to raise a number of conflicts, the rural becoming stage of concrete *fights* between its residents and its visitors, among different perceptions, interests, needs and desires in view of the same environment.

In this paper we intend to approach the conflicting contours between the rural as a *desired* space by the urban ones, and as a *lived* space by the rural inhabitants, based on a set of interviews and inquiries by questionnaire applied to the social and institutional actors of two Portuguese rural areas – the Natural Park of Montesinho and the 'Serra da Freita'. Based on the empirical information we will emphasise not only the existence of two clearly divergent visions concerning the rural, as essentially the consequences that such a divergence can have for the future of that space.

Key Words

Rural, Rural Environment, Social Conflicts

1. Introduction

This work tries to discuss and provide some reflection material about the rural as a space for struggle and a scenario of conflicts among the interests, the needs and the desires of its *consumers* – the inhabitants and the visitors – and still between these ones and the political-administrative entities responsible for protecting the environment and promoting the development of that same space.

This discussion enrols in the actual and growing socio-institutional valorisation of rural areas as reserves of environmental quality and as spaces that carry out environmental functions nowadays considered vital for society as a whole. On account of the changes that took place in the contemporary societies, in economic, political, social and cultural terms, we witness the widespread growth of what we can designate as *environmentalism*[i] and in parallel an increasing identification among nature, the

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environment and the countryside. In this sense, rural areas (particularly the most *remote* and *marginalized* by the development paradigms of urban-industrial type that dominated until some decades ago) acquire a new symbolism and social meaning as objects of consumption, mainly on the part of the urban populations.

Based on the mentioned transformations, we intend to discuss the passage of a rural identified for decades with agriculture to a rural increasingly assimilated by its environmental function, without the necessary time to reflect on and to analyse the consequences of a rural space without that activity. In parallel, we notice that the social identification of the rural with the environment occurs in a moment when the rural populations try to accede to the socio-economic development from a perspective that we call (due to the lack of a better expression) *urbanised*. This uncoincidence between the rural environment *desired* by the visitors and the rural environment *lived* by the inhabitants tends to raise various conflicts, the rural becoming a scenario to concrete *fights* that often place in opposition different perceptions, interests, needs and desires in view of the same environment.

From a set of inquiries by questionnaire and interviews applied to the social and institutional actors of two Portuguese rural areas – the Natural Park of Montesinho and the 'Serra da Freita' –, we try to analyse the conflicting contours between the rural as a *desired* space and as a *lived* space. Based on the empirical data we will emphasise not only the existence of two clearly divergent visions concerning the rural, as essentially the consequences that such a divergence can have for the future of that space.

2. Rural environment as an object of consumption

Along the last two or three decades the transformations that occurred in the rural areas have been widely and deeply debated, being nowadays relatively clear and consensual that most of these areas undergo a critical and declining period. The crisis of the rural world, as some authors have named it, *"is proteiform and it assumes several aspects that are interrelated, but are also independent. It is at the same time an economic, social, human, political and environmental crisis"* (Sainteny, 1992: 22). Although we cannot qualify this crisis as uniform, given the diversity of rural areas, it reaches mainly the most *remote* rural areas, in other words, those that are more distant from the centers of economic growth and that were marginalized by the development processes of urban-industrial type, for decades. Though this crisis *"dresses differently from one place to another in the remote rural areas"* (Pernet, 1994: 163) its most dominant trait is the loss of social and economic importance of agriculture (e.g. Mormont, 1994a; Jollivet, 1997b).

The processes of decline of the rural areas and its consequent transformations, as well as the more global social changes, have originated movements on behalf of the rural areas' preservation. As Jollivet (1997b) refers the rural becomes the place, par excellence, for applying the environmentalist doctrine to the planetary scale. It is so while reserve of natural resources (which places it as object of regulations on the uses of those resources) and it is also while reserve of the biodiversity that often places it as *protected space* (e.g. Chamboredon, 1985, Mormont, 1993b, 1994b and 1994c; Jollivet, 1994 and 1997b). Thus, the rural areas pass from food producers to spaces more and more understood and represented as moral, cultural and environmental *reserves* (e.g. Chamboredon, 1980; Butler and Hall, 1998; Butler, Hall and Jenkins, 1998). Simultaneously the rural passes from monofunctional space (the agricultural function) to space recognized as multifunctional. In the ambit of the rural as multifunctional space the questions associated with the environment have been assuming special relevance[ii]. The environmental functions performed by rural areas proceed from the growing environmental valorisation and social concern. Rambaud (1980) advocates that the social imaginary creates these utopian communities where the centrality of the rural results, in great measure, from situations of crisis and social rupture *"directing the social actors towards a valorisation of the past, centered in the rural world, so that the townsmen prefer more and more the urbanised village to the touristic city"* (Joaquim, 1994: 45). As Mormont (1984: 145) says *"the rural is seen deeply redefined in the social space: from productive space it becomes symbolic space, from space of the past to alternative space, from space where one comes from to space where one goes to"*. This redefinition of the rural and of rurality it is played essentially by the populations of the more developed, industrialised and urbanised societies which represent the rural as *reserve of memories and of nature* and demand that such a picture must be maintained and protected[iii].

The frequency increase of the rural spaces by urban or *non local* populations enrolls in the social movements and transformations that we mentioned before, resulting in the conception and appropriation of the rural areas as commodities, objects of consumption and patrimony (e.g. Peixoto, 2002). In this sense, the *psychological* or *idilic trips* to a rural landscape that is susceptible of offering, in simultaneous, natural beauty, health and well being and a friendly, close and secure community, have been increasingly sold as commodities to be explored by the new market policies (e.g. Goodwin and Cloke: 1993). This circumstance of setting the rural as a marketable and consumption object has important social effects, since, as Macnaghten and Urry (1998:191) refer *"it implies that the countryside will be increasingly consumed as spectacle. Potent images and symbols become readily transformed into saleable commodities"*. One of the most important consequences of this situation is associated with the *divorce* between the marketable qualities of the rural and its historical and social contexts, as well as to the loss of authenticity of the places and of the traditional forms of social and economic organisation. Thus, the rural areas where this predicament can be observed become spectacles, scenarios managed by market strategies and established as attractions where the environmental qualities become consumable goods as well. *"This scenario may help to explain the recent appeals to 'green' tourism by corporate interest and government tourist boards, and the apparent ease and slight effort involved in presenting a 'green' and environmentally friendly image by corporate leisure interests (…)"* (Macnagthen and Urry, 1998: 191). The consumption of the rural environment and of nature is accomplished essentially through its transformation in *landscape* and not as background of productive activities, but rather to be beautified aiming at its aesthetic appropriation[iv]. In social terms, this establishment of the rural as object of consumption presupposes the denial or minimisation of its productive character, although in institutional terms[v] it is assumed the need of maintaining Men on a part of the territory developing ancestral practices. This need arises not only because the human presence on these *remote* rural territories is fundamental in order to maintain its environmental configuration, but also from the recognition that they are fundamental actors (with their practices) in the *rural scenery* that one intends to market and tries to consume. These conceptions tend to *folklorize* the local cultures and environments[vi] according to a mechanism that doesn't seem to be very distant – although it is implemented today under less evident forms – from that of the establishment of the *Indian reservations* institutionally designed to combat the desertification and the disappearance of the vegetable and animal species and, above all, of a certain type of social and cultural organisation and agricultural practices (e.g. Bontron and Brochot, 1989). In both cases the same type of concern is present– the celebration – by perpetuating it – of a national identity and *heritage.*

In an almost paradoxical way these are the actual redoubts of the authenticity and identity that are demanded and consumed by the non-rural people. It is, in a great measure, a rurality re-created and in which not all the images and representations of authenticity and identity will be correct or genuine, although they are effective and accepted as facts (e.g. Dewailly, 1998). As Butler, Hall and Jenkins (1998: 14) refer this is also due to the fact that *"the overall image of rural areas is a very positive one in most of the developed world. Rurality may be a myth in the terms that many people regard it, a peculiar blend of nostalgia, wholesomeness, heritage, nature and culture, combining the romantic combination of man and nature working in harmony, captured on calendars and Christmas cards throughout the* *developed world, but it is a powerful myth that has created a demand for access to, and in some cases, acquisition of parts of the rural landscape"*. For the mentioned authors the most significant way of perpetuating rurality are the recreation and leisure activities, particularly the ones fit for tourism. Tourism, recreation and leisure activities largely contributed to the *formation of places*. In this way, these processes appear as the main institutional answers to the transformations that occurred in rural areas and to its relatively widespread declining situation. This predicament is so intense that it induces Butler, Hall and Jenkins (1998: 117) to inquire *"how many heritage trails, pioneer museums and villages, historic houses, roadside produce stalls, authentic country cooking, festivals, country shoppes and Devonshire teas can we stand?"*[vii].

Rural areas are demanded and consumed essentially by the bearers of the new rurality definition, or as Reis and Lima (1998: 345) say *"the principal bearers of this rurality definition, which doesn't become exhausted in the environmental dimension, rather transports dimensions of defense of the patrimony and the rural culture as well"* are above all the urban or urbanised populations. These areas are set as the post-modern and post-industrial paradigm of the intersection of the contemporary societies with the rural areas and with its environment (e.g. Figueiredo, 2003a). For its presence, for its behavior and, even more important, for the expectations, claims, interests and *desires* that they transport, the urban populations confer to the rural territories they frequent and consume a sense that is not, in most cases, in agreement with the representations and practices of the *local people*. This places important questions that are associated, in the first place, with the identification of the several demands and consumptions of the rural and, secondly, with the (latent or evident) conflicts of representations and practices in view of the same territory and environment. The conflicts can be multiple because as, among others, Larrére (1990) refers it doesn't just exist a type of demand, a type of rural areas, a type of consumptions, a type of nature, but an immense variety of any one of these aspects. As Butler and Hall (1998: 115) refer *"the way people view rural areas is of fundamental importance for the way they use rural areas. There are an increasingly diverse set of viewpoints or perceptions of rural areas, what they are, what they could be, what they should be, and how they could be brought there. Inevitably such a variety of viewpoints can result in disagreement over goals and objectives, and policies and methods of achieving such goals"*. Moreover, the different ways of *seeing*, demanding, consuming and *developing* the rural are hierarquized and hierarquizing, since underlying them there are very unequal power relationships and the unequal and effective materialisation of that same power. The resulting conflicts *"can occur at all levels, including within local communities, as well as between different levels of government and between the public and private sectors"* (Buttel and Hall, 1998: 115) and they can amplify a new subordination of the rural areas and its inhabitants in view of the *external* interests, represented essentially by the State and by the urban visitors. This also occurs because (particularly in the Portuguese context), the inhabitants' point of view is frequently ignored in the measures conceived for rural development.

3. Conflicts between rural environment's desires and needs in Portuguese rural areas

The Natural Park of Montesinho (NPM) is located in the northern region of Portugal and the 'Serra da Freita' (SF) in the central part. In spite of geographically apart these two areas share many social, demographic and economic characteristics. However, there is a relatively important distinction between both – the first one is a protected area and the second one does not possess any legal status of protection. This is, in our perspective, a fundamental difference, since while NPM is institutionally (as well as socially) recognized as an extraordinary rural environment; SF is just an ordinary rural area. On the other hand, we believe that the difference of protection status is also fundamental in terms of the different conflicts we can observe in both areas. NPM and SF areas could be characterised as *remote* and marginalized rural spaces in the Portuguese context. In fact, both areas are characterised by strong losses of population (more than 50% since 1960) due to outmigration and by having a small percentage of active population. The predominant economic activities are agriculture and cattle breading, although often combined with other (industrial or urban) activities. The two areas can also be characterised for having what we can call a high potential to attract visitors, and in both it is visible the existence of some competition for the environment and territory, as well as some resulting conflicts therefrom[viii].

Based on what we argued in the previous section, a relatively clear distinction has been forming between the rural space *lived* and the rural space *desired* or *consumed* as *visited*. Such distinction is susceptible of giving rise to several conflicts among the different actors and entities in presence in the rural areas. In the previous section we suggested that the *remote* rural areas (as NPM and SF areas) are above all the more demanded and consumed by the non-local users, since they tend to represent the post-modern paradigm of the intersection of the contemporary societies with the environment. The visitors of the rural areas we analysed confer equally to the territories they visit a different meaning from that of their inhabitants. This situation can be systematised in the following:

- the representations and the practices of NPM and SF visitors often neglect the productive character of these areas, what leads to their identification with *nature*. This fact is particularly visible in the visitors of the protected area (i.e. NPM) given the objectives and the legal status that the same possesses;
- the practices and the representations referred tend to provoke several kinds of conflicts, since there are multiple forms of demanding and consuming the rural spaces and their environment. The areas in analysis are such an example, once again for the different protection status that they possess. In this sense, the conflicts occurred in NPM area take root much more in the division rural *lived versus* rural *visited as protected* and those of SF in the dichotomy between the rural *lived* and *visited* as *vulgar* space and open to the most various and uncontrolled actions;
- in both areas we observe the materialisation of the fact that the different ways of demand and consumption are hierarquized and hierarquizing. This means (with larger evidence, once again, for the case of NPM) that there are legitimacies that override others, because more powerful and endowed with more efficient means of effective exercise of that power. Basically they are the *external* legitimacies (i.e., the visitors' ones and the State's ones at various levels) that tend to be imposed to those of the inhabitants of these rural areas[ix]. This fact constitutes an important catalyser of conflicts.

As we can see in figure 1, most of the residents and visitors of the analysed rural areas do not know of the existence of conflicts between the local population and the *secondary users*[x] of these spaces. The percentage of those that affirm to have knowledge of conflicts is just a little significant among the residents of 'Serra da Freita', so that we can affirm, although in a relatively crude way, that the relations between visitors and inhabitants, in the two considered areas, are essentially peaceful.

Bearing in mind the reasons for the occurrence of conflicts pointed by both types of people inquired, we observe that in 'Serra da Freita' the garbage, the invasion of agricultural properties, the noise and agitation provoked by the visitors constitute the reasons, in the inhabitants' perspective. In NPM area the reasons are very diffuse, none of them possessing the prominence of those mentioned for SF. Once again the difference of status is fundamental to understand these data, since the visitors that travel to NPM are individuals that demand the area essentially because it is a place where nature is protected, while SF visitors demand this area exactly because it is not *protected* and so they can develop there activities such as the practice of motor racing and picnics. The excess of visitors and their uncontrolled actions are, in fact, one of the most important threats to SF rural environment[xi].

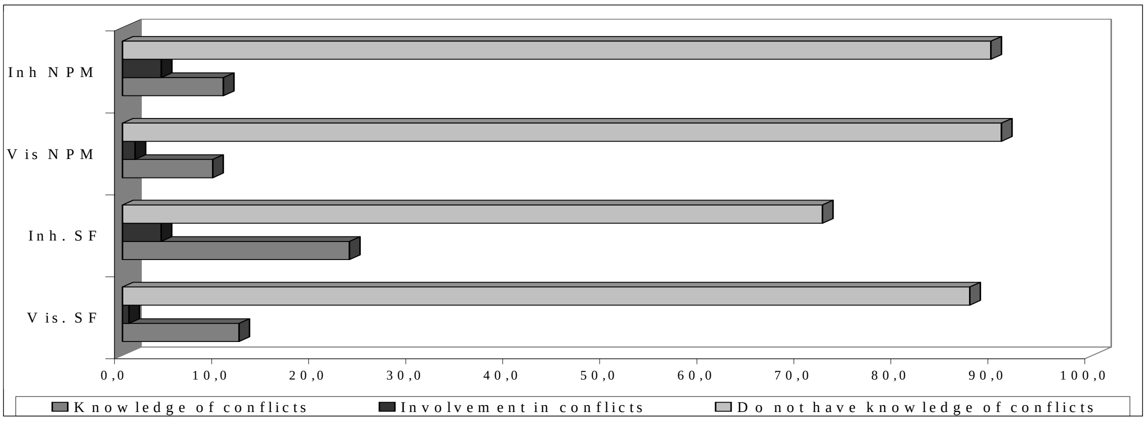

Figure 1 – Knowledge of the existence of conflicts between residents and visitors in NPM and SF areas

Concretely, Oliveira (1994) refers to some aspects directly associated with the external demand and consumption of this area, such as motor rallies, cross-country caravans and *motocross* racings that habitually take place in SF. These activities not only have roused protests on the part of the local populations but they also constitute important risk factors for the natural elements. In the same line Oliveira (1994: 72-73) points out that "*the improvement of the road network, allowing an easy access to some points of landscape interest (…) has been causing an excessive affluence of visitors, some weekends recording, in the Summer, traffic jams and flow troubles on the 'Serra' highways*[xii]". This situation originates conflicts that, in spite of being not evident in the data of the inquiries by questionnaire, are quite salient in the interviewees' speech:

> "*…Because… I also say… it comes thereabout lots of savage people, the youth from these zones near by, from those neighbouring municipalities and near cities come there only to disturb… and they come there at night and I don't know if it is drug or whatever… they make noise and disturb the people that live here in the villages.*" (JF17)

> "*If I was the owner of that space… I would put gates on it, I would close it. And I say why… because the jeeps, the cross-country, the motorcycles, etc. they only do two things: it is noise and they destroy everything that comes in front! The paths, the cultures, they frighten the animals, they scare the persons. People become terrified! They are full of fear, they hate it… and they don't leave there anything, only pollution.*" (ADRIMAG)

> "*Do you know? The visitor that goes to the 'Serra' is the common citizen… and the common citizen unfortunately still has few environmental concerns and he drags behind him a mess.*" (CMc)

> "*The village people when they phone here… they say… 'look! we don't have peace, we are going to close the road… we can't stand this'! Imagine a village where a car doesn't pass and I don't know what else… people come with the cattle and what else and the guys come with the jeeps going through there…. They cross through the fields, they move everywhere (…). Imagine what goes in their mind with this. They ask: 'but what is this?' It is that question we ask: what development? Is this development?*" (CMd)

> "*They come by the thousands…. By the thousands on Sundays…. Mrs…You don't pass… you don't have… the parking in the very approach roads is so chaotic, so ill-done that if there are problems there, for instance, there are situations where not even the firemen go through there.*" (CMd)

> "*They arrive here and they think that everything is theirs… There are situations that… there in the forest zone, in the Summer… they prefer to sit under the trees to lunch and that's OK. But afterwards it is only garbage bags all over the place, the cattle goes there to graze they arrive and eat that…. And there are products, scraps of food…. Everything they can. Sometimes that cattle is ill and we don't known where that came from.*" (JF17)

> "*Tourists?? Tourists is the garbage. The garbage that is made there, that is a shame.*" (JF26).

Reading the previous excerpts we remain not only with the notion of the existence of important conflicts between the inhabitants and the visitors, as with the idea of the main activities that the last ones develop in SF. These visitors, as we already mentioned, are different from the ones of NPM area. In effect, in this last area this type of problems is not pointed, nor this type of consumptions, since it is essentially consumed as *extraordinary* space and environment. Actually, in NPM the struggle for the environment is engaged between the inhabitants and the administration of the protected area, in a scale and with a dimension quite more significant than the fight between the different consumptions of this rural area by its inhabitants and visitors. Figure 2 shows precisely the dimension of the conflicts between the populations of the Natural Park and its administration.

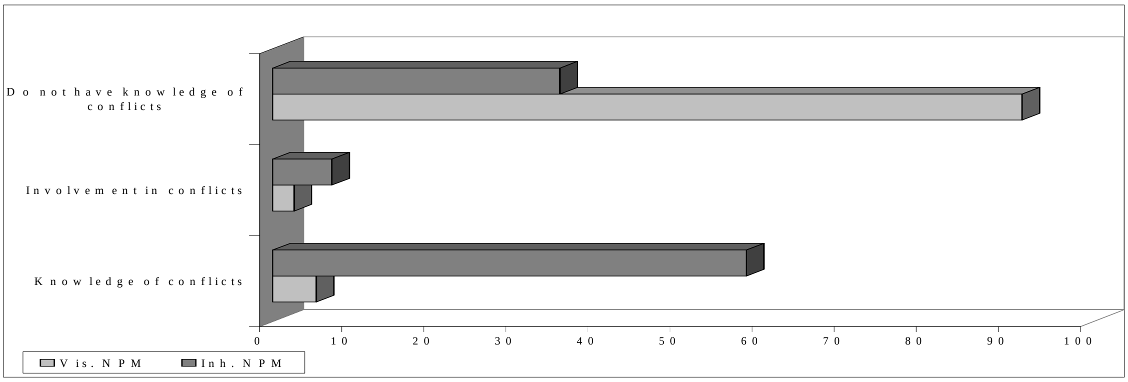

Figure 2 – Knowledge of the existence of conflicts between residents and visitors and NPM administration

We can observe that about 65% of the residents in NPM area know the existence of conflicts between the local populations and the administration of the protected area. However, of these, only 7,2% were directly involved in conflicting situations. As for the visitors (given its nature of *non-direct* and *external* users) most of them don't have any knowledge of the existence of conflicts. As main causes for the existence of conflicts the inhabitants point essentially the restrictions and the regulations that NPM imposes to the exercise of their everyday practices, concerning above all the natural elements[xiii], namely the restrictions to tree felling, killing of wild animals, enlargement of farmings and the construction and reconstruction of buildings without taking into account the traditional materials and outline. The listing of these reasons demonstrates well the situation of struggle for the environment that occurs in NPM area. This fight opposes essentially the *local people* to the *local nature managers*, the interests and the points of view of these last ones (usually) overriding the needs of the first ones.

The speech of the Parish Councils' presidents interviewed reinforces the data respecting the conflicts between the inhabitants and the administration of the Natural Park. Thus, 12 of the 16 interviewees refer both the effective existence of conflicts and situations of disrespect in view of the existing regulations, just as it can be observed in the following excerpts:

> *"here everyone fells* [trees] *at random, even after the Edict… nobody read anything. I still told some people that are felling. 'look, you don't fell cause now there are rules. The Park sent an Edict, you get a fine'… But what they cared more was the fine! They felled all they could… But the Park doesn't allow felling and people say: 'oh and who is the Park to say now that it doesn't allow felling?' And they fell all the same!"* (JF5)

> *"the felling…. Suppose that I have a very large oak grove and that I can even make three or four or five million escudos of firewood and that I have, for instance, a son studying at the university and I do need the money and to fell the trees in order to give the course to my son… why can't I do it? There are rules that are not very appropriate to people's life and there is some rigidity in that."* (JF6)

Besides the felling, the increase of the number of wild animals (e.g. the wolf, the boar, the roebuck), caused by the protection measures, and the negative impact that they have on the farming and cattle breeding activities it is also a reason for conflicts in NPM:

> *"Most people complain about the Park because they sow the lands and the animals destroy… I made a rye seeding in a land that has 6 hectares… and the deer… they got to be eighteen there together and eighteen such animals eat a lot of things and… now practically nobody cultivates anything. And then… they destroy the pasturages and there are some potatoes sowed and they go… and… but that is more the boar… they destroy the potato-field and now it is the Park that is…. And the Park still hasn't got the time to solve that."* (JF11)

> *"There are people here that the boar destroys their potatoes… 'it is the Park that is to blame because it protects them'… Oh well, since it is the Park that is giving protection to those species, the deer, the boars… people say that if it wasn't the Park they would put an end to all that."* (JF11)

> *"I myself have already criticised the Park once … I thought there was too much protection to the boar and I even told then (and they took it a little amiss) that for them it would be more important a boar than a person."* (JF6)

> *"Here… for instance… I cannot admit that IP4* [main road to Bragança] *here had to be altered for the sake of protecting half a dozen of queen eagles… that we had here. It seems to me that is to alter the natural… because the bird adapts. I… for instance sometime ago I had a…. It was not a strife, but… the Park Manager asked me not to make a certain opening of a road because it was the mating season of the deer… and I said: 'Oh Mr. Director, the animal is not ashamed to practice the sexual act at the sight of whoever comes, it has no problems'…. And therefore we went on with the road."* (CMb)

In NPM area, another type of problematic situation concerns the absence of information about the protected area and its regulations:

> *"the older people… some say 'at such, in a little while the people of the Park come here and everything belongs to the Park'… there are still many that think it is like this."* (JF13)

> *"The Park began to be more known here last year… when it went to the Parish Council so that we would stop planting and all that…. Before that it had never come here."* (JF15)[xiv]

> *"No… I don't know any rule … here we are very distant, isn't it?"* (JF14)

All theses excerpts make suppose equally that for some NPM residents the institution of this rural area as *protected* came to collide with their uses of the territory and the natural elements. On the other hand, they also suggest that a good part of the residents considers that also in NPM – to the likeness of what Ojeda-Rivera (1989) suggested about the National Park of Doñana, in Spain – *"a bird is worth more than a person"*[xv].

Another of the conflicting questions in NPM is associated with the perception of the benefits introduced with the creation of the protected area. In effect, most of the inhabitants of this area consider that there is no justice in the benefits' distribution. As we can see in figure 3 most of NPM residents believe that the benefits have just been felt by some groups of the Park's population or by the visitors.

The population groups that the residents refer are constituted essentially by the residents of other places in NPM area, mainly in the villages of Montesinho, Rio de Onor and Moimenta. Even the Director of the protected area recognises, with respect to this, that:

> *"it is a little the logic of 'home where there is not bread'…, isn't it? Feeling that Montesinho took the whole investment, or Moimenta… it is obvious that Moimenta and Montesinho and Rio de Onor have a strategic positioning in terms of example, isn't it? That other villages didn't have…. And therefrom they are clearly privileged villages, what is not anything amazing!".*

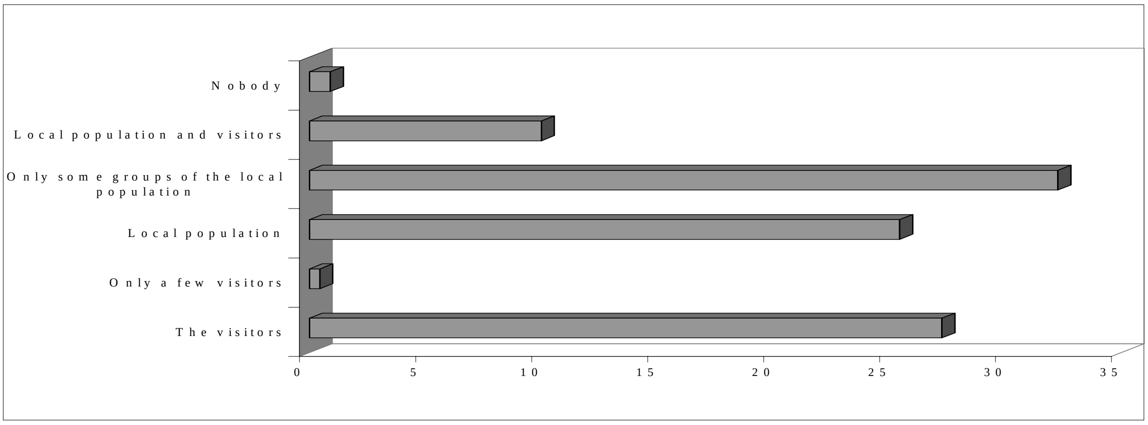

Figure 3 – Principal beneficiaries of NPM creation, according to its residents

In the same sense, but stressing that in many cases the larger access to the benefits depends on the local initiative, one of the local politicians refers:

> *"what happens often is that there are people that have more initiative and many times the people or villages more benefited, where the Park does more things… it is them that go to the Park and ask the things and those were the ones benefited… it is more the people that are more informed. People have the idea that there are villages more benefited than others… but that happens because there are villages that don't have the same dynamism, for instance, than the village of Moimenta… but that is as in everything, the information doesn't arrive everywhere (…). There were few people that knew what the Park was, there were few people that knew what were the supports that the Park could give… and there are few people that still know."* (CMa)

In general, the presidents of the Parish Councils have an opinion quite similar to the one of the local population, as we can observe in these interview excerpts:

> *"Well… here we… the benefit that we have from the Park…. We never had any… it is now only the plantation that they are doing. I think there are others that have been developing more than we here… we are forgotten here (…). One that has developped and it has been protected a lot by the Park it is Moimenta."* (JF15).
>
> *"I think that some parishes take… so, they take more than others. Ahn… I think that Rio de Onor, I think Montesinho, Moimenta, França are the most benefited villages."* (JF13).
>
> *"The Park here hasn't done much yet, but there are villages where it did a lot already, more near Bragança and we are also a bit to blame, because we should get together and say: 'no, you are only doing in Bragança'… but no one ever did that and it is necessary to have a 'fanatic'…"* (JF12).
>
> *"It hasn't… ahn… I think that is more over there near Bragança than round here. I don't know well… in França I think it has done already a lot of things… (…). Here the Park hasn't been quite present till now, I never saw the director here… he shall not know a lot here."* (JF10).
>
> *"I think there are some villages, as Rio de Onor, França and certain villages that are more integrated even in the part of the Park… Montesinho and Rio de Onor are the most benefited villages, isn't it? Me… I don't quite agree with that."* (JF9).
>
> *"In the parish of Moimenta… the Park has been working there a lot…. The people of Moimenta have benefits there… they do, they do… Moimenta has many benefits there, the sanitations… the People's House… the house of the Park… all that… it was all the Park. I think that… they could be helping in all the parishes and not only in one… isn't it"?* (JF5).
>
> *"They have been more benefited on Bragança's side than in Vinhais… and I think that is not right. If we are all protected inside the same zone, I think they should care a little for all. There are really some that have everything, everything, everything from the Park and there are others that don't."* (JF16).

The assessment of the benefits' distribution as essentially unequal is based not only on the capacity of initiative of some Parish Council's Presidents but, as we can see by the previous excerpts, also in the larger presence of the Park in the group of parishes belonging to Bragança's municipality. Also to emphasise that some of the interviewees understand that such unequal treatment is also due to the unequal conservation conditions and even geographical location of the more benefited villages.

From everything that we have been pointing two different situations take shape in what concerns the strife for the rural environment, in NPM and in SF areas. Thus, in this last case, the conflicts occur clearly between the inhabitants and the visitors, reinforcing the dichotomy between the *lived* and the *visited* rural, between the needs of who inhabits 'Serra da Freita' and the *desires* of who demands it while object of consumption. In NPM area the conflicts do not occur in an evident way between its inhabitants and its visitors, but essentially (and in an expressive manner) between the residents and the administration of the protected area. In NPM, the fight for the rural environment has underlying the dichotomy between the *lived* and the *protected* rural.

4. Conclusion

Along this work we tried to debate the emergence of rural areas as new objects of consumption in the contemporary societies, attempting simultaneously to discuss the type of conflicts (and some of its consequences) that can follow from that situation. The constitution of rural areas as objects of consumption, essentially due to their environmental function, has caused the increase of the demand and frequency of those areas by populations that we define as *non-local*. These usually transport with them interests, expectations, motivations and desires in view of the rural environment that, not rarely, are in dissonance with the needs and aspirations of the local populations. Such situation tends to provoke conflicts or *fights* regarding the rural and its environment that should be paid attention in the development and protection measures for that space, namely because it can have important consequences in terms of natural resources use and preservation.

Based on the empirical data gathered, we observed that the conflicts occurring in NPM area proceed from the differences between what we named as the *rural lived* and the *rural instituted as protected*, i.e., between the residents of the area and its administration. These conflicts have ground on the rejection of the regulations that the protected area came to impose on the residents and on the embarrassments that these rules place to their everyday activities. The conflicts in this rural environment occur equally from a perception of the inequalities of the benefits' distribution from instituting this area as *protected*. This situation have some important consequences in terms of natural resources and landscape's preservation, namely throughout the disrespect of the NPM's regulations, as we observed in the previous section.

In 'Serra da Freita' the conflicts tend to occur between the inhabitants and the residents, being clearly associated with the status of *vulgarity* that this area possesses in institutional terms (i.e., it does not possess any legal recognition of its environmental value or other). Indeed, it is the practices and the unregulated and uncontrolled behaviours of the visitors that originate an important part of the conflicts observed in this area. From here we can infer that while in NPM the conflicts are associated with its status of protected area, in the case of 'Serra da Freita' their association is inverse, i.e., with the absence of regulations. This means that the conflicts occur in a different way in different rural areas, essentially from the point of view of their protection. For these reasons we can say that in 'Serra da Freita' we are clearly before a confrontation between a *lived* rural and a rural that is *visited as not protected*, while in the case of NPM it is a *lived* rural that is opposed to a *protected* rural and that is also *visited* in that quality.

If it is not possible to deny that rural areas possess important environmental functions essentially for the *non rural*, those functions can have several negative effects and result in conflicts as the ones that we analysed for the areas of the Natural Park of Montesinho and 'Serra da Freita', namely the ones that are associated with the dichotomy in terms of social and institutional representations between the rural as *life space 'versus'* the rural as *recreation space* and object of consumption. The dichotomy is now predominantly social, but it also possesses spatial contours since it is in the same space that occured the duality of social representations and practices, susceptible of conditioning the future development paths. The analysis of the empirical information made possible to conclude that legitimacies, representations and several social practices are part of the mentioned dichotomy, and the ones that are transported by the external actors override the ones that are played by the local inhabitants. In view of this conclusion, the wider debate concerning the constitution of the environment as an asset or a constraint for the development of the *remote* rural areas, in Portugal, is not only meaningful but it also becomes inevitable. And this inevitability also comes from the realisation, given by the empirical evidence, that the environmental issues tend to place rural areas in a subordinate position since the *internal* or local logics and legitimacies have not been taken into consideration in the programs and measures for those areas, either in terms of environmental protection or in terms of social and economic development. Moreover, the conflicts we identified in both areas tend to provoke important impacts in terms of landscape and natural resources' preservation, given the situations of disrespect of the regulations (in the NPM's case) and the inexistence of that same regulations (in 'Serra da Freita' case). We consider that further research is needed in order to measure the extent and importance of the conflict's effects on the rural environment, namely taking into account the existence of different status of nature and environment protection in Portugal.

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6. Notes

i In fact, as referred by Pepper (2000: 445) *"if an 'environmentalist' (says the Oxford English Dictionary), is 'one who is concerned with protection of the environment' (…) nowadays most of us in the West are 'environmentalists' by this simple definition"*.

ii However, as it is emphasised in a quite recent work of Woods (2003: 272) *"'nature' has long been a keystone in the social construction of rurality. The discursive dualisms of nature-society and nature-civilisation have historically informed the separation of town and country in literature, art, government policy and lay discourse and have fed moral geographies which by aligning rurality with nature have elevated the countryside as pure, nobler and more treasured space than the city"*. On this subject one can also see the works of Macnaghten and Urry (1998) and Cudworth (2003), among others.

iii We say *rural picture* in a very generic sense since as the works of Macnaghten and Urry (1998) and Woods (2003) demonstrate there are several representations and several understandings of nature and rural environment.

iv See, among others, the works of Chamboredon (1980, 1985), Lizet (1991), Butler and Hall (1998) and Dewailly (1998).

v In other words, at the level of the policies, programs and measures for rural development.

vi And also to constitute those aspects as well as the rural as *museums*.

vii Based exactly on this interrogation, we presented recently a work where we discussed the tourism's role in rural development, with the title *"how many more 'tipic villages' can we stand?"* (see Figueiredo, 2003b).

viii For the analysis of the conflicts among the visitors, residents and administrative and political authorities it were applied, in NPM area, 150 inquiries by questionnaire to the visitors and 220 to the residents of 16 of the 35 parishes that integrate this protected area. In this area 20 interviews were also made to the political-administrative entities. In 'Serra da Freita' we applied 150 inquiries by questionnaire to the visitors and 201 to the residents of 10 of the 19 parishes that integrate this area. We made equally 15 interviews to the administrative and political entities. In this section, when we refer to the *visitors*, *residents*, and *entities* we are simply considering the social and institutional actors that were inquired.

ix The residents we inquired in both study areas are all from rural origin. In fact we can say that the NPM and the 'Serra da Freita' areas have little capacity of attracting new residents, namely ones from urban origin.

x We are referring to the non-local users of these areas.

xi The area of 'Serra da Freita' doesn't possess, as we referred, any legal status of protection. However it is included in Biotopes Corine and in the *National List of Sites* in the ambit of *Directive Habitats*. Any of these instruments doesn't have legal relevance as concerns the intervention in the territory and the institution of regulations that seek to control human activities.

xii There isn't any study on the visitors of this area that allows quantifying them. The works of Valente (2000) and Figueiredo (2003b) only allow characterising some visitors regarding their motivations for visiting this area and their behaviours.

xiii In what concerns NPM regulations in view of nature, we joined in this category two types of situations: the first one relative to the disapproval on the part of the Park of certain behaviors of the population regarding the natural elements and the second one related with the disagreement of the local population in view of the existing rules concerning the use of those same resources.

xiv However, we must say that the NPM was created in 1979, 24 years ago.

xv To this purpose see also Figueiredo's work (2001c), under the title *"Is a boar worth more than a person? The representations of inhabitants and visitors on the Natural Park of Montesinho"*.

Studying the Effect of Organic Farming on Rural Landscapes: Issues of Methodology and Scale

Gregor Levin*

Abstract

Implying changes in land use practices, the conversion from conventional to organic farming has a potential effect on the spatial arrangement of land cover and thus on structure and content of natural and semi-natural landscape elements. Several studies point to that organic farming has a positive effect on the content of natural and semi-natural elements in Danish and other European landscapes. However, these findings seem biased by inadequate sampling methods and narrow spatial and temporal study scales. On the contrary, the few studies using more comprehensive samples and broader scales, indicate that variations in the content of natural and semi-natural landscape elements are influenced by regional and local biophysical variations in relation to the localisation of organic farms rather than by organic or conventional farming as such. Consequently, in the context of a current Danish research project on this issue, this paper argues for two supplementing methodological approaches. The first, using national datasets on landscape features, farm characteristics and biophysical conditions. The second, using aerial photos for the last 5 decades together with agricultural statistics, questionnaires and biophysical base maps within larger continuous case areas.

Introduction and background

With special focus on natural and semi-natural landscape elements[1], this paper reviews existing Danish and other European studies on relationships between organic farming and landscapes with special focus on natural and semi-natural landscape elements. The findings from these studies are evaluated in the context of applied data, methods and study scales. On basis of this evaluation it is argued that particularly sampling methods and choice of temporal and spatial study scales are critical issues for the design of an appropriate methodological framework when studying relations between organic farming and landscapes.

Agricultural production is closely tied to its land base. Spatial configuration of soil quality, topography and constraining or promoting landscape elements influence agricultural strategies. In contrast, agriculture also significantly influences landscape patterns as farmers form them to better support their production needs. Throughout history socio-economic, cultural and political changes together with technological improvements affected land use options and led to alterations of landscapes. Consequently, alterations in agricultural practices related to the conversion from conventional to organic farming imply a potential effect on landscape patterns.

In Europe organic farming has a history of more than 75 years. Following a rising awareness of the negative environmental effects of conventional farming, from the late 1980s state subsidies for organic farming in most EU-member states led to a considerable increase of organic farming (Yussefi and Willer

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1 In the context of this paper the terms natural and semi-natural embrace uncultivated undisturbed or extensively used landscape elements like bogs, heath, ditches, hedgerows, meadow etc.

2003). Thus, at present organic farming constitutes an important actor in many European countries, not least Denmark where currently roughly 6,5% of all arable land is farmed organically.

In the societal and political sphere a general expectation exists that organic farming benefits nature content in rural landscapes. Due to its holistic system approach it is seen as a tool to counteract the accelerated negative impact on Danish and other European landscapes that followed intensification and industrialisation of agriculture, particularly after World War II. E.g. Wilhjelmudvalget (2001) points to organic farming as an instrument for more efficient protection of natural and semi-natural elements in Danish landscapes. Yet, though principles for organic farming include the maintenance and protection of plant and wildlife habitats (IFOAM 2002) in most countries standards and rules for organic farming do not specifically concern natural or semi-natural landscape elements.

A potential relation between organic farming and quantity of natural and semi-natural landscape elements however exists and reasons are in principle twofold. First, qua its definition and ensuing standards and regulations, organic farming induces changes in agricultural practices that have a potential effect on landscape patterns and structure. Due to a ban on chemical fertiliser and pesticides organic farming is forced to maintain nutrient balances through crop rotation, possibly leading to a larger heterogeneity in land cover and thus more and smaller fields with longer field margins, which are potential small-scale habitats for wild flora and fauna (Frederiksen 2001). Further, in order to prevent plant diseases and pests without chemical inputs, organic farming possibly promotes the creation and maintenance of small biotopes as habitats for natural predators (van Elsen 1997; van Elsen 2000). Potential reverse effects of organic farming on landscape configuration have also been suggested. The necessity to, to a larger degree maintain supplies of nutrients and matter from within the production system could force organic farmers to intensify land use on formerly uncultivated or marginal land (Frederiksen 2001). As a consequence, although organic farmers may not be directly forced to maintain or improve certain aspects of landscape patterns through production standards, differences in agricultural practices can have a potential effect on landscape patterns. However, such effects of conversion to organic farming will be subject to regional variations and to variations between different production types. E.g. Langer (1997) argues that in Denmark the conversion of pig breeding or crop producing farms will have much more marked effects on the landscape pattern than the conversion of dairy farms.

Second, recent research indicates that land use practices and thus their effect on the landscape pattern have to be seen within a broader framework, embracing socio-economic and cultural parameters (Brandt, Primdahl et al. 1999; Ellis, Heal et al. 1999; Primdahl 1999; Kristensen, Thenail et al. 2001). E.g. based on an analysis of landscape changes within two parishes in western Denmark, Busck (2002) argues that other landscape functions than only agricultural production need to be included in analyses of farmers' landscape management decisions. Busck's results indicate that values largely influence farmers' landscape practice. Similarly Madsen (2001) demonstrates that farmers' reasoning concerning the location of afforestation areas is very complex and includes their socio-economic situation and cultural background. Though research comparing organic and conventional farmers with regards to socio-economic and cultural differences is scarce, such differences may certainly exist, at least in a local or regional context and thus be reflected in variations within landscape practices.

In conclusion, agricultural practices as well as socio-economic conditions and cultural background directly or indirectly influence the way farmers manage the landscape on their farms. Differences between organic and conventional farmers with respect to these parameters therefore imply potential variations in landscape patterns between organic and conventional farms (Stolze, Piorr et al. 2000; Frederiksen 2001). On basis of the above argumentation of the potential effect of organic farming on rural landscapes, the following section presents a number of studies and their findings in the context of used methods, field site sampling and applied spatial and temporal scales.

Review of existing studies

Denmark

Larsen and Clausen (1995) investigate densities of small biotopes[2] on 30 organic farms located within two larger areas on Zealand and compare results to conventional farms from another study on small biotopes in 13 case areas in east Denmark (Biotopgruppen 1986). Their study is based on aerial photo interpretation and registration in the field. Furthermore, historical aerial photos are used to examine changes in field sizes on organic farms. Results point to markedly higher densities of small biotopes on organic farms, constituting 6,5% of all land compared to 4% on conventional farms. Additionally, results also show that field units are smallest on organic farms and have since the 1950s only become slightly larger. Several explanations for these differences between organic and conventional farms are put forward comprising divergent agricultural production, organic standards and farmers' attitudes. But these explanations lack empirical foundation. Furthermore, it is supposed that organic farms are primarily located in areas that in advance are rich in small biotopes. However, this hypothesis can not be underpinned, as the spatial scale of the study is restricted to single farm units and does not encompass the surrounding landscape or a comparison between regions. Furthermore, the investigation of changes is restricted to field sizes on organic farms and can thus not elucidate whether these tendencies are only characterising organic farms.

As part of a larger study on divergences between organic and conventional farming Tress (1999) investigates extent and management of natural and semi-natural landscape elements in two Danish counties[3]. Tress's investigation is based on questionnaires with all responding (133) organic farms and a stratified random selection (330) of conventional farms in the two counties. Differences are most pronounced on the cultivated areas, where organic farms have a larger variety of crops and generally more grassland. However, results also point to a generally higher amount of uncultivated land on organic farms. Moreover, organic farms have higher densities of linear biotopes (esp. hedgerows) while densities of area biotopes (e.g. ponds, groves) are higher on conventional farms. Results also indicate organic farmers being slightly more active in landscape management than conventional farmers. Yet, it is important to note that while differences in the quantity of landscape elements between organic and conventional farms are apparent, they are generally much more marked in relation to other variables. E.g. type of agricultural production, farm type[4] and farm sizes showed much more pronounced relationships to quantities of landscape elements than the division into organic and conventional farming. Additionally, there are large differences in both biophysical and agricultural characteristics between the two counties, pointing to the importance of regional variation. Using questionnaires, Tress is able to include a relatively large number of farms in her study, making the findings more general than results from Larsen and Clausen (1995). Still, as data on biophysical conditions on the studied farms were not included, the investigation is not capable of elucidating whether the documented differences in densities of natural and semi-natural landscape elements are biased by the studied farms' biophysical environment rather than related to organic or conventional production. Further, the spatial scale of the study is limited to the single farm units, preventing to relate landscape patterns on the farm to patterns in their surroundings. Even though information on recent interventions in the landscape is included, in general, the time scale of the study is limited to an up-to-the-minute account.

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2 The term small biotope here embraces small uncultivated landscape elements, e.g. hedgerows, ponds, ditches, field boundaries (Agger, Brandt et al. 1986).

3 Tress used the counties of Vestsjælland in eastern Denmark and Ribe in western Denmark in order to represent two regions with very different biophysical conditions for agriculture.

4 Tress (1999) distinguishes between full time, part time and hobby farmers.

In the third Danish study Ackermann (2003) investigates content of natural and semi-natural landscape elements for all 17 organic and all 11 conventional farms within a continuous case area in southern Jutland. On basis of aerial photos, landscape elements are registered for 1990, 1995 and 1999. Results indicate that spatial variations in content of natural and semi-natural landscape elements are primarily related to local variations in biophysical conditions and not to organic vs. conventional farming methods. Furthermore, a questionnaire survey and in depth interviews revealed that attitudes towards landscape values are related to the single farmer's socio-economic and cultural background rather than to organic vs. conventional farming strategies.

Sweden

In relation to the discussion of spatial scale it is relevant to mention a smaller Swedish study (Lindkqvist 2002). For 27 organic and 27 conventional farms distributed equally over nine regions representing three basic rural landscape types[5] the study focus is partly on differences in landscape patterns between organic and conventional farms and partly on whether landscapes surrounding organic farms are different from landscapes surrounding conventional farms. The study is thus elaborated at both farm scale (single farm units) and landscape scale (5x5 km squares). The investigation is based on a GIS[6]-analysis containing data from topographical maps and aerial photos. The fact that the conducted farms were selected within the same nine regions, each representing a principal Swedish landscape type with its characteristic biophysical conditions, does to some extent overcome the bias from a more random selection used in other investigations.

Results indicate slightly larger amounts of semi-natural and natural landscape elements on organic farms. However, these differences are not statistically significant and seem influenced by a few outliers among the organic farms. Additionally, an investigation at landscape scale showed no clear differences between landscapes surrounding organic and landscapes surrounding conventional farms. Yet, at regional scale, differences between landscape types are very pronounced. Results thus underpin the assumption that differences in the quantity of natural and semi-natural elements in rural landscapes are related to regional differences in biophysical conditions rather than influenced by organic vs. conventional production forms.

UK

A British study evaluates whether the impact of organic farming on rural landscapes differs from that of conventional farming and whether these impacts are beneficial to the landscape (Entec 1995). 24 organic and 24 conventional farms within both upland and lowland landscapes of England and Wales are included in the study. Furthermore, the study distinguishes between horticultural and mixed farm types and long term and short term organic farms[7]. Among other criteria, the amount and type of hedgerows, the number and type of hedgerow trees and the field sizes were used as measures for nature content of rural landscapes. Results show that in lowland areas mixed organic farming has a noticeable positive effect on landscapes mainly due to pronounced differences to the intensive conventional farms. Because of a generally less intensive character of farming, in upland regions there is little discernible difference in effects on landscapes between organic and conventional farms. The length of time through which farms have been farmed organically did not prove to influence farmers' landscape practices.

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5 Lindqvist (2002) uses forest landscape, plain landscape, and combined plain and forest landscape as the three typical Swedish rural landscape types.

6 Geographical information system

7 Long term organic farms = farms which have been organically farmed for 10 years or more; Short term organic farms = organically farmed for 2-5 years.

The study suggests that the degree to which farmers positively affect the landscape is more a matter of the attitude and initiatives of the particular farmer and not the direct result of whether a farmer adopts an organic farming system or not. It also suggests that organic farmers are more likely to adopt farming and land management practices, which are beneficial to the landscape and the environment as a whole. Thus, farmers who choose organic methods provide net benefits to the landscape largely because of their awareness of the environment in general (Entec 1995).

However, these suggestions are not empirically underpinned. The study is based on quantifiable measures and issues related to farmers' perceptions or values are not addressed. Furthermore, even though sampling methods pay attention to biophysical variations between upland and lowland landscapes, biases related to local variations are not further considered.

Other European countries

A method for the assessment and comparison of landscape features between conventional and organic farms was developed by the EU Concerted Action "The landscape and nature production capacity of organic/sustainable types of agriculture."(van Mansveld and van der Lubbe 1999). The aim of the EU Concerted Action was to produce a tool that allows comprehensive (holistic) interdisciplinary evaluations of farms and their nature and landscape production potentials. A system of six sets of criteria[8], covering all relevant aspects of farm-landscapes was used to evaluate the contribution of organic and conventional farms to landscape quality in the following European countries: Netherlands, Germany & Sweden (van Mansvelt, Stobbelaar et al., 1998); Tuscany (Rossi and Nota, 2000); Ireland (MacNaeidhe and Culleton, 2000); Crete (Stobbelaar, Kuiper et al. 2000);Andalusia, Netherlands, Portugal and Crete (Kuiper 2000); Netherlands (Hendriks, Stobbelaar et al. 2000) and Norway (Clemetsen and van Laar 2000). The evaluation was carried out by groups of experts visiting the particular farms. The different criteria were then addressed through field observations and group discussions. Results are thus not as quantifiable as it is the case in the other presented studies. Still, with respect to natural and semi-natural landscape elements or biotopes, the investigations end up with measures that allow the comparison of numbers and/or densities of such elements on the investigated farms.

Almost all investigations using this approach point to organic farms considerably increasing the content of natural and semi-natural landscape elements or biotopes compared to their conventional counterparts or the surrounding conventionally farmed landscape. However, due to very small samples (2-8 farms per region), results can not be generalised. Furthermore, the rather subjective selection of investigated farms must be expected to, to a high degree, bias results. E.g. for a comparison of landscape features on organic and conventional farms in the Netherlands, Germany and Sweden, the organic ones were selected as well known for their long-time management in favour of landscape production (van Mansvelt, Stobbelaar et al. 1998).

It is argued that the concept of organic agriculture as such includes all instruments to produce quality landscapes and it is put forward that the successful implementation of these options depends on the farmers' attitude and motivation, which often are more pronounced among organic farmers (van Mansvelt, Stobbelaar et al. 1998). However, these finding have not been systematically investigated and little attention is paid to limitations due to subjective selection and small samples. Furthermore, applied temporal scales only give an up-to-the-minute account and are thus not able to reveal whether organic farming does increase the content of natural and semi-natural landscape elements over time.

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8 The used criteria are environmental studies, ecology, economy, sociology, psychology, physiognomy and cultural geography (Rossi & Nota 2000).

Critical issues for further research

Table 1 summarises the different studies with respect to methodology and results. Methodological approaches differ widely, as do consequences for sample-sizes, precision and quantifiability of results. However, all investigations have in common that they somehow address the content of natural and semi-natural landscape elements on the investigated farms. The table and the above presentation of different studies indicate that the application of narrow spatial and temporal scales together with small and/or subjectively stratified samples direct results towards a positive relation between organic farming and content of natural and semi-natural landscape elements. In contrary, results from those studies using broader spatial and temporal scales and/or sampling methods, which pay attention to local and regional bio-physical variations, point to much weaker or no relations.

This is not to reject the studies indicating a positive relation. To examine relationships between organic farming and content of natural and semi-natural landscape elements is not necessarily the primary aim of all studies presented here. E.g. the aim of the EU Concerted Action "The landscape and nature production capacity of organic/sustainable types of agriculture." was primarily to elaborate a common tool for evaluations of farms' nature and landscape production potential, not to make up relations between organic farming and rural landscapes. Furthermore, organic farming and thus its effect on rural landscapes may vary largely between different European regions. However, without discussing the obvious limitations related to specific methodological designs, others, e.g. Mander, Mikk et al. (1999) and Stolze, Piorr et al. (2000), refer to the findings of the EU Concerted Action and other studies as supporting positive relations between organic farming and landscapes' nature content.

Table 1: Summary of methods, sampling-strategies, study scales and results in existing studies.

authors and year	coun-try region	method	No. of farms		sampling method	applied study scales		relation between org. farming and land-scapes' nature con-tent***
			org	conv		spatial*	temporal**	
Clausen and Larsen 1995	DK	field registration, aerial photos	30	-	random sample within two larger areas	F	M (40 years for org. field sizes)	++
Tress 1999	DK	question-naires	133	330	all org. farms and stratified random sample of conv. farms	F	M (several years for landscape activities)	+
Ackermann 2003	DK	aerial photos, question-naires	17	11	all farms within one case area	F & L	10 years	-/+
Lindkqvist 2002	SE	aerial photos, digital maps	27	27	stratified random sample within 9 regions and 3 landscape types	F & L	M	-/+
Entec 1995	UK	field registration, question-naires	24	24	stratified sample within 2 regions/ 13 counties	F	M	++
van Mansvelt, Stobbelaar et al. 1998	NL, D, SE	field observation	12	15	subjective strati-fied sample	F	M	+++
Rossi and Nota 2000	Tusca-ny	field observation	2	-	subjective strati-fied sample	F & L	M	+++
Mac Neaidhe and Culleton 2000	IR	field observation	2	2	subjective strati-fied sample	F	M	+++
Stobbelaar, Kuiper et al. 2000	Crete	field observation	2	-	subjective strati-fied sample	F	M	+++
Kuiper 2000	Anda-lusia, NL, PT, Crete	field observation	5	2	subjective strati-fied sample	F	M	++
Hendriks, Stob-belaar et al. 2000	NL	field observation	4	4	subjective strati-fied sample	F	M	+++
Clemetsen and van Laar 2000	N	field observation	2	-	subjective strati-fied sample	F	M	+++

* L = landscape F = farm

** M = up-to-the-minute account (no temporal dimension)

*** -/+ = no clear relation; + = slight relation; ++ = clear relation; +++ = very clear relation.

Yet, small samples limit the validity and generalisability of results, even at a local scale. Additionally, sampling strategies, which do not take into account spatial variations in biophysical conditions, may obscure the influence of an uneven spatial distribution of organic farms in relation to biophysical characteristics. The same may be valid if sampling strategies pay limited attention to the effect of variations in production types, farm types and farmers' socio-economic and cultural situation, which may be related to landscapes' nature content. Further, the most relevant question is not whether densities of particular landscape elements are higher on organic farms than on conventional farms but if organic farms contribute more positively to the nature content of the landscapes they are located in. However, keeping spatial study scales to farm units hinders conclusions about the influence of organic farming at landscape scale. Finally, as landscapes are dynamic systems that change over time, an examination of the effects of organic farming on the rural landscape will achieve more validity when applied within a broader time scale. Otherwise, results will only give an up-to-the-minute account unable to reveal whether organic farming is related to an increase in landscapes' nature content compared to conventional farming.

It may be a difficult task to incorporate all these methodological considerations into one investigation. However, the above review on existing studies forms the basis for the methodological design of a current PhD project on landscape changes following conversion to organic farming in Denmark. The project focuses on the spatial distribution and amount of natural and semi-natural landscape elements, which in the last 50 years, due to industrialisation and mechanisation of Danish agriculture, have experienced a radical decline (Agger and Brandt 1988).

Considerations on sampling strategies, spatial and temporal scales and convenient data can be addressed in two ways. First, a large-scale investigation can be elaborated on the basis of national datasets for topographic and soil conditions together with digital maps on natural and semi-natural landscape elements and agricultural statistics at farm scale. Such analysis enables to spatially relate content of natural and semi-natural landscape elements to biophysical conditions, agricultural production, farm sizes and organic and conventional farming methods at the level of the single farm properties. The advantage of such analysis is the option to include both production and biophysical parameters at a large spatial scale. Drawbacks are the general inaccuracy of such national datasets. Furthermore, the spatial reference does not completely reflect the land area the respective farms' are managing, as farm properties do not include rented land. Finally, the temporal scale will be limited to an up-to-the-minute account. Nevertheless, such analysis will indicate the respective influence of production and biophysical factors on the content of natural and semi-natural landscape elements.

The second approach, which will be used in the current study, is a more detailed analysis for 4 case areas with a relatively high density of organic farms. Each case area, covering roughly 30km², represents a characteristic Danish landscape type with respect to biophysical conditions and historic development[9]. For all landscapes and for the organic and conventional farms within the areas, natural and semi-natural landscape elements will be registered in a GIS on basis of aerial photos. In order to apply a broader temporal scale to the study, registrations are carried out for 2002, 1999, 1995, the early 1980s, and mid 1950s. Information on landscape management and farm and household characteristics are derived from questionnaires conducted to all organic farms and a corresponding collection of conventional farms within the case areas. Furthermore, data from agricultural statistics and biophysical base maps are added to the analysis. The integration of this multitude of information will give a more comprehensive picture of if and how organic farming is related to spatial variations in the rural landscape's content of natural and semi-natural landscape elements at both farm and landscape scale. The application of a broad time

[9] Chosen landscape types are: 1) Hilly moraine landscape in the periurban area of Copenhagen in northern Zealand, 2) Intensively cultivated hill island landscape in western Jutland, 3) Intensively cultivated moraine landscape along a river valley in eastern Jutland, 4) Intensively cultivated hilly moraine landscape in western Jutland.

scale enables the investigation of the spatial development of natural and semi-natural landscape elements in relation to the appearance of organic farms and to the structural development of agriculture in general.

In total app. 150 farms distributed over the 4 case areas will be included in the study. Of course it will not be possible to extrapolate findings to the whole country. However, through the application of broader spatial and temporal scales, the study will overcome some of the methodological drawbacks of earlier research and thus contribute to the understanding of relations between organic farming and landscapes.

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The Indeterminacy of Technical Effects: The Case of the 2nd. Generation Water Conservation Project, the Netherlands

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Abstract

This paper reports stakeholder perceptions of the technical effects of on-farm weirs in an area of sloping, free-draining, sandy soils, in the context of water conservation by the agrarian sector. The effect variables desired by the stakeholders are related to the target variables of the intervention, and to the differences in the mix of policy mechanisms that frame action in two Dutch provinces. The study reveals a wide range of views, variable certainty about being able to establish 'the truth' about the effects, and the extent to which this matters. The core of the issue is that technical effects are irreducibly indeterminate in the context of dynamic inter-active relationships. In North Brabant the approach is seen by stakeholders to have a bias toward building trust and multi-stakeholder learning processes, anchored in experience; in Limburg, the perception is of a bias toward creating binding obligations, anchored in rules.. In terms of the cognitive basis of social learning, one can say that only in North Brabant is there emergence of **coherence** among stakeholders. However, it cannot be shown in either case that there is greater **correspondence** between actions and desired effects.

1. Introduction

This paper deals with a case study in a country in which all surface and groundwater water, and all land use, is managed (albeit under different laws, which severely constrain integrated planning). The case presents a 'moment in time' in the flux of multi-year experimentation with 'agrarian water management'[1]. While groundwater is the responsibility of the provinces, river and surface water management over historical time has been handed to expert institutions, the water boards, and to a powerful national coordinating agency. The water boards have their own tax powers and elected governing boards. Historically, farmers dominated the boards but a reconstruction of the basis of representation has led in recent years to a growing 'democratisation' and the intrusion of non-farming interests. The project, coordinated by a farmers' union, thus represents in part an attempt by farmers' organisations to re-gain the initiative and safeguard their entrepreneurial flexibility.

This paper focuses on part of a much larger study, the relation between 'target' and 'effect' variables with reference to stakeholders' perceptions of the technical impacts of the placement of small weirs on-

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[1]. The experiments began with a number of small scale actions that led to *Beregenen op Maat* (metered use of overhead sprinkler irrigation) In North Brabant, the BoM today covers some two thirds of the irrigated area, and over one third of irrigators; based on a 2000 study, non-participants on average use 26 cum and participants 21 cum groundwater (Provincie Noord-Brabant, 2000).. BoM was followed by a range of crop-water management efficiency experiments and on-farm trial of various physical measures for holding winter rains in farm ditches (known as the 1st. Generation Water Conservation project, this phase also included the Belgium provinces of Antwerp and Brabant) (Jiggins, 2002; 2003). The 2nd. Generation project reported on here, will be followed from Jan .2004 by a new project, again including Antwerp and Brabant.

farm, in the two Dutch provinces of Limburg and North Brabant[2]. The 2nd Generation Water Conservation project coordinates and extends previous multi-stakeholder actions around the spread and management of on-farm weirs and more permanent physical measures in an extensive area of sloping, free-draining sandy soils subject to summer drought. The *direct technical purpose* of the weirs is to hold winter rainfall in field ditches, in order to raise soil water levels in the immediately surrounding land. The purpose is linked in turn to three strong technical effects that stakeholders wish to realise. The technical effect at *farm level* is to 'save' the first mid-season irrigation (mostly taken from shallow ground water). The technical effect the *provincial level* wishes to slow the draw down of shallow ground water. The third technical effect, of the protection of 'wet' Nature areas by raising soil water levels in Nature areas and the buffer zones around them, is related to the construction and conservation of the Ecological Core Structure[3], a *landscape effect.* All three are critically related to how the measures impact the overall hydrological system

The background motivations that led to the convergence of interest in on-farm water management include the increasing recognition by the national and provincial governments, and water boards, of the de-stabilisation of hydrological systems in the delta. The origins of instability include less predictable and more extreme weather events, faster and heavier snow melt in the spring in the upper catchments, swifter run off as more of the catchment area is paved over, a sinking and tilting coastal land mass, and higher sea levels. Engineering solutions to water safety in the delta are no longer sufficient. Space must be found for spreading floodwater and for increasing the absorptive capacity of the land (the sponge effect). At the same time, EU and domestic Nature directives are pushing rural land use away from a single-minded focus on farming, giving rise to a more complex mosaic of soil water requirements as the Ecological Core Structure is created and the mosaic of rural livelihoods changes. The Water Framework Directive in turn is encouraging renewed attention to river system functioning, and water quality, in a context in which competing claims for water by different sectors are intense. A long-running reconstruction of farming in the sandy areas (under the Reconstruction Law - *Reconstructie Wet*), which involves closure or re-location of intensive animal husbandry in order to avoid the pollution effects of excess manure, further complicates the hydrological aspects of spatial planning, as farmers shift out of grassland and into irrigation-demanding crops such as fodder maize, or into high value crops such as asparagus, which require a much lower soil water profile in early spring than grassland.

The deep background relates to the post-WWII decision to set the standard soil water norm in rural areas at a level that erred generously on the side of caution. The reason for this were farmers' fears, based on historical and family experience, of surface water damage, with memories of entire potato crops being lost after 24 hours in the standing water resulting from heavy rainfall or flooding. Water boards are required to drain water from farmers' fields on demand and up to now, farmers have had a free choice as to what crops to grow, where. The major programme in the 1950s and 1960s of land re-adjudication and rationalisation, with re-alignment and deepening of drainage ditches, won the farming sector almost a month of cultivation time in early spring, giving a huge boost to the profitability of the farming sector, and great flexibility in crop choice. The consequences for Nature were not so positive, since the soil water levels preferred for farming almost always lie below the level needed to maintain 'wet' Nature. The decision also increased the demand for groundwater for overhead sprinkler irrigation in dry summer

2 Jiggins, J. & N. Röling. 2003. Final Report. Key Informant Study. 2nd. Generation Water Conservation Project. North Brabant and Limburg.

3 The ECS (EHS - ecologisch hoog structuur) attempts to link isolated nature areas, hydrological systems and land use in ways that strengthen the ecological value and integrity of the Dutch landscape, in conformity with both EU and domestic nature and environmental legislation. In addition to the spatial aspects, related actions include providing, for example, space for water' to spread into Nature areas during peak flooding, the restoration of 'natural' or half natural' river flows and bank-side vegetation, and experimentation with the provision and reward of 'blue' and 'green' services.

spells, especially in the sandy areas, and the need to transport water (of a different quality) from the main river (the Maas) to the primaries in the summer months.

2. Methodology: the relationship between 'target variables' and 'effect variables'

The study is based on archive material, secondary literature, and 50 stakeholder interviews, typically lasting up to two hours in focussed dialogue, with stakeholders in the two provinces, in the categories: policy-makers; *bestuurders*[4]; implementers; subsidy givers; researchers; Nature and environmental agencies. The methodology thus captures *stakeholders' perceptions* rather than 'objective' data, and stakeholders' *interpretations* of the objective data generated by specialist studies and monitoring records.

The authors have constructed an analytic framework that asserts a relationship between the 'given' political, policy, historical (etc.) conditions, the context-specific factors that might lead to 'success' or 'failure', the 'target' and the 'effect' variables (Fig. 1). The study in particular examines the mix of policy mechanisms that have been deployed to produce perceived effects. Policy mechanisms are seen as ways of coordinating action to produce desired effects at societal scales. Where effects appear dependent on coordinating complex inter-actions among stakeholder interests, that are potentially or actually in conflict, it has been proposed that *social learning* is a necessary, but relatively unfamiliar element in the policy mix (Röling, 2000).

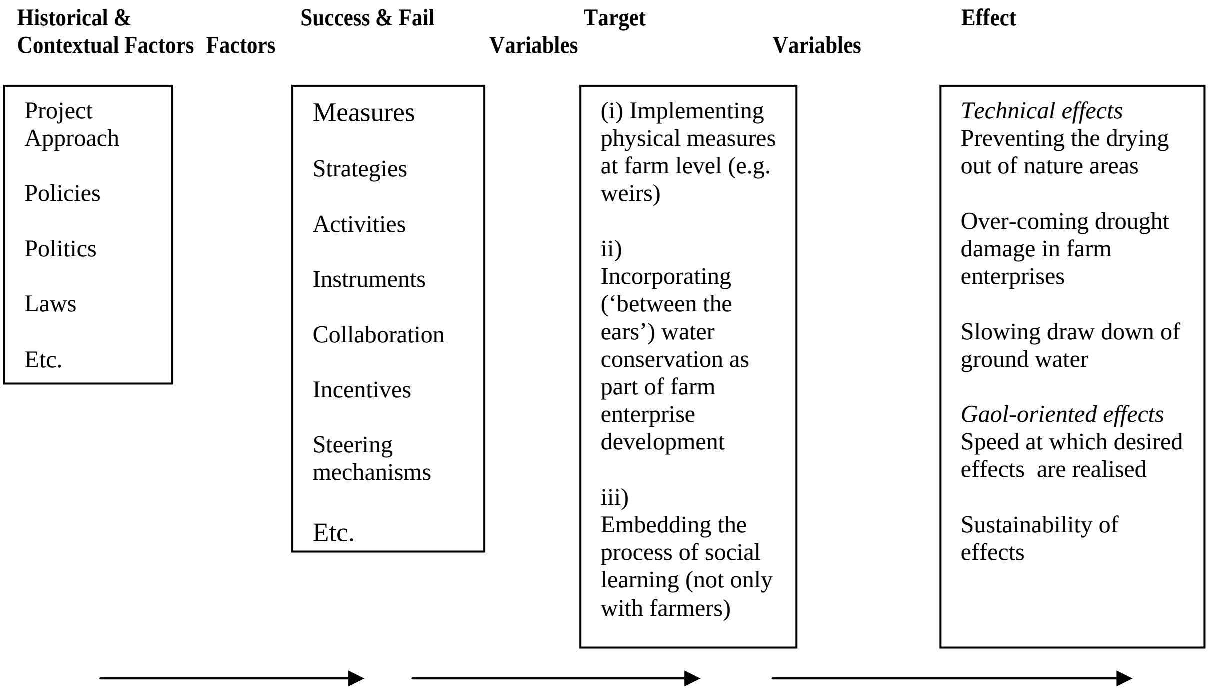

Figure 1: Analytic Framework Used in 2nd. Generation Water Conservation Study

4 In Dutch, *bestuurders*: literally translated, unhelpfully, in dictionaries as managers, directors or administrators, the word has the implication of a senior person, such as a chairman of a water board, or a senior official in the provincial administration, with experience of a range of higher level management functions and responsibilities, who guides or steers relationships and actions towards desired goals through inter-active dialogue. Because of the ambiguity of the English translation, it is preferred to keep the Dutch original.

The relevant literatures suggest that each policy mechanism is associated with a set of internally consistent features (Fig.2). The salient question for the study is which mix most effectively creates *coherence* among actions, and *correspondence* between the actors and their environment (Röling, 2000) ? The well-known policy mechanisms are 'regulation' and 'compensation': both have acknowledged limitations in coordinating actions in the situation of high complexity that constitutes the highly inter-dependent physical and social space of the Netherlands. 'Stimulation' thus often is deployed to lead in a smooth and gradual way (*geleidelijk*) to change mandated by regulation or to smooth the more brutal or abrupt effects of market-based change. However, stimulation assumes that someone knows the direction in which others should go, and that sufficient consensus can be created that this is indeed necessary. This was not the case at the start of the on-farm water management initiatives: Nature and farming interests were in direct confrontation and the provinces had met a hostile reaction from farmers to attempts to impose hard regulation of access to and use of groundwater. The 'water conservation' projects thus have tried explicitly, in varying degrees over time and between the two provinces, to deploy also 'social learning' as a conscious policy mechanism.

The target variables discussed in this paper focus on (i) the physical measures and (ii), changes 'between the ears' that lead to different water management practices. The effect variables covered are those at farm level, in groundwater, and on Nature areas. The main focus of discussion in this paper, however, is on stakeholder perceptions of the *relationship* between the 'target' and 'effect' variables with respect to the technical effects – effects that one might suppose would be unambiguously determinable by objective relationships and data. This turns out to be far from the case, as we report in the next two sections.

Distinguished on basis of	**Regulation**	**Compensation**	**Stimulation**	**Social learning**
Rationale	Instrumental	Strategic	Communicative	Collective action
Basis for individual behaviour change	Involuntary	Identification	Internalisation	Socialisation
Preferred management approach	Hierarchy	Individualism	Egalitarianism	Creation of many-sided relations
Coordination mechanism for organisation of action	Hierarchy	Payment of compensations & subsidies	Applied management	Networking
Presumed origins of welfare	Access to resources and/or power	The invisible hand of the market	Social capital, trust, community	Relational capital
Rules base	Dominance, legitimacy	Exhange relations	Giving meaning; communication	Inter-action
Risks	Non-compliance	Market distortions, market failures	Dependent on availability of financing	Dependent on funding of the facilitation of process

Figure 2: Analytic Framework for Policy Coordination Mechanisms

3. The target and effect variables

The 1st Generation project expressed targets in terms of effort, such as 'number of weirs placed'– the so-called 'effort obligation', which is well established in Dutch administrative and management practice, and signals a commitment to ambition while allowing room for lower level creativity in finding ways to secure the desired results. The 2nd. Generation project includes targets expressed also in terms of 'cubic metres of water saved', and in the case of Limburg, also in terms of the participation of '80 per cent of irrigators' – a so-called 'results obligation' which introduces a harder, more directive line and that assumes a higher degree of confidence in the assumed relationship between the intervention and the outcome. The 80 % figure was based on a provincial estimate of the ‘area coverage’ required to have an effect that was sufficient in terms of Nature stakes and raising the overall ground water level.

Approx. 3500 out of a total of some 4500 irrigators in the two provinces by Dec. 2003 had installed on-farm weirs[5]. Approx. 310 physical measures (including weirs) in addition have been placed in or around the Nature areas. The rate of installation has slowed as the project has moved into the more challenging areas, and out to the margins of experience. In part the slower rate of installation relates to technical uncertainty in specific areas concerning surface water effects, leading water board field workers (who are obliged to drain surface water on demand) in some areas to insist on all local farmers signing an agreement concerning where the weirs should be placed (the ‘area accord’). It is also perceived that the most suitable locations are now filled. However, it is by far from certain that all those who have registered as adopters of BoM, and/or who have weirs, are managing them optimally. Though the indications are positive (Baecke and van Huylenbroeck, 2001), at present there are essentially no means to check ‘compliance’ with best practice; nor is there agreement that such controls would be productive (see further 5.4 below).

4. The technical effects perceived

In the eyes of project stakeholders the single most important question is: are the project’s measures achieving the desired technical outcomes? The ‘water world’ in the Netherlands is data rich and well modelled, so the answer, one might assume, is easy to deliver. There are various kinds of ‘hard and soft data’ available on the technical effects of the proejct:

1. provincial groundwater data, obtained from automatic site monitoring networks;
2. water board surface water data, obtained from monitoring networks;
3. specialist hydrological and other studies of impacts at field and higher levels, statistical analyses of groundwater data over time, and simulation models;
4. water boards’ field staffs’ routine observations and experience; institutional memories of water management;
5. farmers’ daily and inter-generational observations related to crop choices, farm management experience, and observation and management of the on-farm weirs. Although farmers were supposed under the 1st. Generation project to use manual water gauges to monitor the effects on their own land of raising or lowering the height of the weirs, most did not do so (Baecke and van Huylenbroeck, 2001). Under the 2nd. Generation project, 14 of the more enthusiastic users of the weirs, spread across the two provinces, have carried out systematic registration of their actions and observations, in conjunction with data registered by automatic water gauges located at various points in their fields (CLM et al., 2002; Bos et al. 2003). The provinces also have encouraged the water board field staff to use simplified modelling of impacts at the field level, to help them determine, together with farmers, the optimal placement of the weirs and other physical measures.

There is some early indication that run-off peaks are levelling off (although it will take a longer time-series data to establish if this is the case), suggesting that the measures collectively might be contributing to restoration of groundwater levels, and that impacts at the field level, while small, are positive.. However, the ‘hard’ data available are susceptible to various interpretations, not least because the period over which measurements have been made is quite short, there have been two wet winters followed by

5 The total number of irrigators includes those drawing from deep groundwater, as well as hobby farmers and others (such as those with a riding pony), who are individually using too little water to be charged user fees or included in the water conservation projects.

an abnormally dry summer, and various other major changes have occurred in land and water use independently of the project. The interviews with 50 stakeholders indeed demonstrated a marked lack of consensus: some 72 statements about the technical effects of the weirs and other physical measures, can be summarised as revealing that:

- There is no agreement among stakeholders on what the technical effects are, or what their impact is.
- The different categories of stakeholder have different perceptions of technically 'what is at stake'
- These differences are perceived as related to stakeholders' positions in a hierarchy of ecological inter-dependence i.e. that each stakeholder is concerned with effects and impacts that manifest themselves at difference scales of system integration and management.
- The Brabant project experience reveals a bias toward tolerance for uncertainty, and the Limburg experience, reveals a bias toward searching for the truth.
- By opening up technocratic management and knowledge development to wider participation, the project is blurring the boundaries between 'expertise' and 'interests', as stakeholders become more expert, and experts become stakeholders.

5. Discussion

In this section we use four lenses to examine the results summarised above: differences in perceptions of what is at stake; differences in stakeholders' positions and experience of inter-dependence; the 'search for certainty' versus 'tolerance of uncertainty'; and differences in the policy mix that guides the implementation process in each province.

5.1. Different perceptions of what is at stake

In part, we understand that the lack of consensus reflects differences in stakeholders' perceptions of 'what is at stake':

For farmers: it is the preservation of a 'licence to irrigate'; defence of their continuing capacity to exercise entrepreneurial flexibility in response to changing market and climatic conditions; and an opportunity to take a pro-active role in improving their image in society by demonstrating that farming is 'doing its share' to conserve water and reduce the rate of groundwater draw down. Additional perceptions of 'what is at stake' include the opportunity to learn more about the role of water in farming and Nature management, and the expectation of deriving benefit for the farm business from on-farm water conservation.

For water system managers: it is an opportunity to continue to move water users' understanding, and river system performance, in the direction of integrated functions in ways that give greater priority to water in spatial planning at micro (field level) and area levels.

For nature managers: it is the protection of 'wet' Nature areas, and an opportunity to develop other stakeholders' understanding of hydrological systems and the implications for the Ecological Core Structure.

For provincial policy makers: it is an opportunity to avoid the difficulties associated with heavy regulation by establishing the ground for smoother inter-action among interests with competing claims on the same resource, while maintaining the pressure to achieve, through others' actions, their own groundwater goals.

For elected political managers (bestuurders in provincial and local government, farmers' organisations and the water boards): it is an opportunity to translate into local action various European and national political commitments to moving societal behaviour and understanding toward acceptance of the growing importance of Nature interests in land and water use, the changing role of the agricultural sector, the need to find 'space for flood water', conserve groundwater, combat drought, and improve the overall water balance.

5.2. Differences in stakeholders' position and experience of inter-dependence

These differences in turn can be related to differences in stakeholders' position in a hierarchy of ecological inter-dependence. That is, each stakeholder category is concerned with technical effects and impacts of different kinds, at different scales of water system management:

The farm sector: must deliver a positive pay-off at the enterprise level in terms of saving the cost of (at least) one irrigation per season, while avoiding surface water damage; the measures must be sufficiently flexible to allow farmers to manipulate soil water levels according to local weather and crop choices

The water system:, must help to move understanding from 'water' as a factor input to farming, to understanding of water functions; must help make visible the impact of agricultural use of water on the hydrological cycle and on Nature areas; must achieve a new 'water balance' in the whole land-and-water system.

Nature areas and establishment of the Ecological Core Structure: must conserve soil water in the buffer zones at a level sufficient to maintain 'wet' Nature; must help to make the problem of managing seepage water more visible.

Provinces: must reduce the rate of draw down of groundwater; must help move understanding and action from managing soil water levels to meet crop needs, to making crop choices on the basis of soil water levels managed independently of cultivation *('van peil volgt teelt tot teelt volgt peil').*

5.3. The search for certainty vs. the acceptance of uncertainty

Our third lens uses a more abstract framework of interpretation, in terms of a polarity: *the search for certainty vs. the acceptance of uncertainty*. It is proposed that the 'search for certainty' is related to the understanding that 'true knowledge' is based on 'what can be measured', and that true knowledge is necessary if 'right action' is to follow. An 'acceptance of uncertainty' is related to the understanding that 'what can be measured' does not necessarily yield complete knowledge, yet 'right action' none the less can be taken, in so far as actions are seen to lead over time to progress in the desired direction of change. We begin to explore these propositions by introducing a simple heuristic model[6]. It is based on one of the foundation assumptions, dating back at least to Pythagoras, which continues to inform western science and public policy. The assumption might be stated as a simple and unambiguous relation between the True and the Good (Fig. 1)

[6] Presented by Dr. Silvio Funtowicz, at a seminar on The Influence of Complexity on Ecological Economics, Dept. of Communication and Innovation Studies, WUR, Wageningen, 22.10.03. We are deeply grateful for drawing our attention to this line of reasoning.

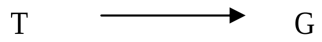

Figure 1: The Pythagorean relationship between the True and the Good

The relation, it might be noted, can be read also as establishing a relation between the epistemological (how we know things), and the normative (what we desire). It also can be read as carrying the ethical implication that right knowledge leads to right action. At the Rio Conference in 1992, an additional normative principle was proposed, the so-called pre-cautionary principle. The relevant text in Agenda 21 states that, *in the absence of scientific certainty*, but with the suspicion of great and irreversible harm, action should err on the side of caution. Since 1992, the growing weight of the evidence that things badly need fixing has tended to push policy makers toward a presumption that establishing the True and determining the Good should be kept separate, with scientists doing the risk assessment and politicians determining the public good (Fig. 2).

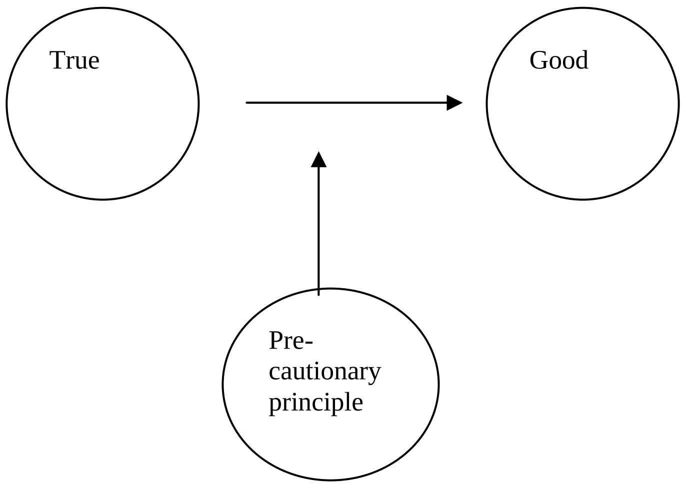

Figure 2: The Precautionary Principle disturbs the Pythagorean relationship

Over the years since Rio, the difficulties have grown of establishing what is happening to the environment by the normal measures of scientific certainty. In the face of a lack of scientific consensus on what is True in terms of the risks, politicians have shown willingness to invite wider citizen and stakeholder participation in the determination of the public response to the uncertainty. One consequence of these participatory processes has been to draw attention to the pre-analytic assumptions made by scientists in their assessments of the risks (What is counted as a risk? for whom ? what burden of risk is considered tolerable ? etc.). This in turn has led to wider citizen and stakeholder participation in determining the issues that frame risk assessment. Within the traditions of science itself, there also has been a growing realisation that the True with respect to man-made environmental risks is complex and ambiguous. There is a beginning of an acceptance within the scientific community that, here also, wider citizen and public participation in creating and interpreting knowledge, can be useful (Fig.3).

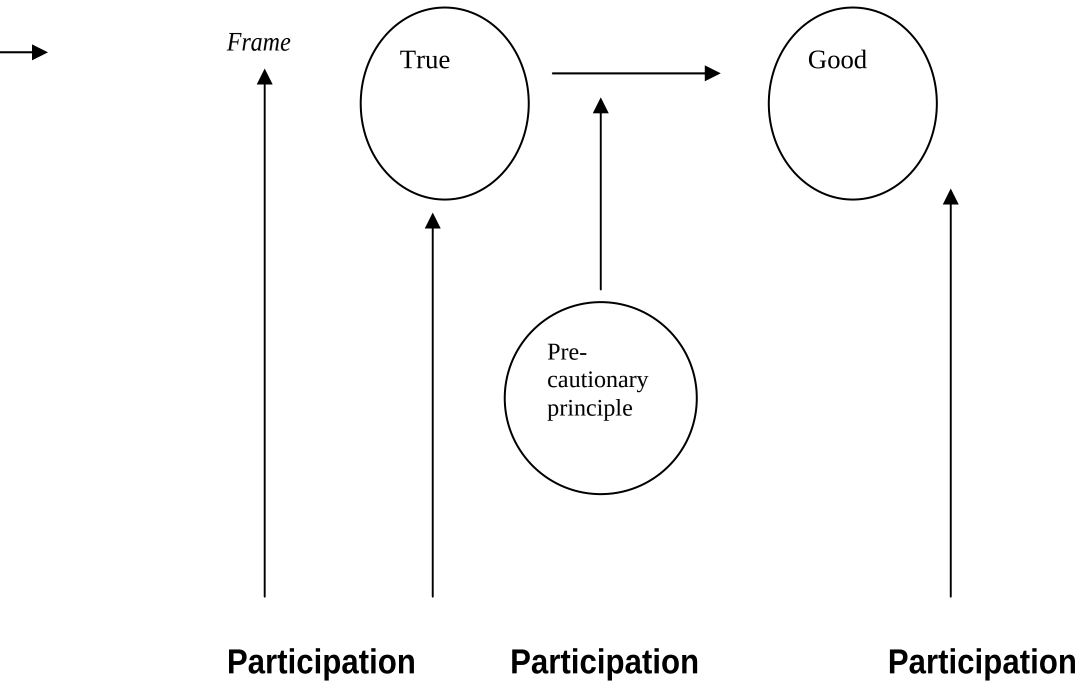

Figure 3: The Pythagorean relationship disturbed by democratic participation

One of the consequences of these steps away from Pythagorean purity, simplicity and certainty, is that *the boundaries between expertise and interest begin to blur*, as a wider set of stakeholders provide knowledge, and as experts become stakeholders. A second implication is that inter-action among stakeholders concerning the framing of the issues, the determination of the True, and the shaping of the Good, implies an acceptance of *irreducible uncertainty*. As the pool expands of those contributing to the co-creation of knowledge, there can be convergence of understanding but not final closure around a single 'truth'.

This framework, we believe, is useful in distinguishing the Limburg and the North Brabant situation. When stakeholders' statements about technical effects and their impacts are sorted by province, it becomes clear that *there is a bias in Brabant toward a 'tolerance of uncertainty'*. Brabanters see themselves as having chosen to follow a *zoekende pad*, a 'searching pathway', that opens up to a range of social actors the opportunity to participate in framing of what constitutes technical risk and risk management, in co-creating knowledge and understanding of the effects, and in defining the public good that results from concerted management of the technical options. It is a renewal process that is clear as to intentions but uncertain as to outcomes. The same analysis reveals that, *in Limburg, there is a bias toward the 'search for certainty'*. The technical issues have been defined by the project partners, as well as how they shall be resolved, and what is a fair allocation of public and private benefits (and costs). Limburgers have chosen a defined pathway, which steers participants toward a pre-chosen target, and assumes certainty in the relation between action and outcome.

The model in addition helps us to understand the comments made by technical researchers, that their understanding of what is 'true' has deepened as a result of interacting with farmers, whom they have come to recognise as having a special position with respect to determining what is 'good' in terms of action. It also provides a frame for placing stakeholders' perceptions that the project has contributed to a much more widely shared understanding that:

- 'Béta-Gamma'[7] knowledge is necessary in order to inform actions with understanding,
- multi-stakeholder inter-action implies a shift from 'thinking for' to 'thinking with',
- anecdotal knowledge, anchored in experience, has value.

5.4. Differences in the policy mix guiding the implementation process

The stakeholder interviews make clear that the differences in perception also relate more or less directly to the different mix of policy mechanisms applied in the two provinces.

North Brabant: The idea of the weirs, and early experimentation with their functioning, originated with farmers in North Brabant, and the idea of water management in the agrarian sector grew from the ground up on the basis of these initiatives. The board of the southern farmers' and glasshouse growers' organisation (ZLTO), together with a number of leading farmers, after a period of feeling 'under attack' by the province, nature organisations and the public, deeply hostile to a threatened ban on overhead irrigation on grassland, and unhappy with a variety of rules (for example, to control nitrate pollution), which were seen as further unwarranted restrictions on their entrepreneurial freedom, committed themselves by the mid 1990s to a pro-active stance. Beginning with BoM, they negotiated their way into a relationship with other key stakeholders, i.e. the water boards and the province of North-Brabant, which led to the 1st Generation project, and subsequently to the 2nd Generation project, based on voluntary adoption of measures for the more efficient use of water in the farm enterprise and water conservation. Agreements between the province, the ZLTO, the water boards and the Brabant Milieu Federation were laid down in Declarations of Intent.

It is important to understand that this orientation has arisen out of an earlier history of conflict and hard regulation with respect to water extraction facilities with a capacity of more than 10 m³ per hour. Table 1 below gives an overview[8].

7 A term used in the Netherlands to signify respectively the natural sciences and the human/social sciences.

8 We are grateful to Jeroen Kessels of the Ground Water Division of the Province of North Brabant for this table.

Table 1: Time Line of Initiatives Taken in North Brabant

Plan period	Regulation	Declarations of Intent	Stimulation projects
1991-1998	• 1991: introduction of compulsory licence. • 1992 Prohibition of over-head irrigation grassland: Total ban from January through May. Ban between 11:00 and 17:00 in June and July. • 1992: No new licences for overhead irrigation of grassland. • Intention to eventually totally ban overhead irrigation of grassland.	Conflict arise because of the hard regulation of overhead irrigation, especially on grassland. The pro-active role of ZLTO lead to agreements lay down in declaration of Intent: • Water conservation 1 to increase groundwater level (1996): First ideas of water conservation; Start of Measured Overhead Irrigation.	• 1996-1999: Project Measured Overhead Irrigation (BoM = Beregenen op Maat).
1998-2002	• No new licences (i.e. including arable land). • 1998-2002: Moving of licences accepted under conditions. • 2000: introduction of general obligation to register and pay levies for all licensees. Everyone has to register quantities extracted. Province has to be informed of total extraction. Province imposes levy (in 2003 and 2004: Euro cent 19 per m³ and max. Euro 68.00 (only if groundwater is extracted, no fee if no extraction).	• Water conservation 2, Measured Overhead Irrigation 1998 with: Further building of Water Conservation Project (Project Water Management). Agreements about scaling up of Measured Overhead Irrigation. • Measured Overhead Irrigation and Water conservation 1999 with: Introduction of regulation: registration and levy; Start of Project Agrarian Water Management per January 1, 2000 (important agreement: participants receive compensation equal to the imposed levy). Further impulses for Water Conservation.	• 1998-2001: Project Water Management Benelux Middle Area: Water Conservation. • 2000-?: Project Agrarian Water Management: compensation equal the levy. • 2001-2004: Project Water Conservation II.
2003-2006	• 2003: moving individual licenses no longer permitted, unless within the framework of implementation of Government plans. • 2003: introduction of licences that allow registration of annual changes in bore holes. No overhead irrigation of grassland		• 2001-2004: Project Water Conservation II; • 2004-2007: Project Sustainable Water Systems Benelux Middle Area.

The degree of voluntarism continues to be influenced by the occasional reminder that there remains a ‘stick behind the door’ in the form of the power to re-impose the ban on sprinkler irrigation in whole or part, and activation of the power to levy a water use fee (that industrial users are already paying). In the particular case of the buffer zones around the Nature areas, the stronger powers available under the Reconstruction Law, and the Nature Protection Law (that allows private interest organisations to prosecute individual farmers for drawing ground water down to levels that threaten Nature), also come into play. At the same time, the provincial and local government authorities have shown considerable finesse and creativity in creating space for new action. The coincidental timing of a new plan period that began in 1996 helped to open the door to dialogue with new stakeholder groups.

The province, for example, has set the levy on ground water extraction at zero, for licensed extractors who are using BoM and who participate in the water conservation project. Participants pay a small fee, which provides them access to a Help desk, a newsletter, other information materials and courses. Local authorities are proving flexible in matters such as private arrangements among farmers who wish to temporarily swap fields, in higher or lower parts of the hydrological profile, in order to grow a particular crop in any one year (including grass), and in the granting of a license to construct a new barn if a farmer agrees to sell out a piece of low-lying land.

The province and water boards also have taken a somewhat relaxed attitude to legal complexities, such as who exactly owns the on-farm weirs and is responsible for their maintenance, on the grounds that if they truly deliver benefits to the farm enterprise, farmers will begin to maintain them anyway. They made during the 1st Generation project a very considerable effort in a shared learning-based approach to developing the understanding, data and skills necessary to manage the weirs optimally in specific contexts. This process has been continued in the 2nd Generation project, and formalised at the request of participating farmers, in a Knowledge Circle, made up of 15 farmers spread through representative sites in North Brabant and Limburg. The farmers, together with technical experts and water board staff, and supported by specialists in facilitated learning, are experimenting with weir management, micro-drainage, and simple data registration using manual water gauges. A monitoring network, of automatic water gauges, complements their efforts.

Neither the province nor the water boards are attempting on a routine basis to ‘control and check’ farmers’ actual use of the weirs and BoM – an attempt that would be strongly resisted by farmers. The ‘control and check’ approach is viewed as something that could only be destructive of the trust and mutual understanding that has grown up. However, this position leaves open the question of whether the measures are located and operated to optimal effect. It does seem to be the case, at least in the view of the stakeholders we interviewed, that on the basis of the voluntary approach and the ‘doing together’ culture, relationships have been created that have carried the ‘water’ message to stakeholders who previously gave no thought to water functioning, and that the weirs (or plans for the weirs, as well as farmers’ agreement to other measures), are now in place more or less everywhere they would serve a purpose within the designated areas. As we shall see, however, in the next chapter, the ‘last percentage’ of participation is proving quite hard to achieve, and the nature organisations and land managers are not so sure that enough emphasis has been placed on strict implementation, sufficient to achieve desired outcomes.

Limburg: elements of water conservation specific to the two Water Conservation projects (and the funding available for these), over time have been folded into a larger programme known as Optimal Water Management Limburg (OWL) (Box 1). The policy mix guiding the programme has had a strong regulatory character:

- Compulsory registration of irrigators; licence to irrigate given on basis of an Enterprise Water Plan
- Enterprise Water Plans, drawn up for each farm (first by the Limburg farmers’ and market gardeners’ organization -LLTB, subsequently by water boards), covering BoM, weirs, and rainwater management, at an initial cost of Euro 800 to the farmer
- Water boards, in discussion with farmers, took the lead in the placement of the weirs
- The cost of the weirs 100 % subsidised
- The LLTB promised to ‘deliver’ 80 % participation under a covenant signed with the Limburg Environment Federation (LMF), the province, and the water boards.

The Enterprise Water Plans were the vehicle chosen to integrate, at the farm level, the rights, responsibilities and obligations of the various stakeholders under the two separate pieces of legislation governing surface and ground water. They swiftly ran into trouble (Box 1). The cost to the farmers of the plans was reduced to Euro 200, and the rainfall water management elements were dropped., but by early 2003, it was clear that the LLTB was not going to be able to deliver the 80 % participation across the whole province as promised, and that effort had either to shift toward a more voluntary, more explicitly social learning basis or toward simpler but stronger regulation.

Box 1: Optimal Water Management Limburg and the Enterprise Water Plans

The Enterprise Water Plan was an instrument signed by the province and the farmer concerning water use within the farm, and included, among other things, the regulation of overhead sprinkler irrigation, placement of weirs in the secondary channels, the location of irrigation wells, land use patterns (in time and space), economical use of rinsing water in barns etc., and the modification of drainage. While the individual farmer, as entrepreneur, was responsible for volunteering to participate, in practice the stimulation came from the LLTB. At the same time, effort was made to ensure that physical measures in the primary system supported the efficiency and effectiveness of the Enterprise Water Plan.. There were just two points that checked the enthusiasm of all parties: who was to pay, in addition to the farmers, for the one-time cost of making the plan, installing the weirs etc., and what was the legal status of the plans and, in terms of ownership, of the physical measures installed ?

It was argued that the plans must be in accord with the law (e.g. the groundwater law), as well as with the provincial planning rules, while according equal treatment to all eligible farmers, and between farmers and other stakeholders. And here in practice things began to go wrong. There were so many fine details (technical, scientific, managerial, administrative…etc), that needed to be sorted out for each farm, involving so many exhaustive enquiries and discussions, that the plan-making process became ever more complex, more time-consuming, and less satisfactory for all concerned. In the end, in October 2000, a way forward was found by negotiating a covenant between the province, the LLTB, the Water Boards, and the LMF, the so-called Optimal Water Management in Agriculture (OWL). The LLTB undertook to ‘deliver’ 80 per cent participation. A Steering Group. Project Group and Working Group were set up to oversee the implementation of the covenant. LLTB also established a special office, staffed by water board and project technicians, to smooth the administration of the subsidy, provide advice to farmers, and guide the development of the activities on the ground.

The covenant served to clarify roles and responsibilities but, after several costly small pilot schemes to test the implementation process and build up the experience of the project teams, it was found that the participation of farmers was rather low. Farmers perceived the plans as primarily a ‘licence to irrigate’. The area-based planning process did little to develop a more comprehensive understanding among farmers of the effects of their actions on the overall productivity of their farm enterprises nor of the contribution of farming to water system management. Although participants were required to sign an ‘area covenant’, interest in the wider issues remained low and peer pressure failed to deliver the number of participants required. And although on-farm weirs were installed in the context of the plans, farmers showed little enthusiasm for their active management. The other measures were rarely adopted.

It became evident by the spring of 2001 that the target participation had not been achieved in a single area. Participation rates varied between 10 and 75 per cent. In response, the procedures were simplified, water board staff assumed responsibility for coordination, and more effort was put into giving individual advice to farmers on the active management of their weirs. Subsequently, further simplifications were made, and toward the end of 2002 the water boards became fully responsible for the development of the plans. A study during this period revealed some of the reasons why so many farmers had not participated, including: the special irrigation needs of particular crops; the enterprise characteristics of particular farming systems; and the fact that many of the older farmers (and even younger ones, following two serious outbreaks, in quick succession, of pig diseases), had stopped farming. Twenty five per cent said they had no interest in the plans, or had no trust in the government (i.e. that further restrictions would not in any case be introduced), or gave no particular reason.

Source: StaatsBosBeheer 2003, a & b

In the event, Limburg has chosen for simple, clear juridical framework for regulation for access to and use of groundwater, accompanied by individual coaching of farmers in water management, and with ownership and responsibility for on-farm weir management passing to the water boards.

The way that the target and effect variables have been linked in Limburg is perceived as increasing the mistrust of ‘the government’ by farmers, dividing the members of the LLTB among themselves, and increasing the mistrust of the LLTB among non-members. The break down of the covenant between the water boards, LLTB, the province, and Nature organisations over the failure to deliver the target participation also has soured stakeholder willingness to engage in further shared action. However, Limburgers also perceive their approach as more capable of delivering the desired technical effects.

A final comment: the interviews in both provinces make clear that there remain strong disincentives to effective *cross-scale* sharing of the various interpretations of data, field observations and local experiences. The key points, from different stakeholders’ points of view, have been widely publicised by the project in both the professional and popular media. Considerable effort has been made to share and discuss the information and experiences in a variety of multi-stakeholder fora, and stakeholders have cited these discussions as among the most valuable and stimulating occasions for mutual learning that the projects have offered. However, different attitudes toward what constitutes valid data and information, and the hierarchical distance of senior policy makers and *bestuurders* from locally situated knowledge, appear to continue to offer strong barriers to the development of convergent understanding.

6. Conclusions

The main lessons learned are:

- It is unrealistic to expect unanimity concerning technical effects and impacts in large scale multi-stakeholder projects that seek to bring about change in individual and institutional behaviours; there is an irreducible indeterminancy in people's perceptions of the dynamic inter-play of bio-physical and human inter-actions.
- It follows that monitoring, and evaluation of success and failure, must be open to the richness of shared and divergent meanings rather than confined to objective standards only.
- Success and failure are as much anchored in implementation processes that belong to particular traditions of governance and specific choices in the mix of policy coordination mechanisms, as they are in technical measures.
- Comparable technical effects and impacts can be achieved on the basis of different implementation pathways.
- Investment in shared learning processes are a necessary complement to regulation and stimulation if the desired results include institutionalisation of behavioural change, among individuals and within institutions.

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Agricultural Land Design Modelling: a methodological proposal

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1 - Introduction

Sixty years after its launching through the «Marshall Plan», the European agriculture revolution is up again, but with some strong contradictions: water pollution, landscape uniformization, ethical crisis (Fresco, 2000). These harmful side-effects of agriculture could be aggravated if the evolution of agricultural practices continues following the current trends towards greater concentration, intensification and technicality. We focus our paper on agricultural practices, from their choice by farmers decisions to their effects, as they continuously remodel our agricultural landscapes. The approach of farming systems as landscapes “builders” is a new one, but its background is the vision of land as resource for agriculture (de Wit, 1992; Lardon et al, 1990).

In spite of some encouraging results in reducing pollution through rationalisation of the use of fertilizers and pesticides (Baudoux et al, 1998; Benoît, Papy, 1998; Küng-Benoit, 1992; Le Houerou, 1994), the European experience shows that the optimisation of practices from the sole agricultural point of view is not sufficient to ensure sustainability, but will rather lead to increased environmental damage.

Agronomic measures specifically designed to maintain soil, water and air quality are necessary, including more severe regulations restricting intensification and the agricultural use of chemicals. For instance, keeping the nitrate content of drainage water to less than 50 $mg.l^{-1}$ requires not only an optimized and reduced application of fertilizers, but also the planting of catch crops during the winter. Parts of the hydrological basins in many areas should be withdrawn from arable cropping and turned into grasslands or forests (several authors in Lemaire and Nicolardot, 1997). Preventing runoff erosion and the associated pollution of surface water (especially by pesticides) needs grassland strips, ditches, or other structures placed in suitable strategic locations in a catchment. Again, similar conclusions could be drawn about many other environmental targets, such as biodiversity, or landscape quality and accessibility (Boiffin et al., 2000).

The farmer practices are the focus point of researchers who built tools to help their changes (Benoît et al, 1990). In this paper we propose a methodogical approach of farmer practices involved in the land designing through land uses and land pattern changes.

2 - The double bind (in reference to Bateson works) between landscape and agriculture

In accord with the Bateson works, we want to focuse on the mutual relationship between land and farmer practices: on the one hand, the current state of the land is a result of farming practices and changes in landscapes could not be decided without farmers participation, but on the other hand, the choice and location of cropping and grassland systems by farmers all over the world takes into account their own land characteristics.

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2.1 - Land as a result of farming practices

A number of farming systems researchers have shown the central role played by landuse patterns and farmer's practices in the evolution of soil erosion, surface and ground water quality as well as of animal diversity.

Example A.: Agricultural intensification, landscape changes and runoff in Kraichgau (Germany) (Herrmann *et al.*, 2003 ; Dabbert *et al.*, 1999 ; Dabbert *et al.*, 2002)

The Kraichgau region extends in the north-western part of Baden-Württemberg. As a result of a combination of relatively high average annual temperature (9° C), an average rainfall of 700 mm per year and extremely fertile soils (Loess), this area has had a long tradition of agricultural use. In most communities of the Kraichgau region, land consolidation and modern agricultural techniques have led to a change of the former landscape structure (e.g. terracing).

Despite the hilly topography, most areas are now characterised by large arable fields, with significant volumes of row crops and only a few remaining landscape elements such as hedges and ridges. Under these conditions, run-off of water causing erosion and consequent flooding are increasingly problematic. Nutrient inputs by erosion to the remaining biotopes cause degradation of the formerly oligotrophic plant communities. Additionally, recent rainfall events have been giving rise to rapid water runoff from arable fields either directly into residential areas or into river systems that subsequently flood downstream.

A recently started research project tries to tackle these problems of water management through agricultural measures that will 'hold water up on the land' and so avoid or reduce the need for expensive (and intrusive) engineering solutions. Further on, the landscape impacts of different agricultural management options should be presented to local residents and other interested stakeholders. Such communication and participatory activities are regarded as central to ensuring the long-term implementation of the relevant measures and, therefore, the project intends to use a combination of GIS and virtual reality display techniques to help engage farmers and other interested parties in decisions regarding the planning of agricultural measures on a landscape scale.

Example B. Landscape changes and runoff, in Rhin watershed-Central Europe (Van Dijk et al, 1996a; Van Dijk et al, 1996b) and in Danube watershed (Vogel et al, 2002):

The key problem to be addressed is that of surface water runoff and soil erosion leading to flood damage. In Central Europe, the problems with recent rainfall events giving rise to rapid water runoff from arable fields either directly into residential areas or into river systems that subsequently flood downstream. The levels of runoff have also contributed to soil erosion that reduces agricultural productivity and in some cases brings soil onto roads and into residential areas. Current predictions of climate change suggest that the frequency of such intense rainfall events is likely to increase in the future.

Our approach is to tackle these problems of water management through agricultural measures that will 'hold water up on the land' and so avoid or reduce the need for expensive (and intrusive) engineering solutions. We feel that through a carefully designed comparison of different measures in these areas we can gain important insights into the effectiveness of different approaches and by working together with farmers demonstrate the practical application of such technique to those involved in the formulation of agri-environmental policies.

The final issue concerns the integration of the research findings into planning and policy frameworks. We anticipate that this will need to take different forms in particular countries, but envisage that it will occur through input into the formulation of landscape and regional plans, agricultural subsidy programs or agri-environmental schemes like the MEKA program in Baden.

These examples show that in many instances environmental issues may be converted into farming systems questions in which the activities of farmers and their changing location from the new picture is the focus point of problem solving (Gaury, 1992; Benoît, Papy, 1998). A number of new research tools such as remote-sensing data and Geographical Information Systems are now available to address this type of research (Benoît *et al*., 1997).

2.2 - Land as a factor of farmers practices.

In most cases, farmers are seen to take into account the properties and layout of their land in deciding about the location of their cropping and grassland systems (Morlon & Benoît, 1990). This relationship between farmers and their territory could be an individual or a collective one (Le Gal, Papy, 1998) The role of land characteristics and environmental constraints on land use is illustrated by the following example:

<u>Example C - Rules of field use and pasture practices in the French Atlantic marshes (Espalieu, 2003, poster Pons *et al*. In IFSA-2004-workshop 3):</u>

Most farms in the French Atlantic marshes have fields both in and out of the mashes, some quite far apart. The main land constraints on field use and practices are related to water excess in some fields preventing machine work or cattle access at given periods of the year, clay sodicity causing soil structural instability, again hindering field work and access, and distance from farm buildings. As these factors vary largely over farmland, they determine the patterns of land use and practices over the farms.

In short, best fields, i.e. the fields that are the less sodic, inundated and far away, are dedicated to the highest return crops (usually maize in the context), whereas the worst fields are pastures. So a direct relationship is shown between land characteristics and use (ALMS). However this simple relation should be corrected for other factors (field relative dispositions, slopes) and may be suppressed when work organization takes priority, as when the farmer has a herd. Similar rules of use can be also found in the management of pastures (hay or grazing, types of animals).

It is interesting to note that in the marshes, the water factor is subject to a collective management occurring at the scale of a small region. The rules of this management and its interaction with individual farm management should provide a model of interaction at different scales.

<u>Example D - Landscape changes and types of farming systems in the Vosges mountains-France (INRA-ENSSAA, 1977).</u>

Location of farm fields is related to farm type. Crossing a farm typology with farm field location in each type shows the role played by small farms (part-time farmers) in slope management. The continuing decrease in the number of these farms has a major impact on landscape evolution in the Vosges mountains. A main consequence on Vosges landscape is the increasing place of planting forest. The actual state of these new forests (planted from 1830 until now) depends on the fertility level during the plantation. So, the agricultural past of the actual forests is a major factor of forest declining in these zones (Koerner, 1993)

<u>Example E. Management of farmyard manure (FYM) and groundwater pollution in Lorraine-France (Kung-Benoit, 1992; Le Houérou, 1993; Teilhard de Chardin, 1990).</u>

The location of FYM spreading has an effect on groundwater quality. When farmers choose to spread all their organic manure on soils with good trafficability, they make a logical decision with regard to management of their agricultural production but a disastrous one for water quality. If soils are trafficable, then they are also permeable and the issue of water quality under such soils is a major one. A vicious circle ensues. Soils permeable to water are also trafficable for heavy machinery (silage, FYM spreading in winter). The only solution at present would be to spread FYM elsewhere or in another form. For this it is proposed to replace FYM by an alternative form of manure that may be spread on grasslands in spring «and summer. This involves working with the farmers on farmyard manure composting.

3- A methodological approach for the study of agricultural land use / environment relations: the Agricultural Land Management System (ALMS)

Whether we want to study the effect of agriculture on landscape or its dependence on land characteristics, a precise knowledge and description of agricultural practices is a necessary preamble. Our aim is to advance on this way by proposing a model of farmer's management of their land focussed on the relations between farmer's practices and agricultural landscape. This model built at farm scale should be extensible to discuss processes at regional scale.

Three steps are necessary for this modelling: (1) the identification of land parts, as conceived by farmers, (2) the identification of farmer's practices, for each crop rotation or grassland management, (3) the identification of rules indicting how the practices are applied to the farm's particular land, with the farmers decision rules as background.

3.1 - The identification of land pattern with the farmers definitions

It is important that fields be defined by the farmer's rules, because if the aim is to understand (and foresee or influence) their reasons, logics and strategies, then we have to consider the objects on which these rules apply, which would be different from fields defined by other means, administrative divisions or else.

All over the world, "the farmers have good reasons to do what they do". This primitive hypothesis of SAD research department in INRA, needs researches on the modelling of farmer practices. For our purpose, the first practices to identify are the patterning of land created by the farmers. We identify these practices with the farmers definitions, their own characteristics, their own land qualification.

3.2 - The identification of crop or grassland practices of the farmers

The practice here is intended as including the choice of crops by the farmers, as well as the operations that are applied to the plots to cultivate these crops.

One central point is that in Europe, the farmer decisions are not taken "crop per crop" but on a crop/grassland rotation series, that is, on a multi-plot and multi-year scale. For example, if we can see a wheat field in a landscape, it is not obey the same logic rules if this wheat is in the first or the third rotation we described above.

So it is important that the description includes not only the result (list of crops and pastures and operations) but the rationale behind them.

a- Definition of Agricultural Land Management System:

The land used by agriculture can be modelled as a complex and dynamic pattern of fields, including tilled plots and pastures. M. Sebillotte, in the 1st European Society of Agronomy Congress, defined the "cropping system" as a set of crop management procedures used on a homogeneously treated space inside a farm, which can be a field, or a part of field, or several fields. According to this definition, a given cropping system is a component of a farming system, and is identified (characterised) by the sequence of crops and corresponding technical operations (Sebillotte, 1990a).

The cropping system is a tool to characterize land use on the tilled part of farms (Sebillotte, 1990b). However many farms have not only tilled crops but comprise also pastures. So if we want to reason at farm scale, it is necessary to generalize the concept of cropping system by including grasslands.

So we propose to name **Agricultural Land Management System (ALMS) the system of crop and grassland management procedures used on an portion of land** (which can be a field, or a part of field including its the boundaries, or several fields). According to this definition, a given ALMS is a component of a farming system, and is identified (characterised) by the choices of the rotation of crops or grassland uses and the farmland structure.

This definition should be completed by including also common items such as hedges, fences etc. that are components of the landscape and play a role in farm management (Burel, Baudry, 1990; Baudry et al, 1998).

The position of ALMS in a framework of farming system research is illustrated in figure 1.

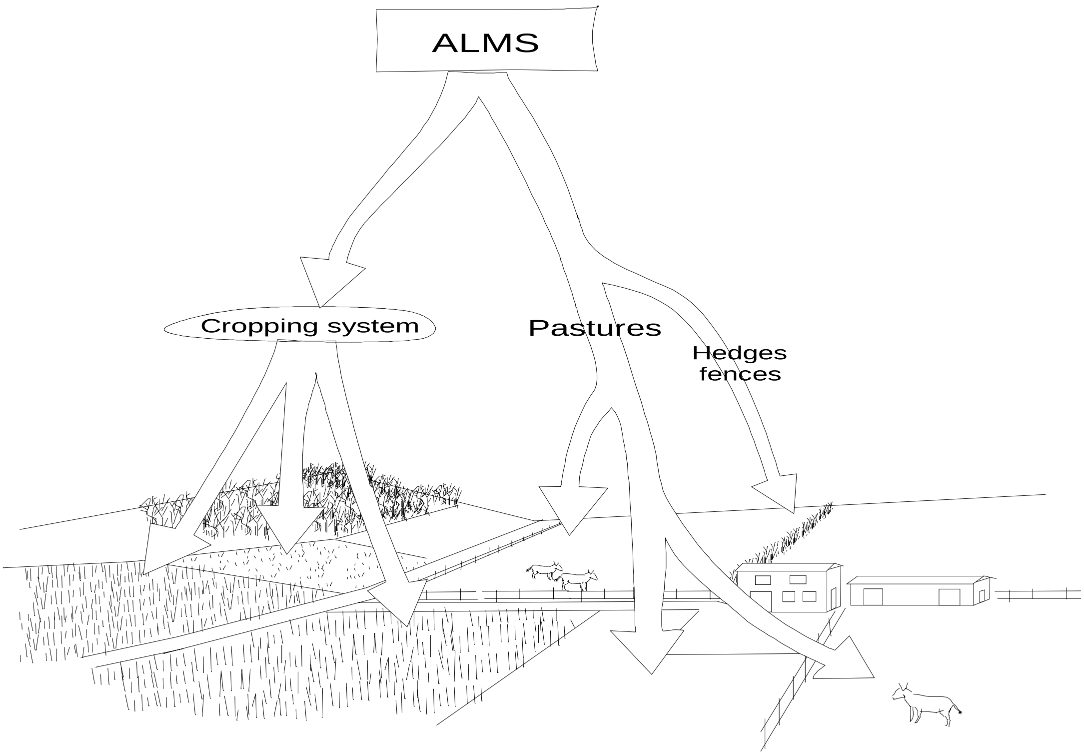

Figure 1. Agricultural Land Management System, a framework of farming system research on Land designing

For us, the ALMS is the basic unit of landscape design at farm scale. At a regional scale, other land uses and actors outside farms should be taken into account (forests, waters, "wild" areas), according to the aims of the models (environment, leisure …) as well as collective farmers' organizations.

b - A proposal of European notation for crop rotations and grassland management:

As a tool of representation and understanding of the interactions between agriculture, land and environment, ALMS could be used as well for research as for management and negotiations in agroenvironmental policies. Especially in this respect, is would be important to speak a common language. Although the agricultural practices we are familiar with are far from covering the whole range of existing systems, we shall propose a method for establishing a nomenclature of ALMS, that could be used in other cases as well as in the examples given.

The origin of these proposals lies in a number of monographs done for a large diversities of farms in a European research project ("Regional Guidelines to Support Sustainable Land Use by EC-Agri-environmental Programmes (EAP)", AIR 3 CT94-1296). These monographs covered parts the Netherlands, Germany, France. This first large range of landscape building monographs meet the works of Pierre Morlon (Morlon, Benoît, 1990), and the French project FORTE ("Formes d'ORganisation Territoriales à finalités Environnementales": Land Mangement to Preserve Natural Resources; managed by Jacques Baudry) as illustrated by Thenail et al., in IFSA-2004Congress-workshop3.

So, we propose a common notation of land use descriptions (figure 2) with two characteristics (i) description of the land uses as they are described, managed and decided by the actors, (ii) account of time scales as first organisational factor (Mari&Napoli, 1997).

All over Europe, the farmers have each year to allocate their crops and grassland uses in their territory. This annual adjustment between chosen crops and field plots results in different perennial rotations of crops and grassland use types (Kareln et al, 1994). Examples are:

- in Denmark : maize/ maize / winter Wheat/Barley
- in south west France without irrigation : sunflower/ winter Wheat/ barley
- in the East region of France : oil rapes-winter wheat
- in the plain of Rhein in Vorarlberg (Austria): maize/maize/temporary grassland for mowing (3 years).

These notations describe yearly sequence of crops or pasture use as they are conceived by farmers: this has the advantages of corresponding to the planning structure of the farmer, which reasons rotations over several years, and to allow a stability of land use descriptions over years, whereas crop by crop descriptions would vary each year.

However they lack the account of the logic behind the simple crop rotation description, although some hints may be given (such as maize for silage vs maize for sale) which complete the raw fact description, so these notations cannot yet be fully counted as ALMS nomenclature. In the future, our aim is to contribute to build a framework of farmer rules used to build rotations. The first work done by Aubry et al (1998) shows the importance of delay between two crops, sowing and harvesting dates, machinery choices.

Examples of use of the proposed European cropping/grassland management systems are given in Figure 2.

For crops:

M / wW / wB..ic /

= Maïs/ winter wheat / winter barley with intermediary crops in automn after harvesting.

For grassland:

.../ hC – tPH2 /...

.../ /... = each year the uses are the same

hC = mowing for hay making

tPH2 = turning Pasture For Heifers 2 years old

Figure 2: Nomenclature of crops and grassland uses sequencies

3.3 - The building of logic rules with the farmers decision rules as background

With a comprehensive survey, we can reach the decisions taken by farmers concerning their land. A lot of factors are described by European farmers: land tenure, accessibility (roads, ways), field soil, slope, boundaries (forests, roads, rivers), distance from the farmstead, size of this field, proximity of other fields, irrigation suitability, ... All of them have a specific local weight.

We propose to use the Artificial Intelligence capabilities to modelize these rules (Le Ber, Benoît, 1998). For example, the simulation system MOSTAR is built on three modules:

- determination of homogeneous regions of land (soil criterias, slope, distance of building) (Figure 3),
- choice of a production system and calculation of crops and grassland need for this system. Three types of system are actually discribed for mixed farming in Europe (extensive milk – hay - cereals; intensive milk –maïs; intensive crops- intensive milk),
- affectation of land uses in the farm territory. The rules are kepted by qualitative surveys with farmers.

The MOSTAR system allows to observe the succesive application of land uses on the farm territory. So, we can evaluate the current competitions between land uses. The figure 4 presents the final result of the simulation in the case of intensive milk – maïs system on the territory illustrated in figure 3.

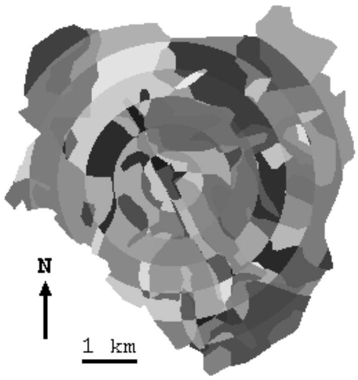

Figure 3. Homogeneous regions in Lignéville territory (Vosges, France): segmentation on farmer classification (soils, slopes, distances between fields and building).

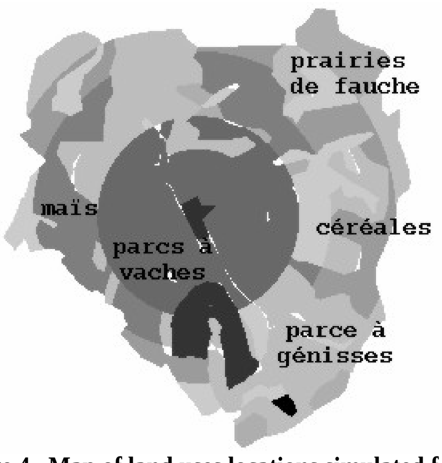

Figure 4 . Map of land uses locations simulated for an intensive milk-maïs system with 420 milk cows in the Lignéville village (Vosges, France).

Conclusion

1 The concept of ALMS that we propose is a generalization of the cropping system concept to meadows, field boundaries when they are tended by the farmers and other areas managed by the farmers. We want to focuse on the logical dimension of this system which is man managed, man thinked, and man evaluated. For us, farmers are land designers, as for other researchers they are food producers.

2 we think that this concept is relevant and can be useful :

- it will help research on agriculture/environment relations by providing types of land use that convey the farmer's strategy, independently of year to year changes that characterise crop rotations; these types of land use are stable over several years and can be related, on one side to field characteristics and constraints, and on the other side to environmental effects.
- it will facilitate discussions between farmers and other actors of rural territories by setting a common language and allowing an objective description of agricultural land use types.
- the concept of ALMS, by considering the middle-term strategy of the farmer, frees itself from the infinite diversity of actual crop successions and facilitates the comparison between fields similarly managed in different farms, and hence facilitates the extension of cropping system research to the territorial and multi-year scales, which are relevant to environmental questions.

3 The concept of agricultural land use system is a first step towards the precise description and classifications of all types of land uses intervening in a region. In order to understand and manage the evolution of landscapes, it will be necessary to include non agricultural uses: forests, waters (in marshes, waters are subject to a particular type of collective management), roads and roadsides etc. ALMS should then give place to the more general LMS (Land Use Systems).

4 Are landscape problems an effect or a consequence of farmer practices? This question is not merely semantic; it is also a social one. If we take "effect" as meaning "the future result of a voluntary action", and "consequence" as meaning "a sideline, involuntary result of an action", then landscape problems are almost always the consequences and not the effects of the farmers' practices. Therefore, the "actors" must be enlightened about the links between their objectives, their practices and the consequences of their practices (Gras *et al.*, 1989). To be more precise, this means that as partners investigating this type of issue we must not set out from the assumption that a farmer has voluntarily deteriorated the landscape parameter that is being investigated.

5 How can we test different scenarios for the actors? Two types of scenarios may be developed based on the following argumentation: "What.... if...", and "How....to....". Research methods to address these two types of scenarios taking into account the analysis of farmer practices and modelling of decision making are to be developped (Attonaty et al, 1999; Affholder et al, 1998)).

The model-building process serves as a tool to construct and discuss scenarios with the actors (Cox, 1996). In our work with farmers, two approaches are used: farmers are taken as "research objects" and as "research subjects". Two main model-building procedures are used: mathematical ones involving methods used in landscape ecology and linear programming, and graphic ones. We shall elaborate on the second procedure, since the first one is well known.

Drawing may be viewed as an interactive form of research: the ability of most people to understand a drawing is used in discussing research results. One research approach developed by geographers (Brunet, 1986) is to represent spatial problems using a dictionary of graphic symbols or "choremes". Using this form of qualitative modelling proves most useful in discussions with a wide number of people: drawing is a universal language. This enables us to build models of farmer practices in their spatial dimension. A potential further development in this direction is the use of 3D visualisation to facilitate the understanding of the land use and landscape changes. Lovett et al. (2003) show an example of using such technique to visualise landscape changes caused by introducing new management techniques (mulch seeding) or additional landscape structures (hedges) to the farmers involved in the procedure.

6 LMS is a pragmatic research object useful to explain land use changes, and we propose to apply our fisrt modelling processes to understand the recent changes and to propose for the future new land uses (Fresco, 1993; Benoît & Muhar, 1993) . So, logically, our works will take place in the international project LUCC (Land Use and Cover Changes) and we invite our communauty to participate to this worldwide research project (Lambin et al, 1999). The challenges for land uses changes are not only european localised, as we show in this paper, but they are also worldwide to manage (Lambin et al, 2003).

7 To end with an ethical posture (Jonas, 1990), we propose a new researcher behaviour: investigating this type of issue we must not set out from the assumption that a farmer has voluntarily deteriorated the landscape parameter that is being investigated. This corresponds to the development of a «decision agriculture» (Miflin, 1997) that is increasingly knowledge-based, and increasingly rooted in the information and communication sciences and technologies and to a sustainability trend with a new weight of land capabilities (Vereijken, 1992; Jordan et al., 1997). We agree with Boiffin *et al.* (2000): “This does not, however, mean a technology-driven process of innovation, but on the contrary increased feedback of action and decision into the design of innovation”...mainly on land design management innovation!

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Nature management and livelihood strategies on Danish organic farms

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Introduction

Societal demands to the farming sector are changing, from solely focusing on food-production to an increased interest in the production of environmental and nature values, as well as a socio-economically sustainable countryside. Parallel to this development agricultural restructuring takes place. The modernisation paradigm builds on scale enlargement and intensification and a large part of the agricultural sector still follows this development path. Mainstream development in Denmark and other intensively cultivated countries implies a strong structural development with fewer and larger full-time farms and a decrease in small-scale farming (Ministry of Food, Agriculture and Fisheries, 1998). Various alternative pathways to farm development have been identified (Ilbery and Bowler, 1998), including diversification of activities and use of human resources for income-generation. These pathways often express alternative development choices than farm intensification (Djurfeldt and Waldenstrom, 1999). A crucial question is thus, if some of these alternative developments may be more suited to deliver those multifunctional values demanded, than the main-stream developing farms are – and may be eligible to more attention from the policy-side.

Organic agriculture has been identified as one of these pathways forming the agricultural restructuring (Ilbery, 1992). Organic agriculture represents a whole-farm approach to natural resource management, aiming for an integration of production goals, environmental goals and goals for nature management and protection. Subsidies to organic agriculture are mainly justified with the benefits for environment, nature and landscape, and OECD uses organic farming as one of the whole-farm agri-environmental indicators (OECD, 2001). Common for all types of organic agriculture is the aim to achieve a farming system, which has a closed cycle in nutrients, i.e. striving for self-sufficiency on farm or local level and minimising nutrient loss to the environment. Another common goal is that biodiversity in farmland and adjacent areas must not be compromised (IFOAM, 2003). However the ways these common goals manifest themselves in the practice of organic farming in different socio-economic and biophysical contexts are quite varied, and it is thus interesting if the label of organic farming cover a wide variety of nature impacts.

We explore the variation in nature management on organic farms in Denmark. Farming practices in organic farming are strictly regulated, both directly through the organic standards and indirectly through constraints imposed by the organic standards. Organic farms therefore offer the possibility of focusing on a segment of farms where certain farming practices are known. Our starting point is, that when farm households choose alternative development pathways like diversifying the income sources, directing time and resources to off-farm work or other on-farm activities, it has potential impacts on the proportion and management of uncultivated and extensively used areas on the farm, stemming from changes in farm practise and allocation of resources. Therefore, we want to move the focus from the farming system to the decision-level, i.e. the farm household, and explore whether using the concept of

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livelihood strategy can supplement existing farm and farmer typologies, especially in relation to the interaction between production and nature. In this paper we describe and analyse how nature management on the farm may be related to the more traditional farm categorisations like farm type and size and regional context as well as to components of their livelihood strategy on a large sample of the existing organic farms in Denmark.

Landscape elements and permanent grassland as measures of nature management

In an intensively cultivated land as Denmark (62% of the total land area is agriculture, of which only 7% is permanent grassland and the rest is in rotation) the potential for nature quality in the landscape is to a large extent related to the agricultural land use and management. In the absence of larger uncultivated areas, landscape elements (hedgerows, woodlots, ponds, etc.) and extensively managed grassland often constitute the principal potential for biodiversity in the farmed landscape. Extensively managed permanent grasslands harbour 15% of the red-listed plant species and more than 50% of the Danish day butterfly species (Stolze and Pihl, 1998). Maintaining grasslands requires utilisation like grazing or cutting, and the link between nature conservation value, i.e. living conditions for wild flora and fauna, and management intensity of a given grassland is well documented (Alard et al., 1994; di Guilio et al., 2001; Ejrnæs and Bruun, 1995; Hald, 2003; Kruess and Tscharntke, 2002; Stolze and Pihl, 1998). Therefore, the farmer's short and long term management of owned and rented land is relevant to the development of quality landscape elements. This is both in terms of non-removal, securing elements with a long continuity, in terms of new planting, adding to the total area of elements and increasing density as well as the management intensity and maintenance (grazing/mowing) of permanent grasslands. Moreover it has been suggested that biodiversity in agroecosystems depend on both landscape and farm management, and that investigations of relationships between farm management and biodiversity should take landscape context into consideration (Weibull et al., 2003).

We use the concept of farm nature management for actions, resulting from farm household decisions that are assumed to influence nature content on the farm. This involves both decisions mainly linked to the agricultural production (e.g. crop distribution and management, removal of hedges for rationalization purposes, management intensity of permanent grassland, etc.) and decisions mainly made for other reasons (e.g. protection or creation of hedgerows, woodlots or ponds for hunting, aesthetic or nature interests).

Livelihood strategies of rural households

Diversity in income sources of rural households is a general pattern for the intensively cultivated farming sector over most of Europe (de Vries, 1993; Djurfeldt and Waldenstrom, 1999; Hill, 1999; Jervell, 1999), and it has been a growing phenomenon during several decades (Kinsella et al., 2000; McNally, 2001). Evans and Ilbery (1993) suggested that a distinction between farm-based diversification and off-farm employment provided a beneficial focus for empirical work, and subsequently several studies have highlighted the importance of a focus on the household as decision-making entity – also for farm management decisions. (Gorman et al., 2001) use the framework of farm household strategies to point at diversification as a means to expand the pool of livelihood assets from which the family's livelihood is constructed.

A few studies have directly explored the relationship between livelihood strategies and nature management on the farm and have documented e.g. differences in hedgerow planting related to farmer occupation (Primdahl, 1999). Battershill and Gilg (1997) state in an investigation of the preconditions for environmentally friendly farming in the Southwest of England that non-agricultural farm income as well as off-farm income were often crucial for the survival of environmentally friendly farm practises. In a study of pluriactivity, farm household socio-economics and characteristics of grass fields in Scotland, (Ellis et al., 1999) concludes that involvement in off-farm activities influence the type and intensity of land management to the benefit of botanical values on grassland.

The present paper thus raises the following questions:
- How does nature management vary on organic farms in Denmark, and
- To what extent can various components of livelihood strategies assist in understanding this variation in nature management?

Data and methods

Data were retrieved from registry on land use of organic farmers (Danish Plant Directorate, 2001) in combination with a quantitative survey consisting of personal interviews with 347 organic farmers with a total utilized area of 20 288 ha and constituting app. 10% of the organic farms. Interviews concerned the farming enterprise, other on- and off-farm activities, management of permanent grassland and fields in rotation, quantity of uncultivated areas on the farm and land use changes within the last 5 years. Farmers were located in eleven case areas all over the country with the aim of including regional variation in broad landscape types and farm types. In order to obtain variation over a broad range of parameters, we aimed at interviewing all organic farmers in each case area, constituting 25-40 farmers pr area.

Nature management on the farms were described with quantity and quality of landscape elements and permanent grassland on the farm. Landscape elements less than 1 ha was anticipated not to have a major economic importance (e.g. as forestry) Their presence results from decisions related to farm lay-out – either in terms of optimisation of field management (uncultivated field corners, slopes, windbreaks, etc) or directly as decisions to establish wildlife habitats, including ponds. Larger bogs and forests/wilderness on the farm area were excluded from this analysis, as they are considered not to belong to the management of the agricultural area. Quality aspects were explored using age of landscape elements, and age and management intensity of permanent grassland.

The interviewed farmers were asked to identify uncultivated areas on a map covering the farm area. Density of landscape elements was calculated based on farmers' information on hedgerow length and number of rows, area of woodlots, length of dikes, and number of ponds and grave mounds. In hedgerows mean row width was assumed to be 1,25 m, and each pond and grave-mound was assigned an area of 400 m2. Density of both landscape elements and permanent grassland was calculated based on total field area rather than farm area, aiming at a description of farmland density.

Density of landscape elements is classified into 4 density classes, and frequency tables explore the simple relationship between each of the biotope types and farm characteristics. Table 1 presents the classes including the total density of landscape elements, calculated from the sum of the three areas pr farm. The density classes approximately follow the quartiles.

Table 1. Landscape element density classes

Element type	Linear (area)	Point (area)	Area	Total area
Class 1	0-40	0	0	0-130
Class 2	41-100	1-12	1-50	131-240
Class 3	101-190	13-40	50-215	241-450
Class 4	>190	>40	>215	>450

Quantity of permanent grassland was calculated based on the total utilized farm area. Management of permanent grassland on the 666 permanent grassland fields were described using grassland age (years since last ploughing), farmer's plans for resowing or ploughing, main use (grazing, cutting, combined, abandoned), nutrient inputs (manure). Fields were classified as being abandoned, extensively managed (no fertilizer and no plans for reploughing/resowing) or intensively managed (fertilized and/or plans for reploughing/resowing).

Farms were classified in three categories ("PG High/old", "PG Medium", "PG Low/young") based on a combination of the percent area of permanent grassland and the proportion of grassland older than 40 years. "PG High/old" are farms with either more than 5% permanent grassland, all of which is older than 40 years, more than 10% permanent grassland of which more than half is old, or more than 25% permanent grassland of which some is old. "PG Medium" are farms with up to 25% permanent grass, of which less than half is old, with up to 10% grassland of which more than half is old or with less than 5% grassland, all old. "PG Low/young" are farms with permanent grassland, all younger than 40 years.

For the exploration of livelihood components farmers were asked about the off-farm income, for themselves as well as for their spouses. Moreover if they had any non-agricultural farm activities on their farm, such as direct sale of farm products, farm based tourism, windmills, renting out of buildings, handicraft etc., and if yes, how important these activities were for their economy.

In addition to region, i.e. landscape context, and farm size, three types of farm categorisations were constructed for the analysis:

- Traditional farm types i.e. farm specialisation based on economic importance of the production branches on the farm (dairy farms, etc.)
- Farms with varying number and economic importance of non-agricultural farm activities
- Farms with varying degrees of off-farm income from farmer and spouse respectively. The latter aspect was additionally explored with the variable "farmer type" based on farmer's own perception of his status as full time, part time, hobby farmer etc.

The household level of off-farm income was classified according to increasing levels based on both farmer and spouse activity. The classification is presented in table 2:

Table 2. Household off-farm income levels on organic farms

	Farmer's off farm income	Spouse's off farm work
A	Major income	Full or part time**
B	Major income Minor income	Minor* Full time
C	Minor income*	Part time or minor
D	No income	Full or Part time
E	No income	No income

*Minor is less than 20 hours/week (spouse) and less than 50% of income for farmer.
**Part time is 20-37 hours a week for spouse

Table 3. Farm, household and farmer variables and the acronyms used

Variable	Acronym	Number of classes	Class names
Farm type	BT	4	Small, plant, mixed, dairy,
Size of farm	Size	6	< 10 ha, 10-20 ha, 20-30 ha, 30-50 ha, 50-100 ha, >100 ha
Region	REG	5	Regions 1 to 5, see table 4.
Farmer type	FT	3	Full-time, part-time, hobby/other
Off-farm income	PLUR	5	A,B,C,D,E – explanation in table 2 above
Non-agricultural farm activites	NAFA	3	0 (no activities), 1 (one or more activities of no or some economic importance, 2 (one or more activities of some or considerable economic importance

The eleven case areas were combined to 5 regions related to broad landscape types. They are unfortunately of very different size as the original case areas were selected so to cover both a range of landscape types and other parameters. The regions are presented in table 4.

Table 4. The landscape content in the regions

	Number farms	Landscape description	Major soil types
Region 1	129	Heathland: outwash plain and old moraine	Coarse sandy soils
Region 2	68	River valley in young moraine	Sandy clay and clayey sand
Region 3	76	Young moraine	Sandy clay and clayey sand
Region 4	35	Dominantly Yoldia and litorina, some young moraine	Fine sandy soils
Region 5	38	Young moraine – coastal landscape	Clayey sand

The simple relationships between individual farm variables and density of landscape elements or share of permanent grassland were analysed by chi-square tests of frequency tables.

Results

Livelihood components on the farms

We start by looking at the farmers' off-farm income levels. More than half (54%) of the farmers derive their main income from off-farm work and 26% have no off-farm income at all. However, 41% consider themselves as full-time farmers, thus including the major share of those, who have minor off-farm incomes, but also to a smaller extent those, who have major off-farm incomes. 71% of the spouses work full- or part-time outside farm, and this has an influence on the way that the farmer perceives himself. Thus if both the farmer and the spouse work most of their time off-farm, only 5 farmers consider themselves a full-time farmer. If the farmer works mainly off-farm, but the spouse has only minor off-farm incomes, 20 farmers consider themselves full-time farmers.

Looking at the household off-farm income levels very few (8%) of the interviewed farm households had no off-farm income from either farmer or spouse (class E), and 12% had only minor income (C). In 42% of the farm households both the income of the farmer and wife was mainly derived from off-farm work (A). Farms with major off-farm incomes were considerably smaller than the farms where the household had only minor or no off-farm income, but other conclusions on relationships to farm size cannot be made, as variation in farm size within groups is high.

Table 5. Household income types on organic farms

	Farmer's off farm income	Spouse's off farm work	*Number of farms*	*% of farms*	*Mean farm size, ha*
A	Major income	Full or part time	147	42	25
B	Major income Minor income	Minor Full time	66	19	47
C	Minor income	Part time or minor	42	12	76
D	No income	Full or Part time	63	18	83
E	No income	No income	27	8	90

Half of the farms were engaged in non-agricultural activities on their farms, and 15% are engaged in more than one activity (table 6). While 21% of the farmers state that these activities are of some or major economic importance, there is still a high degree of farmers having non-agricultural activities on their farm, which are judged as having no or minor economic importance (27%).

Table 6. Number and economic importance of non agricultural activities (NAFA). % of farms.

Non agricultural activities, no.		Economic importance				
		No	Minor	Some	Major	Total
No activities	50,7					50,7
One activity		12,9	8,4	6,3	5,8	33,4
2 or more activities		1,4	4,6	3,4	5,4	14,8

Quantity of landscape elements and permanent grassland

On the 346 organic farms, linear landscape elements were present on 89% of the farms, while point and area elements each were present on 2/3 of the farms. Based on the total area of utilized land and the total area of landscape elements less than 1 ha on all farms, the overall density of landscape elements was 2,3%. Based on farm densities, the average area density of landscape elements on farms with elements was 3.9%. 13 farms had no landscape elements.

Table 7 Length, number and area of types of landscape elements on 346 organic farms

Landscape elements	N *)	Mean length / number / area per farm	Mean length / number / area / ha	Mean estimated area density, m2/ha
Linear (hedgerows, banks)	308	2221 m	58 m/ha	146 m^2/ha
Point (ponds/grave mounds	235	2,6	0,13/ha	46 m^2/ha
Area (woodlots etc.) <1ha	232	8800 m^2	234 m^2	234 m^2/ha

*) Farms without landscape element type excluded

The area of linear landscape elements contributes with 43% of the total area of landscape elements, with 7% of the length of linear elements constituted by earth banks and stonewalls. The point landscape elements, ponds and grave mounds, contribute with approximately 6% to the total area. The grave mounds constitute 22% of the number of point elements. Area landscape elements include woodlots, small uncultivated areas, wet areas with shrubs and the like. Mean densities are seen in table 7. Frequency tables of landscape element classes versus farm variables were analysed and the significance levels are presented in table 8.

Table .8 Significant relationships between farm variables and landscape element densities

Variable	Linear	Point	Area	Total area
BT	***	***	***	***
Size	***	***	***	***
REG	***	***	(NS)	NS
FT	**	***	**	***
PLUR	**	***	NS	**
NAFA	NS	NS	NS	NS

Linear landscape elements are significantly related to most farm variables as illustrated in table 8. High densities of linear elements are especially related to landscape type, where the Region 1 has the highest density (md.= mean density 67 m/ha) and Region 2 the lowest. Among farm sizes, small farms have the highest densities (md. 107 m/ha) – almost three times as dense as on the largest farms. Hobby farmers have a significantly higher density than the other groups of farmers, which are alike, and among the farm types dairy farms have the highest density (md. 88 m/ha). Farms with a high income from off-farm work (Class A: highest off-farm) has the highest density (md. 67 m/ha). Figure 1 shows the relationship between density of linear elements and landscape context.

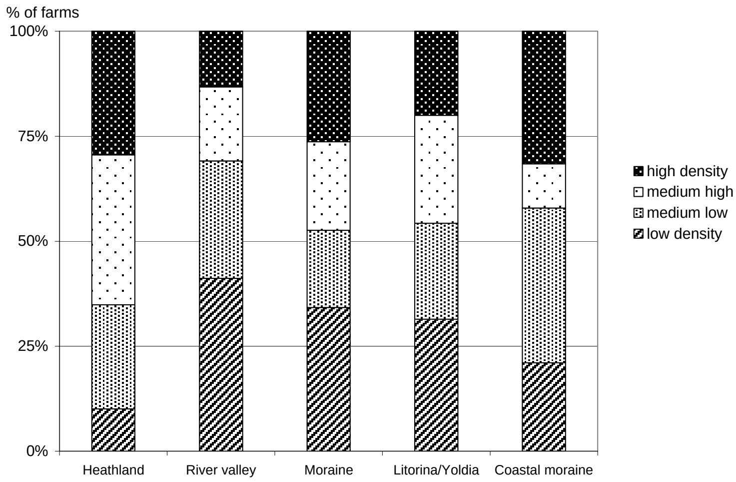

Figure 1. Distribution of farms in linear element density classes on regions

Ponds are also significantly related to all farm variables except NAFA, but the significance level is higher for the livelihood components. High densities of point elements are related to Region 3 (mean density 0,12/ha), to small farms (md. 0,14/ha) and hobby farms (md. 0,09/ha). Off-farm class A has highest density (md. 0,08).

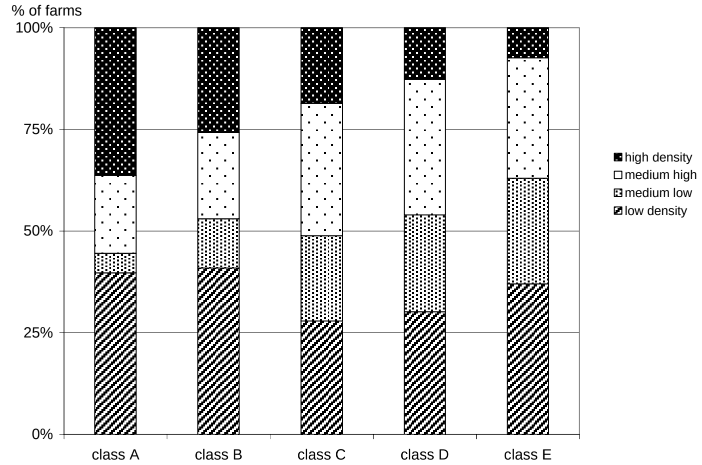

Figure 2. Farms in pond density classes distributed on off-farm income classes (see Table 2 in text)

Woodlots are only significantly related to farm size, farmer type and farm type, but not to region, off-farm and NAFA. High densities are related to small farms (md. 306m^2/ha), hobby farmers (md. 264 m^2/ha) and the farm type small farms (312 m^2/ha).

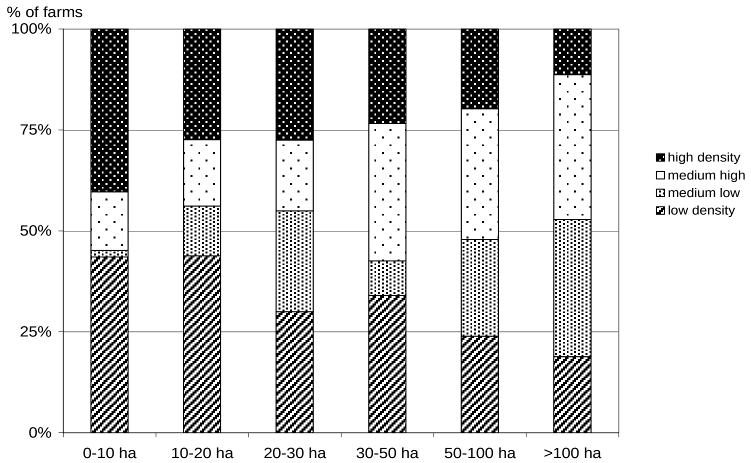

Figure 3. Farms in woodlot density classes distributed on farm sizes

When classifying farms according to their density of each type of landscape elements in high (Class 3 and 4) and low (Class 1 and 2) density, farms belonging to the high density group for all three element types constitute 14% of the sample (48 farms). Among these farms with both a high density and a high diversity in landscape elements, there was a higher frequency than expected of small farms and farms located in Region 3 or in Region 4. Additionally hobby farmers, households where both farmer and spouse derived a major part of their income from outside the farm, and households with no non-farm activities characterised the sample. This points to the group of hobby farms as the ones with highest densities of all elements. However, small farms (0-10 ha) only contain 5% of the total biotope area, and thus do not contribute much to the total area of landscape elements.

On the 346 farms permanent grassland amounted for 16% of the total utilized area. 220 of the farms (64%) have permanent grassland, with a mean proportion of the utilized farm area of 15% on farms, which have permanent grassland. The presence of permanent grassland is linked to farm types: dairy farms (80%) more frequently have permanent grassland on the farm, and small and arable farms (56%) less frequently. Among the farms without permanent grassland, hobby farmers are more frequent than expected, whereas full time farmers more frequently than expected have permanent grassland on the farm.

Quality of landscape elements and permanent grassland

Age was used as the main indicator of quality of landscape elements. As seen in Figure 4, the oldest class make up the largest share of the group for all three types of landscape elements. For the linear landscape elements, age distribution is different in the two dominant hedgerow types: in one-row hedgerows the old elements (>30 years old) constitute by far the largest length of hedges (38%), whereas three-row hedgerows established with economic support implemented in the early 1980s are predominantly less than 30 years old. Figure 4 and 5 show the hedgerows distributed in age-classes, and the dominance of older hedgerows is evident. Also for the point landscape elements, the oldest class (which includes all grave mounds) is largest (Figure 4). Recent establishment of ponds contributes with a considerable share (28%), which should be seen in connection with only two ponds having been removed during the last 5 years. For the area landscape elements, the oldest class of elements make up the largest share of the area as well (57%), while recent establishments accounts for 16%. Removal of area elements during the last 5 years has been insignificant.

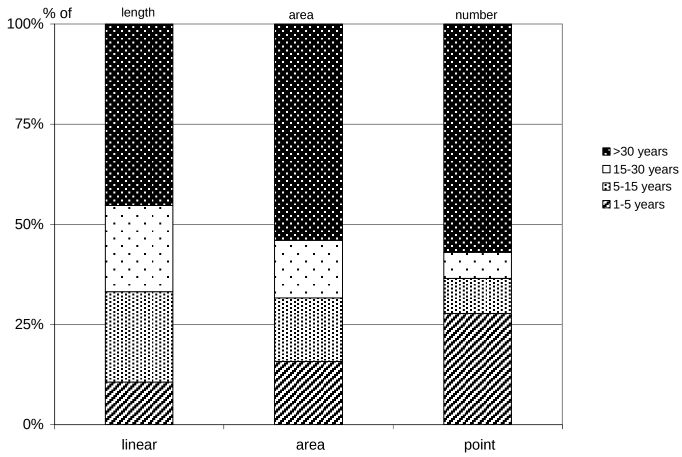

Figure 4. Age distribution of three types of landscape elements

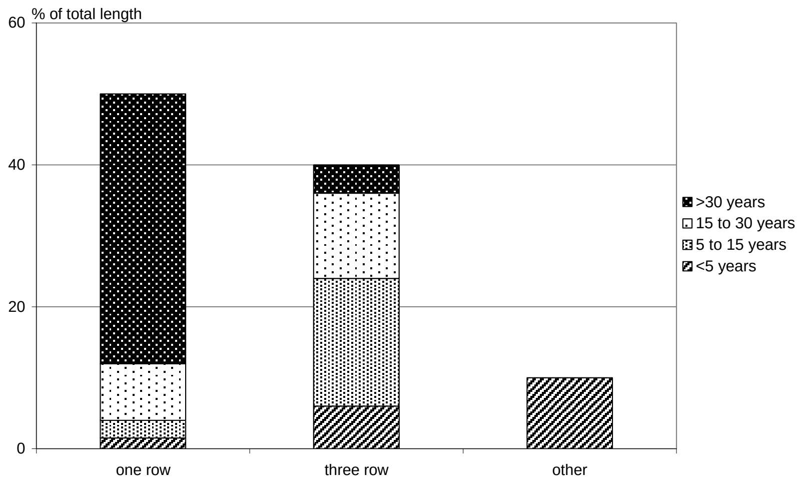

Figure 5. Age distribution of length of two hedgerow types

The age distribution of landscape elements on individual farms show, that 222 farms have old linear landscape elements, 166 farms old ponds and 131 farms old area elements. For all three types, the presence of old elements is predominantly related to farm type, size and farmer type, with dairy farms, full time farmers and larger farm sizes being more frequent than expected. Also landscape type influences the chance of the farm having old landscape elements, with the highest relative frequencies of farms with old linear elements found in the Region 1 and 5, whereas farms with old point elements are frequent in Region 5 and area elements in Region 2. Other livelihood components do not have any significant influence on the presence of old landscape elements on farms.

Age distribution of permanent grassland on individual farms show, that of the 220 farms with permanent grassland, 103 have permanent grassland older than 40 years on the farm. The distribution of farms classified as “PG High/old”, “PG Medium” and “PG Low/young” was influenced by landscape type, with Region 2, Region 4 and Region 5 exhibiting a larger than expected frequency of farms in class “High/old”, whereas farms in Region 1 and Region 3 showed less than expected. The distribution of farms in grassland classes also differed among farm types, with an above frequency of mixed farms in the group “High/old”, and with arable farms showing more farms than expected in the class “low/young” (Figure 6). Also, although not significant, farms managed by full time farmers tended to be present with an above average frequency in the class “High/old”.

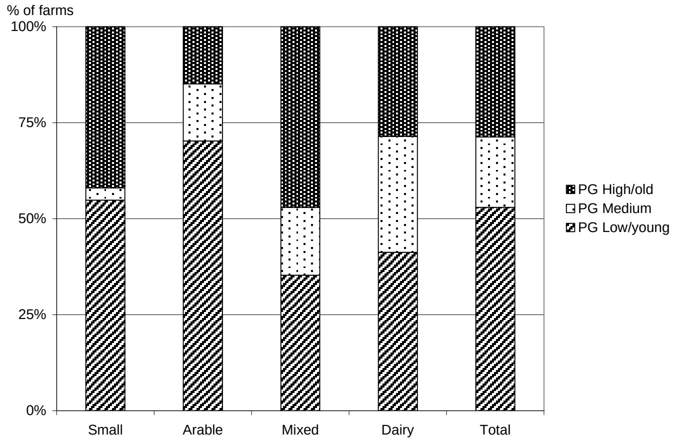

Figure 6. Distribution of farms with varying area and age of permanent grassland on farm types. “PG High/old” are farms with a high area% permanent grassland and a high % old, N=64. “PG Medium” are farms with a medium area permanent grassland and some old, N=39. “PG Low/young” are farms with no old grassland, N=111. Distribution is different among farm types (Chi2=0.0001)

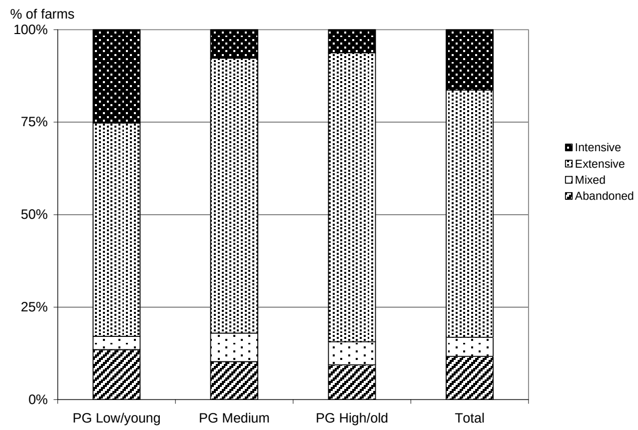

Figure 7. Distribution of predominant grassland management on farm grassland proportion and age. Management differs between classes (Chi2=0.01)(N=214)

Farmer actions: creation and removal of landscape elements and management of grassland

Farmers have planted 9% (64 km) of the existing length of hedgerows within the last 5 years. In the same period only 12 km hedgerow have been removed. 133 (39%) of the farmers have planted or removed hedgerows within the last 5 years. Of these, 97 farmers have only planted hedgerows, 8 have only removed, and 27 have done both. Both landscape type, farm type and size and farmer characteristics influence the frequency of planting. That more farmers than expected have planted in Region 1, while especially in Region 2 less farmers than average have planted, confirms the general picture in Denmark, where the potential for wind erosion on the sandy soils have lead to more frequent hedgerow planting. Large farms of >100 ha dominate among farmers planting hedgerows, while farms where both farmer and spouse work fulltime outside the farm and those who consider themselves hobby farmers are less frequent. Dairy farms and mixed farms have a higher planting frequency than small and arable farms.

61 (18%) of the farmers have established new ponds within the last 5 years. Although the same variables are important, the farmers who are active in this field are not the same as the ones planting hedgerows. Region 2 and Region 3 show above average frequency of farms with new ponds, with small and mixed farms as well as part time farmers dominating. Also farms without other activities on the farm occur more frequent than average. In general the differences are not as large as for the linear elements.
Establishment of new area elements have occurred on 61 farms with other farm(er) characteristics than for linear elements and ponds. Farmers in Region 2 and Region 5 plant area elements more frequently than expected. Also, farm households with off-farm work have a considerably higher frequency of planting area elements than the others. Additionally, as for planting of linear elements, farmers with on-farm activities of no or little importance were represented above average.

More than two thirds of the farms with permanent grassland manage all their permanent grassland on the farm in the same way. Classifying the farms after their predominant management of permanent grassland as extensive, intensive, abandonment or mixed management (e.g. some fields intensive, other extensive) show, that almost all farms in class "PG High/old" manage their permanent grassland extensively, whereas most farms with any grassland being intensively managed are farms in the class "PG Low/young" and thus have no old grassland (Figure 7). This positive link between age and management may be due to several factors, including low productivity, other production constraints on individual grasslands or to protection measures.

Discussion

We set out to explore the diversity of nature management on organic farms and to examine whether including components of livelihood strategies of the farm household could supplement other farm characteristics in our understanding of this variation. This paper present the first results from the interview analysis of approximately 10% of organic farms in Denmark. Since farm diversity is perceived as being a characteristic of organic farms, and since organic farming has been identified as a diversification strategy, we have been interested in how diversification of farm resources would impact the way nature elements are managed on the farm. Non-agricultural activities on the farm as well as off-farm activities are included in the analysis together with other factors which potentially influence the density of landscape elements, such as landscape context (soils, terrain, cultural factors, etc), farm type and size of farm. The present paper includes analyses of simple relationships, but the strong linkages between relevant farm variables ask for multivariate analysis, which will be done at a later stage.

During the analysis it has become evident that nature elements to some degree have to be analysed as separate entities, i.e. there is no relationship between the share of permanent grassland on the farms and the density of landscape elements. From this descriptive analysis it is not possible to present in-depth explanations of relationships found, however, it indicates that the elements are related to their function on the farm. Permanent grassland is closer linked to the production than the landscape elements and thus to the farm type, but also hedgerows show some inclination to production parameters like farm type and size of farm.

The age of landscape elements in combination with the limited removal indicate an increased interest in the nature content on the farm, and many farmers are active nature managers in creating new landscape elements. Hedgerow planting takes place with an above average frequency in the heathland, whereas ponds and woodlots tend to be established in the river valley regions and on the young moraine. The inclination to plant hedgerows on the sandy soils in Jutland is related to the need for windbreaks as a protection against wind erosion, which have formerly been a major plague in this area. Large planting schemes took place in the first half of the 20th century to contradict the sand drift, but during the 1960s planting almost stopped and major removals of hedges took place on Zealand in order to rationalise farm management. Planting subsidies however changed the situation in the beginning of the 1980s, as evident in the figure of the age of 3-row hedges above.

The analysis of landscape element densities shows that small and hobby farms contain a relatively higher density of nature areas than larger farms of other types, while it does not show anything about the contribution to the total nature content in the farmland. But it indicates that farmers' nature management vary considerably, and the low overall densities of landscape elements indicate that there is still a need to promote the establishment of landscape elements among groups of farmers.

Old nature elements constitute a surprisingly large part of the total, both for the landscape elements and for the permanent grassland. They do not only present historic evidence of former farm lay-out, but indicates present time activity of non-removal. As a matter of fact the removal of landscape elements is not very significant. There is a considerable potential nature value related to the old landscape elements, and since the old landscape elements are especially related to larger farms and to full time farms, where structural adjustment (e.g. increases in farm and field size) is going on, it seems important to direct attention to their value.

The off-farm income levels show significant contributions to some of the landscape element analyses, i.e. the density of linear and point elements, and the age distributions of landscape elements. No effect of non-agricultural farm activities can be revealed by the present analysis, but we expect that in-depth exploration of types of activities and time spend on the activities may present us with more detailed results. Also the co-variance with other farm(er) variables has to be explored more in detail. As the spouse's participation in the farming activities influence the farmers perception of the farm as a full- or part time farm, it would be interesting to explore the importance of the spouses' involvement or dis-involvement in the farm activities for the nature management. This awaits further analyses.

We have chosen to take our starting point in the population of organic farms. It is our assumption that the large differences shown here among the organic farms and farmers – both in terms of share of farm with nature elements, of the kind of elements present on the farm and in terms of the intensity of management, are not specific for organic farms and farmers but may be similar on farms in general. We aim at exploring the relationships between farm and farmer variables and their attitudes to nature management further, which may enable us to establish groups of farms with a common profile that could be target groups for certain nature management initiatives.

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Combinations of productive and environmental functions in a farmland area: synergies and antagonisms: Method of analysis and application in a small area in a mixed crop-livestock farming area in France

Rapey H., Klingelschmidt F., Josien E.*, Lardon S., Servière G.*** and Fiorelli C.******

Summary

For some years now, in response to new social demands, agricultural policies have recognised and tended to favour the environmental and social functions of agriculture, and more generally, the multifunctional nature of farmland use. The complete evaluation of the situations and results obtained is still difficult, particularly in view of the complexity of the interactions between functions and their varied and delayed impact on the environment. This situation has prompted research and led to the development of new methods to analyse farming practices and systems. The work presented in this paper contributes to this effort and is in two parts: 1) the construction of a framework for the analysis of the relationships between environmental functions and agricultural production at area scale, and 2) the application of this framework and the proposal of a preliminary diagnosis concerning synergies and antagonisms between functions from an empirical study in a small mixed crop-livestock farming area. The first part of this work enabled us to define various concepts used in the field of multifunctionality and devise a method for characterising them: "function", "productive function", "achievement of a function", "achievement of a combination of functions", "farmland area", etc. The second part is an application of this analytical framework to a 350 ha area of continuous farmland characterised by a diversity of environment, uses and users. Two environmental functions (preservation of surface water quality and landscape diversity) and their interaction with the productive function are singled out. We show that plots of land that display synergies and antagonisms between productive and environmental functions are often located close to one another in the farms and farmlands concerned. Antagonisms are much more common on large farms and in some areas made sensitive by their geographical features (areas near watercourses or on hillsides). Synergies occur in farms that are often given little consideration in development and planning policies because of their low spatial and economic importance. Our findings argue for using different modes of intervention for different areas and for different farms. We also outline methodological perspectives for simplifying diagnosis.

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Context

The environmental expectations for areas used for agricultural production are greater than ever. Since the nineties, public policy has been taking these new social demands increasingly into account. Agricultural multifunctionality was a declared objective of the 1999 French agricultural planning act. It is also foreshadowed in the work of the European Commission on the next Common Agricultural Policy (CAP) (E.U., 2003). The different attributes that are felt to be desirable for farmland are increasing in number, with broadly diverse individual or regional variations; these attributes involve multiple items (e.g., plots, hedges, paths) that are sometimes interconnected. Despite research and methodological progress in this field (Beuret and Mouchet, 2000; Hayo and al., 2002; Hervieu, 2002; Véron, 2003), overall appraisal of multifunctionality (both quantitative and qualitative) is still difficult to carry out, especially because of the complexity of the interactions between productive and environmental functions, and the widely varied and sometimes delayed effects they exert on the environment through their aesthetic, ecological and agronomic consequences (Boiffin, 2001). For example, how do we measure and compare agricultural multifunctionality in hedged and non-hedged land environments? How do we measure and compare the efficiency of certain modes of agricultural management, while taking into consideration the state and specific interactions of landscape, ecological and productive functions in these environments?

Agricultural entities (farm areas, buildings, etc.) that can support attributes valued by society may undergo modifications due to farming practices, and interact among themselves; these interactions then generate antagonisms or synergies between productive and environmental functions within a given area. However, adjustment or changes in farming practices in an area is currently one of the ways most often advocated for improving agricultural multifunctionality, even though the relations between farming practices and multifunctionality are not yet fully known and understood.

This situation makes necessary new tools and methods of analysis of farming practices and systems. First, the agronomic approach must cover areas larger than a plot of land or a pattern of fields. The whole farmland area farmed by several operators in an area must be taken into account to assess the environmental effects of farming practices more accurately (Benoit and Papy, 1998; Boiffin, 2001; Sébilotte, 2002). Second, to promote multifunctionality of agriculture and farmlands without increasing agricultural production and support costs, it is essential to improve evaluation of and allowance for the effects of synergies and antagonisms between environmental services and agricultural production at area scale (Mahé, 2001). Thorough analysis and justification of these processes is also necessary now that the economic relevance of multifunctionality is being challenged by some countries for the renegotiation of the organisation of world markets in agriculture in 2003 (OECD, 2001; Dron, 2001).

Problem

The aim of our work is to analyse how the nature and spatial implications of farming practices facilitate synergies and antagonisms between environmental functions and agricultural production at area scale (Rapey and al., 2003).

To improve the efficacy of farmers interventions from a multifunctional point of view, different options are possible: - set out achievement of several functions on the same entity or separately on neighbouring entities? - undertake action at plot level, farm level, or over whole area. It is necessary first to have a method that defines, describes, and links characteristics of environmental and productive functions.

What are the support entities and conditions of achievement of each function? How to evaluate their level of achievement and how favourable the impact of farming practices is on each function (criteria and relevant scales of analysis)? How to characterise globally the effects of farming practices on production, water quality and landscape, for example?

Our work is accordingly in two parts:

- development of a framework for the analysis of relations between environmental functions and agricultural production at an area scale.
- application of this framework and the proposal of a preliminary diagnosis on synergies and antagonisms between functions from an empirical study in a small mixed crop-livestock farming area.

In what follows, we report methodological and analytical results from our work on the multifunctionality of farming areas.

Method

Definition of an analytical framework

Before characterising the farmland functions and their achievement, a clear meaning had to be assigned to these two concepts of "function" and "achievement of a function", as the literature showed unclear definitions varying from one author to another.

We specified a <u>function</u> is what must be accomplished by a farming entity to meet a user's expectation. This definition incorporates three key concepts:

- an <u>entity</u> that undergoes modifications as a result of interactions between farming practices and farm environments (e.g., a hedge maintained by a farmer, a plot fertilized , a co-operative delivered by a farmer).
- an explicit <u>expectation</u> concerning this entity, either expressed by people who share that expectation (often for some precise activity area, expressing a "local" expectation), or embodied in regulations ("global" expectations provided for in a law, a charter, etc.).
- a <u>farmland user</u> who uses this area not necessarily entailing farming practices with a view to claiming for himself an economic, recreational or patrimony benefit (e.g., a wet grassland orchid specialist, an soil-less livestock farmer, a livestock trader with animals out to grass over the summer, etc.).

From this definition, we consider that, for the support entity of a function, <u>the level of achievement of the function</u> depends on how fully the user's expectations are met. It can be evaluated either directly in retrospect by a user surveys, or indirectly beforehand by observations on the support entity, compared with known characteristics for conditions favourable to the achievement of the function. The first type of approach requires competences in sociology or psychology; the second mostly competences in ecology, agronomy or animal production. In this second case, we evaluate <u>a capacity of achievement of the function</u> rather than a real achievement level (because "favourable" conditions do not automatically lead to a "favourable" result that will satisfy the user, but simply indicate that this result is more probable).

<u>Farmland</u>, by which we mean a continuous area of land on which different operators are applying farming practices (for profit or for other purposes), is one of the supports that allows the observation of the capacity of achievement of various functions in relation with farming practices and diverse

agricultural environment. Farmland is not the sole exclusive support (example of other possible supports: social or commercial networks of farmers); however, it offers a wealth of readily accessible information and variation, which enabled us to address the question of combinations of agricultural functions rapidly and significantly. We thus focused on the spatial component of the multifunctionality of agriculture, which represents only a small part of the multifunctionality of agriculture and rural areas. We could, for example, have designed and extended the approach to cover combinations of "socio-economics networks" functions, the support entities of which are not permanently locatable within the area studied, but which undergo socio-economic transformations induced by individual practices within the area (not necessarily related to agronomic practices).

The productive function of farmland for a farmer has a special status as regards the multifunctionality of agriculture. The user-farmer occupies both a supply and a demand position as regards production expectation: he both formulates an expectation and seeks to respond to it by his farming practices. His formulation of his expectation and the practices he adopts strongly incorporate the characteristics of his objectives and his economic, technical, soil and climatic constraints. He strives for the best possible fit between his expectation and the achievement of this function (Capillon and Sébillote, 1980). Consequently, there is no greater or weaker capacity of achievement of the expectation by the support entity, but rather a way in which this function can be achieved. It responds in a localised manner to the farmer's goals and constraints. It can be termed a "function for production". This concept of "function for production" we introduce here is quite similar to those of "surface function", "land use", or "plot function" defined respectively by Guerin (1990), Bellon (1992) and Fleury (1995). In complement to these authors, we also separately consider farmland areas outside the forage system that play some role in the farming system (for example: cash-crop cereals plots, family leisure parks, etc.).

These different points make it possible to differentiate the capacities for the achievement of a combination of functions concerning plots or groups of plots; it is thereby possible to define areas that are relatively homogeneous in fulfilling the expectations of farmland users. This helps to identify and understand how different areas and farms variously contribute to the multifunctionality of agriculture.

Applying this framework to the analysis of interactions between agricultural functions

The use of the above analytical framework requires some preliminary considerations to specify the forms and spatial entities of the farmland area multifunctionality . It is especially important to:

- define the boundaries of the land and farms studied, based on a prior diagnosis of multifunctionality within an agricultural region (diversity of nature and localisation of expectations);
- define common predominant functions of the land (expectations, users and support entities concerned);
- identify available information, and what remains to be collected, on targeted functions.

Definition of land and farms taken into account

To study a diversity of multifunctionality forms stemming from a variety of environments, farmers and farmland uses, we opted to study a small area that was transitional, both geographically (between granitic uplands and clay soil lowlands) and agriculturally (between stock farming and cereal-growing regions); it was an area of land located in a single local administrative area forming a vast north-facing terrace, bordered to the East and West by a watercourse and to the south by woodland. It comprised 350 ha of continuous farmland composed of 239 plots and 36 farmland users.

The farmland users had various production activities of wide-ranging nature and scale, with or without a commercial purpose: they ranged from the full-time farmer with 200 ha of crops and grasslands (in and outside the land area being studied), to the town dweller with a horse on 1 ha. Given the numerical importance of “amenity” users in the studied area (about one quarter of the total), we integrated these and met all of them for our study. All are referred to as "farmers" operating on "farmland".

Definition of predominant functions for the studied area

First of all, to restrict the field of investigation to a suitably small number of interacting functions, we made a rapid review of "local" expectations concerning agriculture (expressed in a meeting with members of the local council), and of "global" expectations (stated in regulations applicable to the area). The preservation of the quality of surface water and landscape diversity were the two environmental functions selected, accompanied by the "classical" agricultural function, i.e., the production of market food produce. Next, environmental conditions and practices that would favour the achievement of the two environmental functions to varying degrees were identified from the literature and meetings held with "experts". These conditions were then reformulated to make them applicable to the studied area on the basis of available or easily collected data for the farm plots (ground maps and farm surveys). We thus specified three degrees of capacity of achievement of each environmental function for the studied area– weak, medium, and strong - (see Table 1).

Table 1. Example of criteria used to define the achievement capacity of environmental functions for the function "water" (N.B. if environment and practices are favourable, then capacity is strong)

Conditions for the achievement of a function ("water"):	Significant characteristics of the farmland plot and practices for this function:	Capacity of achievement of this function:
Unfavourable environment / Water *(= vulnerability of the environment)*	•Proximity to watercourses(< 35 m)	⇨If practices unfavourable: <u>weak capacity</u> ⇨If practices favourable: <u>medium capacity</u>
Unfavourable practices/Water *(=aggressive nature of practices[1])*	•High[2] Surplus of N according to apparent balance figures •High[2] Surplus of P_2O_5 according to apparent balance figures •High number [2] of pesticides treatments at certified doses ➔ Unfavourable when at least one of these criteria is met	⇨If environment unfavourable : <u>weak capacity</u> ⇨If environment favourable: <u>medium capacity</u>

The various modes of achievement of the productive function of each plot (defined earlier as "functions for production"), were differentiated according to the use of vegetal product expressed by the farmer during the survey, this use being considered here as significant in defining the function of the plot in the farming system:

- standing forage(A), conserved forage (B), mixed forage -A and B- (C)
- animal confinement (D) (night, winter and control paddocks, etc.)
- cereals and forage sale (E)
- fallow land(F)
- family amenities (G) (garden, vineyard, orchard, animal leisure park, etc.)

1 For plots of land located in permanent grasslands, only exercise areas and night paddocks for animals were rated as using unfavourable practices. For temporary grasslands and crop growing, three characteristics were used and are set out in the table.

2 Relative to all values observed in each plot in the area.

- no use (H).

This nomenclature allows spatial differences of expectations and practices of farmers within farms to be taken into account, so as to provide a farming system that will locally fit the aims and constraints of each farmer.

The contribution of these eight functions to agricultural production is direct and specific to varying extents according to the case. We can define four categories:

- functions that play no part in the production system (G and H).
- functions that play a part in the system but not necessarily in production (D and F).
- functions that necessarily play a part in the production system but with no particular requirement for animals (E)
- functions that play a part in the production system with special requirement for animal production (A, B, C).

Grouping them in four categories makes it possible to characterise farms and areas globally from a production point of view; they are useful in the analysis of particularly diversified areas or farms.

<u>Information used</u>

The main part of information concerning the physical environment was extracted from ground maps (IGN, 1993) and aerial photographs (IGN, 1999). Information was précised locally by "experts" and from observations in the field. These data were digitised and integrated into a spatial database set up for the purposes of the study (Matter, 2002).

Concerning uses and users of the studied area, a preliminary localisation on a map by the mayor, himself a farmer, was necessary. All selected farmers using more than one hectare were surveyed (Fiorelli, 2002). Questions were linked to the global management of the farm and to practices localised on each plot used in the studied area. As the individuals and farming structures studied were varied and quite often outside the scope of the standard definition of farming, some “classical” technical parameters were found to be irrelevant or unimportant for many users (especially “amenity” users); during the analysis, the overall comparison of farms was not always possible and required the setting-up of sub-groups studied more individually from the point of view of certain specific characteristics. As much information as possible was entered in the spatial database to help to identify the mode, influencing factors and spatial organisation of agricultural functions and combinations of functions (Fiorelli, 2002; Klingelschmidt, 2003).

The methodological approach described here thus attaches great importance to defining the concepts necessary for the analysis of multifunctionality. Specific relations between agriculture and its functions and the area [area being a support, a factor and a product, and being subject to internal and external interactions (Lardon and al., 2001)] very strongly influence the approach and the issues developed here concerning multifunctionality: the taking into account of a continuous area of land and all its users, surveys and analyses of spatial characteristics, etc. The application and results obtained are not limited to the analysis of spatial effects; they help to define determining factors of multifunctionality at plot, farm or area scale. The key points are developed below.

Results

A part of the results obtained concerns the productive functions of the farmland: their role in the production system, their distribution, their variability, etc. It was only subsequently that the different specifications of these productive functions were linked to the characteristics of two environmental functions studied in the same area.

Diversity of farmland area functions for production in relation to the spatial structure of farms

Over both the whole land area studied, and the area used by each farm within this land area, we noted broad diversity in functions for production.

Each of these eight previously defined "functions for production" covered 2% to 30% of the area studied (out of a total of 325 ha) and 11% to 42% of users present (out of the 26 questioned). The most widely represented function was the "mixed" mode (C) (98 ha, 11 users), and the least "animal confinement" (D) (6 ha, 4 users).

Globally, for each of these four categories of contribution to agricultural production, we found: 10% of the farmland played no part in the production system (amenity use + no use = G + H), 5% played a part in the system but not necessarily in production (confinement + fallow = D + F), 20% played a part in the production system but with no particular requirement for animal production (crop sale = E), and 65% participated in the system with special requirement for animal production (standing and/or conserved forage = A + B + C). The analysis of these categories brought out similarities between certain farms[3].

A group of two farms presented only "crop sale" and "fallow" functions in the area ; their farm- stead is inside the studied area, but most of their land lay outside this area (an average of 63 ha per farm, with 64% outside the area). Farm activity did not account for most of their income (one part-time farmer, one retired). This formed a small group of "small-sized, multi-activity, local[4] cereal farmers".

Another group of four farms in the area covered a large part of the land area with requirements for animal production (standing and/or conserved forage), on a total of 159 ha, and with a small proportion of land area for cash crops. These were full-time livestock farmers working on medium-sized structures (71 to 94 ha) of which barely one half was located within the area. We called this group "medium-sized local crop-livestock farmers".

The most popular group (10 farms, 93 ha in the area) was of farms for which the land within the area was solely dedicated to production for animals. We could identify two sub-groups: (i) farms with land for cash crops outside the area of study and whose farm-stead was often located outside the local administrative area, and which had large areas (118 to 200 ha), and (ii) farms with no area for cash crops, of medium or small-sized overall area (9 to 98 ha), with their farm-stead within the local administrative area, and plots of a small size on average (less than 1 ha). We differentiated, therefore, between "outside livestock farmers operating on large structures", and "local livestock farmers operating on medium-to-small structures".

The last group represented a large group of farmers for a very small proportion of the area (9 farms, 26 ha); these belonged essentially to retired land users and those who used the land for pleasure pursuits,

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3 One farm that had only fallow land within the area studied could not be integrated in the groups and was excluded from the analysis.

4 From the point of view of the farm-stead.

living within the local administrative area. In most cases, all their land was within the area, with small plots, and was not contributing to a production system. We called this group "local and amenities users".

The characteristics of these groups showed that it exists relations between functions for production in a given area and the spatial structure of the farms (size and grouping of land in an area and, in particular, close to the farm-stead). This implies that the functions for production within an area take modes that vary to different extents according to the diversity of the farms there and according to the varied localisation of their land areas. It must be noted that neighbourhood users (whose farm-stead is within the administrative area) had particularly diversified and extended uses (242 ha out of 326), while remote users had relatively similar productive uses ("feeding animals" on a total area of 84 ha); the neighbourhood users will therefore be especially important in the diversity of functions for production in a farmland area.

Continuing the analysis of the spatial structure of the farms, we also noted that the percentage of hillside land, small plots, and land close to villages over the area studied, were different in each group: "local cereal farmers" had most of their land located in the flat north-west of the area and combined the use of small and large plots. The "livestock-crop farmers" and "outside livestock farmers", had mainly large plots spread over the entire lowland area and in the valleys. The "local livestock farmers" had small plots of land on the eastern half, in small valleys, and lastly, "local and amenities users" mostly had small plots of land located close to villages.

These preliminary results indicate a wide-ranging degree of variability of functions for production over the whole farmland area, according to the farms and their spatial organisation. It is probable that the achievement of environmental functions and practices-environment relations vary according to the same criteria. We went on to deal with this point in more depth.

Diversity of environmental functions achievements in relation to functions for production

Each of these four categories of functions for production (defined earlier) presented combinations of strong and weak achievement capacities, for the two environmental functions studied. Two categories most often had combinations of strong achievement capacities (see Table 2).

Table 2: Different capacity combinations of environmental functions for each of the four categories of functions for production (NB: the percentages that differed most from average percentages measured in the studied area are in bold print)

Categories of functions for production: / **Environmental functions:**		**Cash crop (E)**	**Standing and/or conserved forage (A, B, C)**	**Fallow+ Confinement (D, F)**	**Amenity+ No use (G, H)**	**Total**
Weak capacities combinations [5]	area	17 ha	24 ha	6 ha	2 ha	49 ha
	% area	**26%**	11%	**39%**	**5%**	15%
Medium capacities combinations[6]	area	18 ha	91 ha	2 ha	15 ha	126 ha
	% area	**27%**	44%	**15%**	46%	39%
Strong capacities combinations[7]	area	31 ha	96 ha	7 ha	16 ha	150 ha
	% area	47%	45%	46%	49%	46%
Total area % total area		66 ha 20%	211 ha 65%	15 ha 5%	32 ha 10%	324 ha

5 = weak capacity of achievement for at least one of the two functions: "water" or "landscape", whatever the capacity of achievement of the other function.

6 = medium capacities of achievement of the two functions: "water" or "landscape".

7 = strong capacity of achievement of at least one of the two functions: "water" or "landscape", the other function having a strong or medium capacity.

Comparing the groups of farms, we note that they all also integrate both strong and weak capacities combinations for the two environmental functions studied. The groups of "outside livestock farmers", "local livestock farmers", and «local and amenity users» were differentiated by less often having weak capacities combinations than "local cereal farmers" and "local livestock - crop farmers" (between 1% and 5% of the area used for the first three groups, between 21% and 28% for the last two).

At this level of analysis, in spite of the differences found, it was difficult to conclude on what types of farms or functions for production would be most favourable for the achievement of the two environmental functions studied.

We therefore continued our analysis, focusing on the characteristics of land areas with a weak capacity for at least one of the two environmental functions (15% of the area studied, corresponding to 11% of "weak" areas for the "water" function and 4% for the "landscape" function); this brought out relatively well the group of farms and the categories of functions for production. We found either confinement paddocks and cash crop areas (D and E) near a watercourse ("unfavourable condition for water"), or forage areas ("standing and/or conserved forage" = A, B, C) on visible hillsides ("unfavourable condition for the landscape"). In these different plots, the function for production corresponded to what we observed on the other plots of the farm, but in an environment that was especially sensitive in terms of water quality or landscape (proximity to a watercourse, visible hillside). Nearly all these plots were larger than one hectare and were found in medium-sized to large-sized farms run with commercial aims. Given the above findings, it is probable that globally, the larger livestock farming structures and crop-livestock farming together with cereal farms occupy greater areas of land in sensitive areas, with hillside grasslands or cultivated surfaces in lowlands crossed by watercourses, owing to their localisation and surface area. The smaller structures (operated with or without a commercial aim), while presenting relatively strong capacities of achievement of environmental functions, can play a non-negligible role as they use very specific and "sensitive" plots on steep hillsides (statistically significant difference) or of small size.

Plots that support synergies and antagonisms between productive and environmental functions are, therefore, often located close together within farms and farmland; this does not favour a simplification of intervention procedures and indeed argues for their differentiation. The most difficult problems to solve due to antagonisms were more usual here in large farms and in a few sensitive zones due to geographical characteristics (areas close to a watercourse or hillsides). Situations where synergies are exercised occur in farms often given little consideration in development and planning policies because of their low economic and spatial importance.

Conclusion and discussion

The method implemented may seem relatively cumbersome, and as it is restricted to small areas of land and to spatial factors, it may, overall, appear of low operational value.

However, viewed differently, this procedure can be seen to present two "innovations" that are important for the analysis of multifunctionality and its determinants: it takes into account a continuous area of land and all its users, and it takes into account, simultaneously, various functions relating to farmland, in particular productive and environmental functions. Hence the procedure generates useful conclusions on relations and possibilities of combining these functions. It further makes it possible to differentiate the types of contribution that farms make to the multifunctionality of the agriculture in an area, and to differentiate the links between productive and environmental functions. On the area studied, for example, the large livestock structures, livestock-crop and cereal farms presented a much broader range of variation in the achievement of environmental functions, linked to the diversity of the forms of their productive functions and their environment, than did local livestock farmers and local users. The jointure between environmental and productive functions was more marked and more variable for the first three types of farming systems. We deduce from this that in order to act on this jointure and favour multifunctionality, the instruments of intervention for these three types need to be different from those used for the other two: the first three types of farms, which are the most closely market-driven, require targeted action on the area, while the last two, on the market fringe, require global action at the farm level in its whole. To progress in the transfer and application of the method to other larger farmland areas, a number of possible directions can be followed. From our exploratory approach, identification and localisation of production and environmental functions do not seem to require exhaustive surveys on farms; local panels and some surveys conducted in sampled farms, together with the study of maps and aerial photographs are probably sufficient. These simplifications still need development and specific research.

In the preliminary work reported here, we see that multifunctionality modifies the approach to farming activity, whether viewed from a political or a scientific standpoint. The acquisition of knowledge and the "efficacy" of this concept are, therefore, heavily dependent on methodological research in this field, justifying further work towards improving the applicability of our methods and analysis to other scales, more functions, and other agricultural contexts.

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Farms considered as units of management of natural resources at various landscape scales: needs for concepts and methods. Illustration with French cases of study

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Abstract

Shifts are proposed in the domain of natural resource management, toward cross-boundary, multi-scale and adaptive management. We analyzed whether such features could be identified in the interaction between technical farm management and landscape, and if this could suggest means for improving and/or supporting the natural resource management by farming systems. Examples are taken from our studies to discuss these three notions. Hedgerows and other small elements in farmland are shown to be subjected to activities coming from different parts of the land and its actors. Landscape patterns, such as large land use patches or gradients, are produced by inner farm mechanisms. There are mechanisms of joint evolution between farming systems and landscapes. Adjustments, but also inertia effects, can be identified, as well as the way farms can keep producing a diversity of land-use/land management types in time. To contribute to an integrative management, farm-centered studies of land/land-use management technical systems remain meaningful, but need to be renewed in order to better account for 1) the interactions between farming systems and landscapes, 2) new developing forms of farms, 3) interactions between farmers and other farmland actors.

Keywords
Farming system, landscape, natural resources, technical system, cross-boundary management, multi-scale management, adaptive management.

Introduction

It is now generally stated that the intensification of agriculture in Europe from the 1960's, favored by agricultural policies, has led to a decrease in the variety of landscapes (Bouma *et al.*, 1998), and an increase in the use of pesticides and fertilizers, being at the origin of water and soil pollution (Piorr, 2003). From this statement, new policies arose to counter such effects, even to reorient land use toward more environmentally friendly management. The status of agriculture in the current frame of policies is actually not even, and it notably reveals tensions between integrating and segregating agriculture and environment. The following examples of measures are given by (Piorr, 2003) and illustrate this duality. Measures such as the "creation of nature zones taken out of production" is literally an option of segregation of agriculture and environment. However, most of the measures refer to an integration of agriculture and environment, but to varying degrees regarding farm production, organization and techniques. The "maintenance of landscape features which are no longer viable in agricultural landscapes" or the "continuation of traditional environmental land management in zones liable to

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neglect" recognize a corpus of agricultural techniques and practices suitable to maintain elements or areas in the landscape, but which do not overlap anymore with production. Shifts in production systems or farm management are proposed with measures promoting organic farming or a better management of organic manure. The greatest corpus of measures that is proposed actually refers to "good farming practices", which are standards applied to selected farming practices such as pesticide use or fertilizer application. In the latter case, the field is generally the scale at which these measures apply, and their coherence with the whole farm management and development is generally not considered. The sustainability of such management patterns suppose they would be relevant and maintained / developed in farms that have them in charge. If the segregation of agriculture and environment is in focus, for instance with a protected area, ones should also address the question of the repercussion of such modifications on the management of farm territories, hence, on environment within and outside of the area. In addition, natural resources concern landscape scales, as they evolve with the landscape dynamics controlling movements of species and biogeochemical fluxes in the landscape. If farms are expected to manage natural resources, the linkage between their management and the landscape dynamics is an issue (Baudry & Papy, 2001).

In this paper we propose a perspective in which agriculture takes part in the management of the natural resources at landscape scales. From this standpoint, we suggest that a farming system approach dealing with the interaction between technical systems of land-use / land management and the landscape, can contribute to decision support for the involvement of farming systems into this natural resource management (Papy, 2001b). Cases will be taken from our research studies to illustrate principles and suggest needs for concepts and methods in this frame. Such issues cross the path taken by researchers and developers aiming at better articulation of natural resource management with ecological processes occurring at landscape scales (Liu & Taylor, 2002b). Natural resource managers endeavor to organize the management of natural resources, thus the different contributions of actors involved in the use and governance of the land. Liu *et al.* particularly emphasize the need for a set of shifts that must be undertaken in natural resource management (Liu & Taylor, 2002a). We propose to examine these shifts successively in this paper, from a farming system perspective.

The first element of their proposition is to shift *from within-boundary management to cross-boundary management, in order* to account for instance for the interactions occurring in the landscape through activities and ecological processes beyond the boundaries of the units of management. The second element is to shift *from single-scale management to multi-scale management,* where will be examined the landscape heterogeneity, the ecological consequences that are often scale dependent, and the multiple management units that need to be coordinated. A third shift is finally considered from *static management to adaptive management*. It suggests that the practices of natural resource managers should be organized in order to adapt to new emerging conditions. Our aim is to analyze if such features can be identified in the interaction between farm management and landscapes, and if this could suggest means for improving and/or supporting the natural resource management by farming. From a farming system perspective, we hypothesize that if agriculture has negative impacts on the land, it can also produce and maintain functional landscape structures, hence soil, water and biodiversity. We also hypothesize that it is related not only to practices at field level, but to the management and development of farms and their coordination at landscape scales (Baudry & Papy, 2001). An "integrated management" would suppose coordinating the different types of natural resource management both in space and time (Liu & Taylor, 2002a): we will conclude about possible contributions.

1. From within-boundary to cross-boundary management

The notion of crossing boundaries assumes the presence of different domains with interfaces and different kinds of interaction between them. We present in this section the example of the field boundaries that are defined as the surface structure associated with the specific vegetation that grows in between two fields (Marshall & Moonen, 2002).

Evidences have been accumulated about the complex role of field boundaries and other small elements in the landscape (ponds, wood thickets, fences etc.) regarding ecological functions (Le Coeur *et al.*, 2002), landscape development (Bonnemaire *et al.*, 1995) and farm management (Marshall & Moonen, 2002) in agricultural landscapes. It was hypothesized that field boundaries could be affected by drifts of farming activities implemented on the field, but also by practices of management targeting them specifically. On the other way around, the type of field boundaries adjacent to the field could exclude or promote certain types of land use; they could also influence the field management. A corollary to these hypotheses stated above was that the structure of the field boundary would influence their interactions with farming activities. For instance, the center of hedgerows on banks could be physically isolated from the influence of the field, while narrow hedgerows and other field boundaries would be more likely to receive pesticide or fertilizer drift from the fields.

Studies were made in Brittany (France) where a large diversity of field boundaries exist, from simple herbaceous strips to hedgerows. Observations were made to survey the state of field boundaries and adjacent fields, but also adjacent rivers, lanes and other land use types, as well as marks of management activities (Baudry *et al.*, 2000). Interviews were made with farmers to assess the situations when they implement technical systems of field boundary management (Thenail & Codet, 2003). A technical system of land / land use management can be defined as a set of techniques, practices and means, coordinated in time and space for achieving a target result of management. Such a technical system is likely to be integrated in the whole farm management (Gras *et al.*, 1989). The results showed that drifts from farming activities coexisted indeed with technical systems of field boundary management (Baudry *et al.*, 2000; Thenail & Codet, 2003). Farmers' decision rules were identified according to: 1) the type of field boundary (*e.g.*, structure, vegetation), 2) the type of crop rotation in the field (*e.g.*, pruning trees in the winter between a cereal crop and a maize crop), 3) the sequence of crop management operations (*e.g.*, mechanical shrub clearing of the field boundary before sowing), 4) the availability and organization of the equipment and workforce globally and during the year (Thenail & Codet, 2003). The results also showed significant differences whether the field boundary was included into an agricultural area, or near rivers, roads and other types of land use. The density of hedgerows was for instance lower alongside roads (Baudry *et al.*, 2000), than in between fields. The constraints and objectives of field boundary management results of the farmers, or of the two different managers of each side (*e.g.*, a farmer and an employee of the Department of Roads Maintenance) can be different (Baudry et al., 2000; Labrunie & Lecointe, 2003). Interface, border, or cross-boundary effects with these field boundaries were indeed shown, through activities of management.

2. From single-scale to multi-scale management

A case study on erosion and another one on nitrogen leaching illustrate the necessity of a multi-scale farming activity approach when dealing with natural resource management. The first case scales up from a field to a small watershed, or up to a large river basin in the second case.

2.1. From field scale to local scales

Martin et al. (in press) studied run-off erosion in a 50 ha sub-water catchment (loamy soils in Upper Normandy, France) managed by several farmers (Fig.1). The involvement of farmers into this issue was very variable. The main ephemeral gully runs across the fields of Farmer 3. Yet this erosion process originated in the upslope field of Farmer 1, where the surface run-off concentrated. The reason of this was the crop rotation and management undertaken on this field, which favored bare and compact soils at the rainy cool autumn and winter seasons. Alternative crop management practices showed their limits when their integration into the whole farm management was tested. Limitations were notably due to competitions between tasks in term of time schedule (*e.g.*, equipment and workforce availability), and between production and environmental objectives (Martin *et al.*, in press). For instance a vegetation cover at the inter-crop period could slow down the erosion, but complicate the control of nitrogen availability for the next crop. Moreover, the starting run-off was no real constraint at that stage for the crop management and yield of Farmer 1's field.

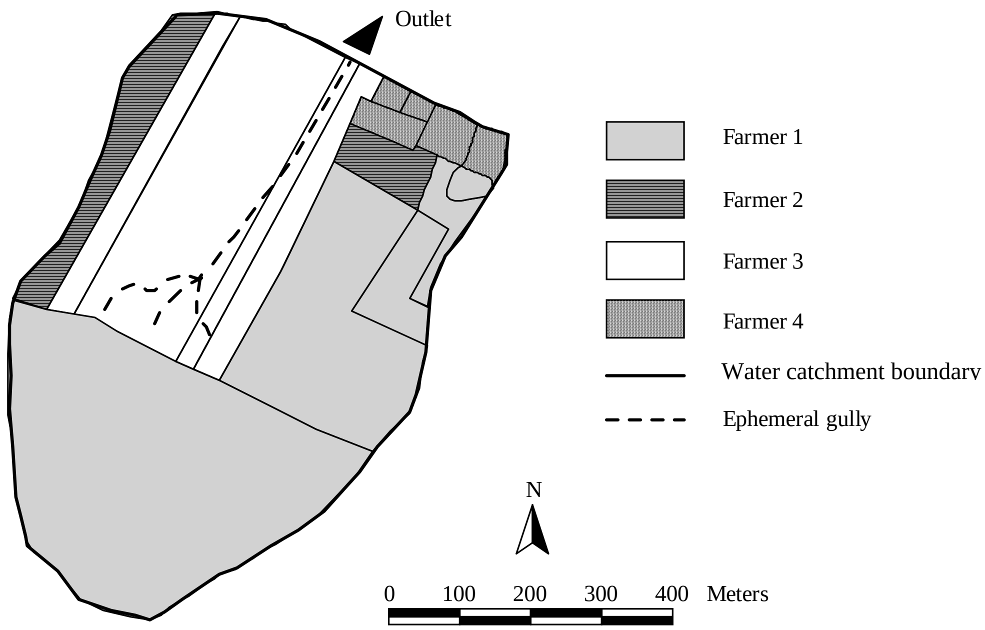


Figure 1: Map of farm territories and ephemeral gullies in a small catchment (Pays de Caux, Upper-Normandy, France)

This example shows how farmers can find themselves in very different situations regarding ecological surface fluxes, due to the relative configurations of their field pattern. The evaluation of the involved mechanisms, factors and effects implied to take into account these configurations and the cross-boundary interactions on a range of scales (Joannon, 2003; Joannon *et al.*, 2002). It supposed to consider both farming practices on fields, and structures such as grass strips or small retention ponds that could mitigate the process. Several units were identified when upscaling: the field where the process originated, the sub-catchment where the gully developed across fields and constrained farming activities, and finally the whole catchment receiving concentrated fluxes from the outlets of one of several catchment(s), which could end up in muddy floods polluting drinking water. If the field is primarily a unit of management, the other two units are firstly ecological units. At the same time, the level of the farm remained essential to take into account, as the management of the field depended on decisions taken by the farmer relatively to the other fields of the farm, and to the overall organization of the equipment and the workforce at that level (Papy, 2001a).

2.2. Up to regional scales

Erosion processes can lead to other dramatic processes expanding out of small water basins, and following the hydrological system. More generally, the management of water implies to take into account large hydrological systems, such as the one of the Seine river in France (95.000 Km2). This basin is widely used by agriculture. Parallels can be made between the overall evolutions of agriculture and nitrate concentration in such a basin, but this is not sufficient. To target the proper levels and means for action, it was proposed to identify the local variations in the agricultural pattern and the nitrate concentration associated with it, as well as the mechanisms involved in these variations (Benoît *et al.*, 1999). It was suggested that “Small Agricultural Districts” (SAGDIS) were pertinent to determine these variations and associated mechanisms (Mignolet *et al.*, in press). These SAGDIS were defined during the early 1950’s in France from soil, climatic conditions, agricultural production and land use patterns. For the current objectives, those units could provide a sound basis partition to describe agricultural dynamics over these decades, as far as agriculture would still be dependent on soil and climatic conditions at those scales. This partition was also assumed to be a better one for agricultural management than the administrative pattern. In addition, Small Agricultural Districts corresponded well to the main geological areas of the Seine basin’s aquifers. This was an important point to model the nitrate flow evolution according to agricultural dynamics (Benoît *et al.*, 1999). To test these hypotheses, a temporal data mining method based on Hidden Markov Model (Mari *et al.*, 2002) was used to assess the diversity of crop sequences over the 150 SAGDIS. A classification of these sequences was then made, from expert knowledge for the period 1970-1992 and from available statistics for the period 1992-1999 (Fig.2). To evaluate these patterns in terms of nitrate flow evolution, the crop sequences were described according to nitrate loss risk indicators, including the length of the inter-cropping period, and integrated into a model representing the transfer of nitrate from soils toward aquifers and surface water sheets (Gomez & Ledoux, 2001).

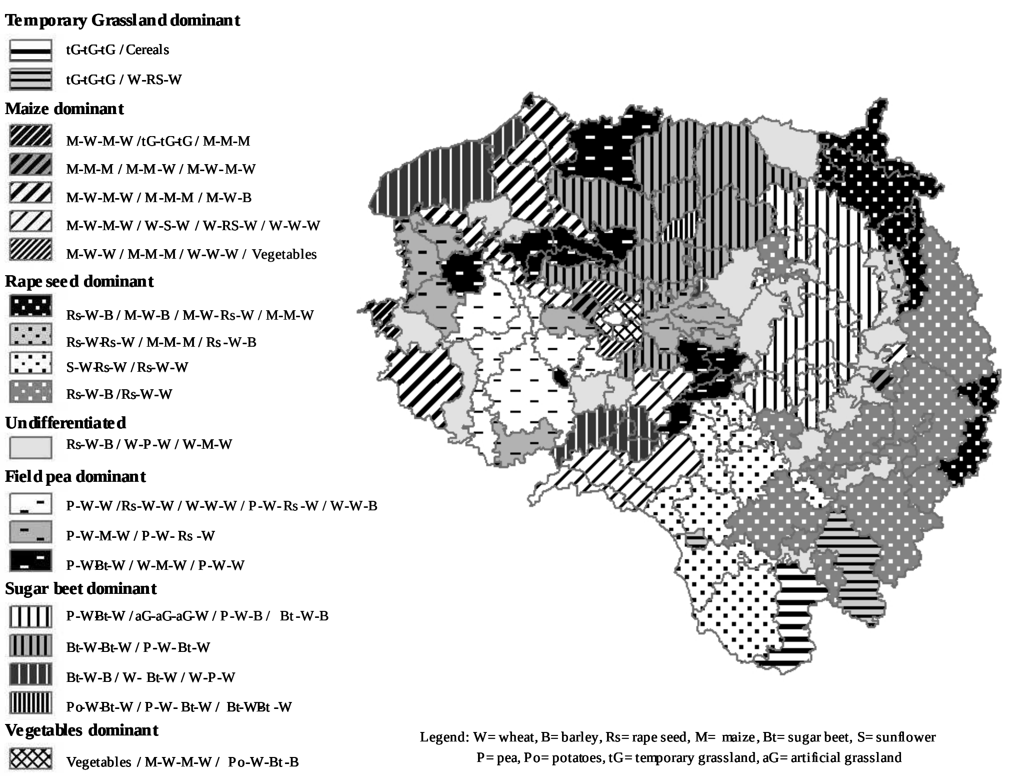


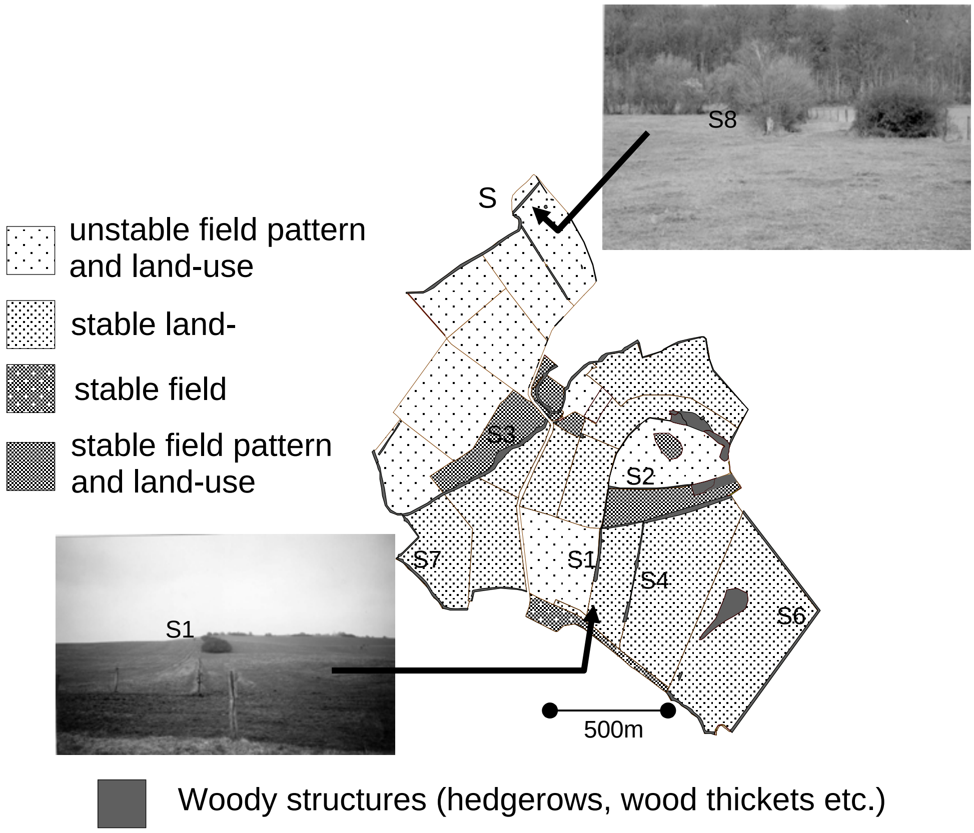
Figure 2: Classes of crop sequences (period 1992-1999) in the Small Agricultural Districts of the Seine Basin (France)

The results showed greater differences of crop sequences between than within SAGDIS, which was consistent with the hypothesis. However, if such units were pertinent to suit the decision help support to the variations of conditions, the main targeted levels of decision by policy makers remained the farms. In addition, it was also hypothesized that the underlying factors and mechanisms driving the partition in space of crop sequence dynamics were to be found in the farm trajectories. Such an analysis of farm trajectories since 1970 in term of production orientation was carried out from the data of the four Agricultural Censuses 1970, 1979, 1988 and 2000. Indeed, the results displayed linkages with the SAGDIS partition (Mignolet et al., 2001a).

3. From static to adaptive management

Natural resource managers proposed to shift from static to adaptive management because planning operations were remaining the same while the context was changing constantly, leading the former to rapidly become obsolete (Liu & Taylor, 2002a). Considering farmers as natural resource managers, two questions should be addressed: 1) are farmers realizing this adaptive management and if so, in what ways, in particular in regard to environmental issues?, and 2) what should be undertaken to support or enhance this adaptation, and in what direction? Production and related socioeconomic adjustments in farms are very much studied in the context of the international markets and policies evolution, and landscape changes (Gilg, 1998). However the previous examples emphasized the role of technical systems as an essential link between socioeconomic and land-use / land-cover patterns in farms and at landscape scales. This justifies the necessity of understanding how farming techniques and practices of land and land use management, as well as their coordination, are adjusted over time (Lardon *et al.*, 2001; Maigrot *et al.*, in revision).

Maigrot *et al.* (in revision) proposed a diachronic analysis of a farm in order to identify possible factors and mechanisms of technical adjustments in farms that apply to landscape elements and patterns. The farm has a surface area of 201 ha and its evolution was reconstructed from different sources of information from the beginning of the 20th Century up to nowadays. The farm territory has always been kept in one block (even if the inner field pattern has changed) and has been run by the same family. This situation enabled to study the successive decision rules on the same farm territory. It therefore allowed focusing on the evolution in time of the mechanisms linking land and land-use management practices to landscape structures (Fig. 3). Especially field patterns and woody structures (isolated trees, wood thickets, hedgerows etc.) were considered among landscape structures. This linkage was the hypothesis to test, in a changing socioeconomic and production context (nature of production, market, policies, etc.).



Examples of stable hedgerows :

• Stable field boundaries with hedgerows, along physical boundaries. S1: along temporary stream (see photo); S2: along hill border; S3: along river
• Stable field boundaries with hedgerows linked to the long land-use/management history. S4: border of a former forest, S6 or S7: external limits of the farm.
• Change of field boundary, with remaining hedgerows (function of shelterbelt): S8 (see photo).

Figure 3: Synthesis of the evolution of land-use, field patterns and woody structures in Family Zablot's Farm (Lorraine, France) from 1956 to 1999

The linkage between choices in techniques and practices (variations implemented by farmers on one technique) and the spatial structures was assessed by the mean of spatiotemporal databases (de Sède *et al.*, 2002). In the beginning of the mid-20th Century, the farm was typically a diversified food-producing farm. The farm progressively specialized into dairy production (and a little horse breeding draft) on grassland, in relation to the development of markets between the two World Wars. The specialization went on until the 1970's when costs increased, leading to seek cost cuts and work simplification, as well as a certain diversification in crops. From the 1970's, after diverse trials, the farm was turned to a beef cattle production (with grassland and a little fodder maize), in a context of developing markets of quality products. From 1988 agri-environmental contracts signed with a mineral water company reinforced the beef cattle / grassland system. The technical factors identified as explaining the evolution of the farm territory (Fig.3) were: 1) the choice of cropping and livestock systems, 2) the soil characteristics that compel the use of certain techniques and tools, 3) the characteristics of configuration and access that constraint certain land-uses, 4) the implementation or removal of devices such as water pumps or large hedgerows, which has a significant cost. Continuities (even reinforcement) or shifts were identified in land-use, woody structures, and in the limits of fields that were qualified as relative stable or unstable frames. If land-uses changed, the hierarchy according to soil conditions remained the same. For instance the slopy fields were the only grassland fields in the beginning of the Century, whereas in the 1990's, they were kept as pastures for the less productive animals. The best soils that were formerly croped, shifted in the 1990's to pastures for the most productive animals. In parallel, the suppression of woody structures increased in the first case, and slightly decreased in the second case. The most permanent field limits were the external limits of the farm territory, which were eventually reinforced (*e.g*., simple grass strips could evolve into hedgerows). But some internal limits were also stabilized, when they bordered 1) special physical configurations (limit of slope, water circulation), 2) technical features (*e.g*., a perennial organization of the herd allotment). In a first type of situations, hedgerows were removed if they were in between two fields worthwhile to be merged. In a second type of situations, hedgerows were kept when field patterns were adapted to land-use organization, but then they played a role of long-lasting frame for activities (Chouquer, 2000). In a third type of situations, hedgerows were left even if they did not correspond to field boundaries anymore, because they answered to real needs through new or "reactivated" functions: for instance the sheltering of the most productive or fragile animals in pasture (S8 on Fig.3). From this diachronic study, synchronic methods were then developed to identify possible inner-farm factors and technical systems adjustment mechanisms of land and land-use management (Maigrot, 2003).

Discussion

The purpose of this paper was to analyze if "cross-boundary", "multi-scale" and "adaptive" characteristics were attributes that could be identified in the interactions between farm management and landscapes. The corollary question was to know if such findings suggest means to improve and/or support the natural resource management by farming systems.

The results of the study cases showed that farms have indeed cross-boundary and multi-scale effects on landscape (hence associated ecological processes). Conversely the farm territory characteristics and its management depend on cross-boundary and multi-scale information. These interactions are not obvious to characterize, and generally not explicitly taken into account when considering decision support for farm management. The case of hedgerows and other "non productive areas" is meaningful in that way. Assessments in the Netherlands about the density and management of those elements showed 1) a lower density of hedgerows in regions where they were owned and managed by local authorities, 2) no difference in the maintenance of "non productive land areas", when comparing conventional, integrated and organic farm management (Manhoudt & de Snoo, in press). These results are in the line of those presented in this paper. They suggest that it may be counterproductive to define small landscape elements as "semi-natural habitats […] remaining undisturbed " (Manhoudt & de Snoo, in press). It is preferable to consider that they may be part of technical systems of management (farms or other decision units). The assessment of the degree and type of integration of these elements in farms may provide a sound basis for management (Smeding & Joenje, 1999). In fact, the multiplication of terms qualifying these elements ("green habitats", "small biotopes", "non-productive elements", etc.) suggests how unclearly are viewed their connections to farmland on the one hand, to landscape on the other hand. This brings us to notice that if activities occurring on the farm should not be restricted to human-defined borders (Vogt *et al.*, 2002), *a fortiori* one should be aware not to restrict his view to one border analysis definition.

The study cases, focusing on farming systems, illustrate the need to handle both spatial scales and boundaries of the management units (Vogt *et al.*, 2002). Combining bottom-up and top-down approaches with this double viewpoint makes the issue of aggregating models even more accurate (Rabbinge & van Ittersum, 1994). Land planning models are mainly based upon the definition of large land units appropriate for coherent management purposes. Questions arose in our studies about the type of spatial patterns that correspond to today's agriculture and the scales at which they can be examined. The results showed that large land units ("Small Agricultural Districts" in the example) persist as organized features. Nevertheless, these units are dynamic. Patterns of land units may emerge at one scale or another according to the period. Finally those patterns may not come from the same determining mechanisms according to the period. There is today an ongoing enlargement of farm territories while their number is decreasing, and consequently a scattering of each farm territory on long distances (Joannon *et al.*, 2001; Thenail, 2002). The fragmentation of farmland is also commonly due to urbanization and tensions between different uses of the rural land (Carsjens & van der Knaap, 2002). In this context, the recognition of large landscape units is not sufficient to handle the complexity of decision-making on broken apart farm territories, scattered on increasing scale range. In addition, this evolution leads to an increase of the length of interfaces between farm territories and their embedding landscape. As in the presented example, descriptors and methods of analysis are required to identify the contribution of farms to different kinds of landscape patterns and gradients (Benoît *et al.*, 1997; Deffontaines, 1996; di Pietro, 2001; Thenail, 2002; Thenail & Baudry, 2004). There is also a need to characterize the circulation in farm (equipment, livestock, organic matter, etc.), which is at the same time a limiting factor in farm management, and a driver of ecological fluxes in farms, hence, in the landscape.

The conditions to evolve from static to adaptive resource management is twofold according to (Liu & Taylor, 2002a): 1) knowledge should be accumulated to reduce the uncertainty of the system, so that management alternatives could be tested, 2) the management process should be an iterative one, so that it could be adjusted to new conditions. In this paper, we addressed the question of the knowledge we have or we should get of the joint evolution mechanisms between farming systems and landscapes. In these mechanisms, adjustments, but also limitation and inertia effects can be identified. The aim is therefore to assess them and search the means for enhancing, supporting or on the contrary modulating these mechanisms, in the perspective of decision support. The example from the diachronic analysis of the farm suggests a dynamic balance between land structures (field limits, surface structures, hedgerows, etc.), and activities. According to the situation, the land structures are reshaped to be adapted to the activities, or the activities rely on these frames. The functions associated to these structures evolve accordingly, but one should not underestimate the importance of the framing function of farmers' activities in space (Chouquer, 2000). Secondly, the example emphasizes the diversity and the complementarity of land-use and land management types in the farm. This is linked to the capacity of the farm to beneficiate of a diversity of conditions (of physical environment, field patterns etc.), while organizing the production in a changing market, political and socioeconomic context. This capacity of maintaining this diversity in time is important regarding ecological processes at landscape scales. That is why it has been suggested that promoting heterogeneity could be more pertinent than concentrating on particular farming practices (Benton *et al.*, in press). The identification of limitations and thresholds in the development of heterogeneity is therefore very instructive in order to make a balance diagnosis of the farms as units of production, and units of natural resource management. Studies made in contrasted agricultural regions of France, showed in this respect, that the farms of small economic sizes were those able to use different conditions of physical environment and field patterns. This is a discrepancy to handle in order to reach environmental and economic sustainability (di Pietro, 2001; Thenail, 2002; Thenail & Baudry, 2004). Underestimating the necessity of technical adjustments of the farm territory management under changing production and socioeconomic conditions can also be counterproductive in terms of natural resource management: this can be the case with policy measures which strictly apply prescription of farming practices (Benton *et al.*, in press; Van der Ploeg, 1994). From such a knowledge, simulations based upon scenarios (of farm enlargement and production shifts for instance) should help anticipating future patterns (Baudry *et al.*, 2003), and contribute to adaptive management methods.

Conclusion

In this paper, we tried our hand at deciphering the interactions between farming systems and landscapes, by developing the viewpoint developed in the field of natural resource management of cross-boundary, multi-scale and adaptive management. We mentioned in the introduction that a natural resource manager attempts to organize the management of natural resources, therefore he must base his tasks on organizing together the contributions of the different actors involved. The results show that these properties of cross-boundary, multi-scale and adaptive management, can be found in the interactions between farming systems and landscapes. Farmers are part of the actors involved in natural resource management, and the decision support to develop this role would benefit from following these principles. In the introduction of this paper, we mentioned from (Liu & Taylor, 2002a) that an "integrative management" would suppose to coordinate the different types of natural resource management both in space and time. From a farming system perspective, we have concluded that farm-centered studies stay meaningful, but need to be renewed so as to better integrate farming system dynamics into the overall management of natural resource. The first issue is to look more carefully at the interaction between farms and their landscape environment. The second is that such approaches should better account for new developing forms of farms, in term of status, activities and workforce, that might differ in their technical systems of land/land-use management (Laurent *et al.*, 2003). Finally, they also should elucidate the implications of collective concerted actions between farmers in agricultural land/land-use management, and the interaction between farmers and other actors of the rural areas (Joannon *et al.*, 2001).

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The Continuous Re-creation of a Swedish Rural Community: Moose hunting, the School, the Church, Agriculture

Yvonne Gunnarsdotter

Abstract

This paper has its point of departure in how rural inhabitants reflect and act to maintain a viable local community in times of increasing urbanisation and globalisation. Two kinds of changes are discussed. First the kind of continuous changes, which are part of daily life, and that the inhabitants usually find ways to cope with. Two common trends in this category are that most people leave the village during daytime to earn their living and that the school, shop and other local meeting places are closing down. Second, I identify four types of more radical changes like “increase of market pricing relations”, “mobilisation to save meeting places, “changed power relations in institutions” and “decrease in the agricultural sector”. To illustrate these changes I present four examples from a fielwork in a parish of southern Sweden. The exampels concern moose hunting, the school, the church and farming. As a conclusion the paper end with four phenomena that are needed to maintain a lively local community.

1) *Means of support* that are locally based and that uphold a diversity of relations, not only instrumental. Some of them preferably organised as co-operatives investing for the good of the whole community and not only for individual inhabitants.
2) *Meeting places* to encourage social relations face-to-face in between work and household.
3) *Institutions* that symbolise place identity which both have a historical continuity and are open for contemporary society.
4) *A landscape* that is actively cultivated and with the knowledge of the place embedded.

These concludings can be used to explore the more action-oriented question of “How rural policy may be formulated to better correspond with the inhabitant’s conception of a viable local community".

1. Introduction

Concepts

Though a lot of rural inhabitants spend most of the days in towns many of them are strongly engaged in their local community. The village action movement is an example of this engagement, with 4000 groups registered at the Popular Movements Council for Rural Development (Herlitz 1989). Irrespective of their activities the local action groups create and reproduce a place-related communality, establishing new ideas of what the place is (Berglund 1998:193). Out of several social identities (like nurse, bridge player or mother) place identity often constitutes a substantial part of rural people's social identity. Of course people also feel rooted in urban areas, but it is more likely in rural areas to find a sense of community connected to a place. It is also more likely that so-called indigenous cultural systems tend to be at the most visible in rural communities (Ray 1999:265). I make two basic assumptions. The first assumption is that many people feel related to a place, including its inhabitants and its history. This can be described by the Swedish concept of "*bygd*", in English *local community*. The second assumption is that the societal change of western societies tends to break up the relations between people, place and history. This can be understood partly by the concept of *modernity.*

To investigate modern rural life the two assumptions about local community and modernity as well as the relationship between them are analysed. This is done by integrating local narratives and social actions with theories of identity, place, time, (high/reflexive, post or a-) modernity.

To understand what it takes for a place to become a home I use the Swedish term "*bygd*", a part of the term "landsbygd", which could be translated to "rural". Landsbygd means literally the part of the land that is cultivated and settled. "Bygd" in Swedish, "dwelling" in English and "bauen" in German all originate from the Old English and High German word "buan" (Ingold 2000: 185-188). The three concepts has since then diverged from the original perspective of "building/cultivating a world to dwell in", and we now use separate words for "to build", "to cultivate" and "to feel at home". In Swedish the words farmer (bonde), live (bo), cultivate (odla), build (bygga) and local community (bygd) are closely related, which shows that bygd has kept some of the connotations from the original word. Bygd thus makes it easier than any English term to encompass an ontological perspective of the world as something created through interaction between persons and their environment. "Dwelling" is closely related to bygd, but in the text I use the more common "local community". In the thesis I use my own definition of bygd as "a shared conception of interconnectedness between people and a place over time". This is expressed in dialect, buildings, food, clothes, business, traditions etc. The definition could also apply to local communities in urban areas. Another useful concept to understand peoples bonds to the place is Bordieu´s "habitus" (1990). Habitus is expressed in the taken-for-granted practise of people, constructed through the relations between personal experiences and the structure of society. Bordieu use the metaphor "to have a feeling for the game" when he describes habitus.

Modernity is a term as frequently used as it is frequently criticised. A "first approximation" by the sociologist Anthony Giddens (1990:1) says that "modernity refers to modes of social life or organisation which emerged in Europe from about seventeenth century onwards and which subsequently became more or less worldwide in their influence". The worldwide influence is expressed by another social theorist called Arjun Appadurai (2000:1) who grew up in Bombay where he "saw and smelled modernity reading Life (…..), seeing B-grade films from Hollywood". A way to avoid historical and geographical categorisation is the term a-modernity used by Bruno Latour (1993). He suggest that we have never been modern, and that societal change is a matter of shifting contexts. Obviously there are continuities in the history of mankind, with several features that so-called traditional societies have in common with modern societies (often synonymous with Western). But modernity also brought discontinuities like the pace and the scope of change as well as modern institutions (Giddens 1990:6). According to Giddens (ibid:16-17) the dynamics of modernity derives from the separation of time and space, the disembedding of social relations and the reflexive ordering of social relations. To distinguish early modernity from today's mode of life terms like high or reflexive modernity are used. The term post modernity emphasise a new discontinuity without any grand theories to explain society. Theories of modernity do not belong to post modernity.

Rurality related to (late) modernity is problematic since rural communities so obvious are rooted both in time and space. Land, forest and water, and the activities historically derived from it, are contexts that give rural areas meaning which is the driving force behind the local engagement of many inhabitants, even though they are not farmers. But to view modernity only as a threat is not enough to understand rural conditions. Instead of a causal connection there is a paradox embedded in the concept of rural (or local) development: change implies strains as well as opportunities for the local community, depending on perspective. Development that may gain some people can lead to a loss in the qualities that characterises the rural community, such as landscape or social networks.

Development is a concept associated with modernisation, and a metaphor for something gradually growing. The object of growth has shifted from the 1800´s and onwards, and now we have two alternative meanings. The most common is a neo-liberal definition of economic growth (Vail 1996) and another includes growth of justice, inclusiveness and sustainability in society (Korten 1990). When the expression "rural development" is used in Sweden it refers to both definitions depending on who is using it. The kind of rural development I study takes place when the local inhabitants act to make it possible for themselves and other to live in a place where they feel at home. Sometimes these actions are included in political initiatives like CAP[1] or Leader[2], but mostly it concerns spontaneous every day actions without explicitly working for 'local development'. Local inhabitants rarely use the term development when they speak about voluntary work in the sport club or organising a market fair.

Another concept closely related to modernisation is *globalisation*, which usually includes a homogenisation in economic, political and social structures. One who have studied the effect of globalisation also on our perceptions of time and space is Bauman (1998). He means that mobility is the keyword of globalisation. Ingold (2000) is questions the concept of globalisation. In this model people and things are put somewhere, either in a very small place (local) or very large (global). Local-global presuppose a location of things and people, while a place needs activity, like inhabiting or dwelling. Instead of locals he talks about inhabitants who "make their way around in the land", where movement instead of destination is important (Ingold 2000:219-242).

The rural community

To understand the local strategies of coping with the paradox of rural development a case study has been carried out, with participant observation and qualitative interviews. The disciplinary base is anthropology, with influences from human ecology, sociology, geography and history. The local community chosen is a parish of 500 inhabitants, named Locknevi. The name indicates that the place has been inhabited for at least 1000 years (Gerger 2002:6). The parish is situated in the province of Småland, and belongs to the municipality of Vimmerby, which is part of the Leader area "Astrid Lindgrens native place". The number of inhabitants has remained constant the last decades, in spite of the few jobs available locally. Most people commute to nearby small towns. There are about ten farms left of which a few are large enough to support a family.

2. The continuous re-creation of a local community

This part concerns the first assumption about people's feelings related to a place. The empirical examples concern how the inhabitants reflect and act according to the slow transformations that take place at such a pace and on a scale that it may not be noticed in every day life. In other words, this section describes situations where the paradox of rural development can be handled, that is when most people do not view change as a threat. In accordance with the definition of bygd the examples are divided in the three concepts of identity(social relations), place and time.

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1 CAP is the Common Agriculture Policy of EU.

2 Leader is one of the common initiatives of EU, aiming at stimulating innovations to promote rural (economic) development. Leader areas are governed by a partnership consisting of private business (enterprises), public sector (local authorities) and idealistic sector (non-profit-making associations). The partnership should mirror a bottom up perspective.

Identity and social relations in Locknevi

Relationships with other inhabitants were historically maintained through work during weekdays and attending church service on Sundays. This pattern gradually broke up from the 1940´s, and in the 1970´s only a few people were included in these kinds of relations. Sport activities among the male inhabitants has since the 1940´s grown in importance as a way to keep up the social relations. Politics, hunting and associations were other, not so widespread, activities. Several female informants who moved to Locknevi during the 1970´s spoke to me about their difficulties to get to know other people. In the village shops nobody spoke to them, and when passing the houses they only saw the curtains move. It took years before they talked to some of the neighbours.

In the beginning of the 1980´s new kinds of social relations started to develop when one of the women who had moved to Locknevi invited other women to aerobics groups in the school. The mobilisation to save the local school grew partially out from the aerobic group. The next step was that the different sport clubs, including the gymnastics, established a common association. As their first task the association put up notice boards in the villages and as their second task they distributed a local newsletter to all inhabitants. The newsletter also helps to maintain social relations even for those at a distance, those who have moved from Locknevi or for other reasons may (like research) subscribe to it. Another association was established to run the rural community centre (bygdegård) and arrange activities like study circles. There were already many old associations, associated with the church, Red Cross, temperence movement, farmers association, the local folklore society and political groups. When these got involved in a larger context covering the whole community many of them became more vital. A lot of activities, old and new, are now engaging many of the inhabitants.

Identity according to Mead (1939) is created in interaction with other people, but he did not say much about the role of the environment that is crucial in the construction of a place identity. One definition of identity building on Meads theories is “the names we call ourselves” (Charon 1995:80). The reason that people in Locknevi gave for their engagement in the activities organised by the many associations is that they call themselves inhabitants of Locknevi. The categories and symbols that make up a person's identity serve dual functions. Identities are socially constructed and vice versa they construct society. Among the different communities that form the greater society Wenger points out communities of practise, as the "basic building blocks of a social learning system" (2000:229). Considering the engagement in the associations I suggest that Locknevi is a community of practise constructed by the names people call themselves, i.e. inhabitants of Locknevi.

Especially in western societies the same person has several social identities, and place identity could exist parallel to professional identity, gender identity etc. One way of describing differences in terms of identity is sociocentric and egocentric relationships between the individual and the society (Schweder and Bourne 1984). A sociocentric solution subordinates individual interests to the good of the collectivity, while in the egocentric solution society becomes the servant of the individual. A person with a sociocentric identity is defined as a daughter of or neighbour of someone, and becomes a component in a field of social relations. With an egocentric identity you become someone through your personality, stile, professional ability etc. In rural contexts a sociocentric identity is more likely to be evoked.

Connected to the concept of identity are theories of social relations. Fiske (2000) recognises four universal models of relations; Communal sharing, Authority ranking, Equality matching and Market pricing. In order to interact there has to be an agreement on which relational form is concerned. In rural communities like Locknevi communal sharing is the norm, and rather common also in practise though authority ranking is also common in many situations. With modernisation market pricing leads to a gradual shift from sociocentric identity towards egocentric identity.

Relations to the place of Locknevi

The only places to meet during wintertime are the school, the rural community centre and the church. The last shop closed in the beginning of the 1980´s. In the summer the inhabitants meet at the beach that was restored and enlarged with public money and local working force. Barnyards are semi-public places that are getting fewer as the farmers are closing down.

To maintain relations to the place people often tell anecdotes about different farms and other places they visit. Especially during hunting it is common to stop and remind the others when a moose passed there or some other event took place. The different places where the hunters go to wait for game have their own names that refer to significant features or events.

The following three real-estate purchases show other ways to keep relations to a place. A man, who lives outside Locknevi, wanted to sell his parent's house when they died. Instead of getting a market price he wanted to sell to a family with children because there are too few children in the local school. His behaviour was highly appreciated by the inhabitants. An interpretation is that the well-being of the community was more important than his own (economic) well-being, an example of socio-centric identity. The second example is when six siblings sold their deceased parent’s small farm to a German family when one of the brothers could not afford to buy. The German family now lives there all year round and cultivates the land. The brother visits them sometimes and he shows them how the heating system works etc. An interpretation is that he cares about the farm in itself (the place) in spite of who owns it. The last example is when the church sold the old priesthouse. A family with three children who had lived there for several years wanted to buy it but the church asked for a market price, which the family could not afford. The family moved and most people consider the church greedy and unsympathetic towards the community. An interpretation is that the church finds its own well-being more important than the well-being of the local community.

“Sense of Place” is a concept developed by Relph (1976). He seas the concept consisting of the physical space, the activities taking place there, the meaning of those two and the spirit of the place. With this definition it is possible for people to carry an image of the place irrespective of where they are. It is obvious that people in Locknevi have a strong sense of place, but it is getting more difficult to practise this since there are fewer public places and the locality of the community are divided into several more private places. Discussions of place and modernity is a big field in geography. A common stanpoint is that time-space relations are compressed and that place is becoming less important (Harvey 1993, Appadurai 2000). Others reject this and argue that there are new power relations that make way for new interpretations of what place is (Massey 1993). The boundaries of a local community like Locknevi are shifting depending on contexts. Or maybe there are no boundaries but a perceived place that exists when people act and communicate.

The interest in the local, the place, the landscape and the feeling of belonging associated with this has lately been questioned. Lippard (1997) writes about the lure of the local, and she wonders "…. how a multicentered world can be wrested from the control of multinational corporations to assure a certain local legitimacy of the projects of home and place". The landscape is also political, besides other meanings. An important agricultural issue is how the possession of land is an aspect of place that highlights power relations (Newly et. al.1978).

Relations to the history of Locknevi

Many inhabitants are conscious about the history of Locknevi. To be viewed as a real inhabitant it is more important to have ancestors in the community far back, than to be actively engaged in the local associations. A sign of the importance of old times is that many people where involved in study circles about genealogical research about 15 years ago. Another example is the various written records. The local association of retired people have, together with a researcher who moved back to Locknevi, written two reports about work and the school in the community concentrating on the period before 1950´s. A similar but older text is an ethnographic book from 1812 written by the local cantor. Many inhabitants have read it and quote parts from it that describe the character of people from Locknevi. In the 1950´s and 1960´s the vicar collected cuttings about Locknevi from the local newspaper. These are kept in five files by the local folklore society, an association that arranges the homestead day every summer and is responsible for restoring some old buildings. Two situations illustrate the presence of the past. A 85-year old woman, who moved to Locknevi as a teenager, told me with tears in her eyes about when the church of her native village burnt down. It happened in the 1700's. A hunter spontaneously lent me some framed letters from the middle ages concerning legal disputes in his village.

Also recent history is important, and many old people are still upset about the reform 1971 when Locknevi was incorporated in the municipality of Vimmerby. They say that they lost their independence and that Locknevi historically belongs to another cultural context than Vimmerby.

The concept of time has also been discussed in relation to modernisation. Historically time was linked to place, but they became separated (Giddens 1990). In traditional societies a place is where social activities take place and it has a time dimension of “now”. Also in late modernity co-presence, i.e. social interaction face-to face, is important. But the local here and now is affected by social actions far away in time and space. We have different perception of time according to context. When living off the land like farmers do it is more likely to view time as circular, as compared to when we have an urban surrounding which evokes a perception of time as linear. Societal change is by neo-classical economists perceived as something deterministic, based on a linear perception of time. A way to overcome this polarising is the concept of an expanding present (Bergson 1996). The inhabitants of Locknevi are living in a kind of expanded present, when they in daily life are conscious about the past and even use it for common activities, which creates new memories to relate to.

3. Four processes of change

In this part I turn to the second assumption about the more radically societal changes called modernity (high, reflexive, post or a-). I identify four processes of change that the inhabitants discuss in terms of conflicts, fights or problems. These processes illustrate how people reflect and act according to changes that might imply discontinuity in the history of their community. In line with the paradox of rural development a situation that is perceived as threatening for some people, could be viewed as a possibility for others. There is a tendency that people who have moved to a village are more willing to act either to promote change or to stop change, like closing down the school. Those who are born in the village sometimes feel expectations not to differ from the majority, and prefer to wait and see rather than take an initiative. Differences between people can also follow other criteria, like gender, generation or class. Different contexts can activate different perspectives for the same person, like the landowner who talked about forestry from a business perspective during an interview and later during hunting talked about the game and the forest in terms of beauty, memories and feelings.

Moose hunting and hunting tourism. An example of increasing market pricing relations

Many people who have left Locknevi return for moose hunting every year. At these occasions' relations between people, place, and history are confirmed through an activity where land is actively used. Since it is mostly the landowners and their relatives that are members of the hunting teams, and since most of them have quit farming and many have even moved out from Locknevi, the moose hunt can be viewed partly as a compensation for farming. Hunting is an activity that in different forms has been a part of human culture for ever, but the tradition with hunting teams for moose is only about fifty years old in Sweden, while hunting smaller game individually has a longer tradition. The importance of hunting seems to be to strengthen the bonds to the place, but also the forest, animals (game and dogs), and to (male) friends. Other features are the excitement and an opportunity to step out of civilisation. This corresponds to research showing different aspects of hunting (Adelswärd 1996, Ekman 1991: 64-76). Despite social change there is a cultural continuity in hunting. How the meet is distributed, who gets the trophy, who is included in the team, how the game should be treated both when shot and when slaughtered, the great importance of equipment are in many ways similar to societies of hunters and gatherers.

Women and hunting is a combination that gradually becomes more common, but it is still problematic. There are some women engaged in moose hunting in Locknevi, but most of them drive the game and only a few shoot. One middle-aged woman born in Locknevi and still living there has been hunting since she was young. She was a member of a big hunting team but is now only hunting in her own forest together with her son-in-law and his friends. “She probably wanted the meat”, is a comment from her former team. To hunt for the meat is not serious and the fact that she is a woman could be an explanation for that judgement. Another woman in her forties has moved to Locknevi as an adult and started to hunt. She and her husband are members of a hunting team together with some neighbours. A tensed situation arose when she invited a young German woman knowledgeable about hunting. Though it is allowed to invite friends to the hunt this was not accepted by the team. The others did not say anything but showed their disapproval in different ways. An interpretation is that the local identity was too weak. As a woman who had moved in to Locknevi she did not really belong to the hunting team and when she brought a female foreign guest the link became too weak. Since then she has become more accepted with good relations to the other hunters.

A relatively new phenomenon is ‘hunting tourism’ that started in the 1970´s when prices on land began to rise and the moose stock increased. Hunting permits was leased for several years and for small sums. In the last fifteen years foreign tourists pay to hunt for a week at a time. This is increasing in much of the country and in Locknevi there are some landowners that are leasing out weekly permits to German and Danish hunters. There are also examples of hunting teams that have paying guests from Denmark. Many landowners try to find a balance between on the one hand getting an income when farming is not so profitable, and on the other hand to contribute to the local hunting tradition as a way to keep a viable community. Both perspectives, the economic and the cultural, are needed to maintain a rural community.

The problems with hunting tourism according to the inhabitants of Locknevi can be categorised in three kinds.

- A cultural problem. Trough the money the relations between hunter, forest and game are changes which thereby changes the meaning of hunting. The price gives instrumental values to what used to be intrinsic values. Expressed by the hunters themselves as "The money has ruined the hunt" and "With hunting leasing the ethics are gone”.
- A social problem. Relatives and friends that return to Locknevi for hunting might not afford hunting when the prices go up. The same holds for inhabitants that don’t own land. It is already hard to attract young people, which partly could be explained by the high costs. This evokes the question of

how the local identity is created.

- An ecological problem concerning game preservation. Most of the Danes hunt without a Swedish guide, and they are accused for "shooting everything that moves". It is also supposed that they consume a lot of alcohol. By these reasons people are worried about that they don't stick to the hunting regulations, and explain the decrease of raw dear from this. The Germans have Swedish guides and are supposed to stick to the rules. The hunters of Locknevi assume that those who pay want something out of it, and lack solidarity towards regulations and game preservation.

My interpretation of what happens when the local hunting meets hunting tourism is in terms of the modernisation process. When the moose hunt is taken out of its context of a male network that confirms the community, the meaning is changed to a source of income for the landowner. To make this possible the hunting must become a part of the market economy, which many hunters oppose. To put a price you have to redefine the context from a relation to an object that could be measured. An object is something that you can have claims on, it becomes a resource that you can own or use (Evernden 1987). Tourism in general involves a risk of objectifying "the other" (Urry 2002). Of course hunting before also was a way to provide but it was direct (meat instead of money).

The fight for the school. An example of mobilisation to save meeting places.

This example contains two processes of change. One is the diminishing number of meeting places. The other process of change is the mobilisation triggered by a threat. The most well-known Swedish example of inhabitants mobilising to keep the local school is Drevdagen in the 1980´s (Halvarsson 1999). In other local communities it is the local shop that is threatened and there are parallels between what a shop and a school means to a local community (Kaijser 1999). In Locknevi the last shop closed in the beginning of the 1980´s before the development of new kinds of social relations that made mobilisation possible. A few years later the municipality suggested that the school be closed, because of too few children, and move the children to the neighbouring community which had become bigger than Locknevi. The school was built in the 1940´s representing progress and wealth. Not only parents, but also other inhabitants were engaged in the struggle to keep the school going when the authorities wanted to close it.

A mother who had moved to Locknevi some years earlier took the initiative to mobilise the inhabitants against the decision. She engaged not only other parents but also other inhabitants, one of them a returning researcher who specialised on local schools and who presented facts that made it difficult for the authorities to ignore the protest. Not all inhabitants engaged and the fight made peoples opinions visible in quite another way than before. The school is situated in the northern part of the community and some of those in the southern part already preferred the bigger school in the neighbouring community closer to them. The woman who took the initiative is also a politician, and another local politician from the same party spoke in forward to the decision, which evokes hard feelings from many inhabitants. After a while the fight succeeded, and the school could continue, but only for a year or two at a time.In the last years the school has had classes up to fourth grade, often in B-form, i.e. different grades in the same class. In 2002/2003 eight children was registered and the school closed down in June 2003.

This example can be viewed both as a success and as a failure. It is common that a threat of loosing the school activates place identity and the inhabitants mobilise. The success here was that the mobilisation like in many other villages led to other initiatives, which will still exist when the school is closed. It was also a success that the school continued another fifteen years. The failure is that Locknevi lost another of its few meeting places and workplaces. In the future it becomes difficult for the children to create relations with each other and with the place. Many conflicts have been avoided because people trust each other since they went to school together. Yet another consequence is that the boundaries of the community changes, as Locknevi is gradually merging with the neighbouring community. The fusion of the two parent-teacher associations into one some years ago was a step in that direction.

The conflict between the priest and the church council. An example of changed power relations in institutions.

This example concerns a conflict between on the one side the members of the church council and on the other side the new priest. The church in Locknevi was built in 1903, when the population decline already had begun though there were still more than 2000 inhabitants. The church council has since many years been dominated by a couple who was powerful when Locknevi had its own local authority before 1971. The wife is a daughter of the last head of the local government board, and the church council has served as an unofficial local government board. Three priests have quit because of the powerful church council, and the new priest was conscious about the situation when he arrived in 1996. He became very popular and soon the church services attracted more people than they had for a long time. One example of his many new ideas is the yearly “hunting service” before the moose hunt, with a stuffed moose, beer and pea soup in the church.

Two years ago the priest got tired of not being able to make any decision on his own and after a fight before Christmas he closed the church and told the parish that “it’s me or them”. Unlike traditional ways of handling a conflict he called the newspaper. Some people in Locknevi answered in the same public way and distributed a call in favour of the priest. Many added their name but many preferred to be neutral, not only those who were born in Locknevi but also some of those who had moved there. A few people took a stand for the church council. Finally the priest stayed and the old couple and a few other elderly people left the church council. They also left other associations connected with the church, and they do not attend church service anymore. The new church council consists mostly of the same people that engage in the local associations. Some visible changes are that the church visitors applaud when there are musicians in church and that the churchwardens are casually dressed.

An interpretation is that the church has changed identity from an institution representing the old community (when Locknevi was a municipality) to representing modern rural development as one of many local associations. In this case the change was so abrupt that some people literary stepped out of the community. Different interests like in this case do not have to lead to conflict, but when the change is abrupt there is a risk that the persons involved distrust each other and the situation.

Farmers and the cultivated landscape. An example of decrease in the agricultural sector.

Since centuries Locknevi is characterised by smallholding, with an open landscape in the Central Valley and small plots in the forest. The farms are almost the only local working places and they represent the major part of the economical activity. There are about ten farms left, three or four of them providing full time work and two of them with employees. Many others live on a farm and grow some hay for the horses. Everybody is aware of the decline of farms, and both farmers and others talk about it as a problem.

Seen from outside: The farmers play an important role locally, not so much as food producers though. Most people seems not to care so much about the food quality or were the food is grown. Only a few, well-educated persons, prefer ecological food. Many women cook and do not buy semi-manufactures. Farmers are instead appreciated as agents of local culture and as landscape keepers. They are in a concrete way upholding the relations to the place by cultivating the land. In some part of Locknevi the fields are abandoned and people worry about that it soon will become overgrown with weeds. In one of the villages a younger couple have sheep besides their full time job in the town, and thanks to them the landscape is still rather open. Now they are divorcing and selling the sheep which will affect the whole village. All inhabitants know who is living on the different farms, and how they are running their farm. Those who live on a family farm since generations have a special role as “real” inhabitants. A young farmer, who mistreats the farm and the cows, was excused in the presence of me by the inhabitants in a way that goes against their conception of a respectable farmer. They know his background and don’t want to blame him.

Seen from inside: The farmers are both local inhabitant and professional, and there is a widening gap between the two identities. The local farmers association stresses the professional role, and at a yearly market-day at the community centre they placed themselves a little apart from the other activities. One of the two biggest farmers views the farm and not the community as his home. Outside his farm he is as much from Småland as from Europe, he says. The other big farmer is very active in several local associations, including farmers association and very well known in Locknevi. Some young farmers prefer the company of other farmers even if they live in another district, and many farmers are sceptical towards rural development like Leader and other modern projects. There seems to be a mutual ignorance between farmers and other rural inhabitants, which probably will increase in the future. To change identity from being food producer to landscape keeper is something many farmers have to reflect on in the future (Flygare 1999).

Farmers are still important for the community but the question is if the farmers manage to let the community be important to them. The farmers are becoming fewer and fewer, which undermines the importance of farming in rural communities. This is undermining rural communities since the cultivation of land is a crucial way to maintain relations to place. Focusing on the process of landscaping is an alternative to putting a price on different objects in the landscape as the rural policy of EU (CAP) does (Olwig 1993).

4. Conclusion

To understand how the inhabitants of a rural community reflect and act according to change, we first have to know what it means to be an inhabitant. An answer to this could be: It means that you uphold relations to other inhabitants, to the place and to its history, that the social relations are sometimes reciprocal, that all kinds of relations (to people, place and history) are elaborated in practice and that you among other social identities also present yourself as an inhabitant of a community, i.e. you have a place identity. Other ways to express this is that to be an inhabitant of a local community you have to dwell there. Since many people commute they have to find ways other than through work to maintain the relations or to dwell.

The next step will be to discuss change. Societies have through history been characterised by mobility and influences, though at different paces and scales. This implies that a community always has to be re-created. The activities and reflections presented are part of a continuous re-creation of the community, helping the inhabitants to balance change and tradition.

The four examples of moose hunting, the school, the church and agriculture all illustrate situations that evoke conflicts or fights and show what could happen when the relations are not possible to maintain, or when the cultural models are violated. Out of the four processes of change that the examples illustrate I have identified four phenomena that are crucial to maintain a viable local community.

- Means of support that are locally based and that uphold a diversity of relations, not only instrumental. Some of them preferably organised as co-operatives investing for the good of the whole community and not only for individual inhabitants.

- Meeting places to encourage social relations face-to-face in between work and household.
- Institutions that symbolise place identity which both have a historical continuity and are open for contemporary society.
- A landscape that is actively cultivated and with the knowledge of the place embedded.

One possible interpretation of the four processes of change is that they represent a discontinuity that could be threatening for the Swedish countryside. The time-space relations that give meaning to, and thus create, the community are in these examples replaced by other relations which change the meaning and thereby the whole phenomenon of the community as a dwelling-place for the inhabitants habitus. But others welcome what some people perceive as a threat. Since there are different views in a local community one challenge for the decision makers is to complement the economic and legal policy instruments with methods for handling conflicts, social learning and other communicative instruments that empower the inhabitants to act in ways that maintain the local community without conserving it or completely renewing it.

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WORKSHOP 4

Knowing and Learning: labour and skills at stake for a multidimensional agriculture

Organising for change – a national approach to meet the challenge for the Australian dairy industry

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Abstract

The dairy industry is an important agricultural industry in Australia, but facing increasing complexity and external challenges. As an industry we were disorganised on a national scale in farming systems research, development and extension (RD&E), which meant that there was the possibility of missed opportunities. There was also a developmental opportunity to move from farmlets as the only approach for farming systems RD&E, to a broader, more comprehensive suite of approaches.

The National Dairy Farming Systems project was established to address this. Key areas of development were; integration, methodology, modelling and extension. There have been challenges to implementation, but we have gone a way to achieving cultural change and a national perspective within the farming systems RD&E network.

Foreseeable global challenges for the dairy industry include; farming systems and supply chain management, privatisation of knowledge, and risk. Farming systems RD&E is well placed to address these issues as we move beyond the farm to organise on a regional, and national, basis. A development agenda has been emerging from the work of the NDFS project that is charged with mapping a path for future farming systems RD&E that will cope with these anticipated challenges. These challenges are likely to involve stronger links between on-farm practices and innovation in supply chains, a capacity to better manage new innovations in relation to labour issues, management of critical natural resources like water, and fostering co-learning opportunities with our partners in south-east Asia.

There are also methodological and implementation challenges to be addressed – increasing our systems thinking capacity; improving extension outcomes and professionalism; and overcoming institutional boundaries, for example. At another level, the question has been raised as to whether overcoming these challenges will be sufficient, or whether it is the responsibility of the NDFS project to engage and inform RD&E policy in order to achieve change.

There is a very exciting future for dairy production which will rely heavily on new innovations that do more to extend the product quality and product differentiation opportunities in a way that ensures dairy farmers capture and retain the majority of the benefits. This may mean we will see even greater diversity in our farming systems and associated supply chains, with a focus on improving the recognition of the health benefits arising from improved land and animal management practices.

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Introduction

There's no argument that dairy farming in Australia has changed significantly over the past 20 years. But how well placed are we to deal with the challenges that the next decade or two will bring? The future of our industry will depend on our ability to develop farming systems that deliver adequate returns on the capital invested, and that also enhance or maintain the status of our natural resources and provide a rewarding lifestyle for dairy farmers (DRDC, 2002).

This paper reports on a distinctive and new approach to farming systems RD&E for the Australian dairy industry. An industry-funded national project, National Dairy Farming Systems (NDFS), was developed and implemented to improve integration of outputs from existing farming systems projects, facilitate the adoption of innovative learning approaches, and establish guidelines for the design, implementation and evaluation of farming systems RD&E.

Key areas of development have been integration, methodology, modelling and extension and these are briefly addressed. New challenges involving project alignment, clarity of communication of the concept, relating investment to outcomes and adapting to emerging challenges as we change the way of operating in projects in real time exist for the Australian dairy industry. Research and Learning portfolio development will also be influenced by the shared global challenges of improving supply chain management, privatisation of knowledge, and risk, as well as unforeseeable challenges.

What are the types of farming systems we will need as we enter a period of increasing complexity for land managers? How will our farming systems cope with the current and future demands for environmental certification, the impact of globalisation, issues of intellectual property rights, food safety and quality assurance, and changes in trade labelling? These are the issues that are confronting both the dairy industry as a whole, and individual dairy farm businesses, as they increasingly influence the boundaries of operation and modern farming practice.

Farming systems RD&E is well placed to address these issues as we move beyond the farm to organise on a regional, and national, basis. A future development agenda for farming systems RD&E is proposed and key criteria for new projects outlined.

Background

The Australian dairy sector is one of Australia's leading rural industries, with an annual farmgate value of approximately AUD$3.7 billion and accounting for 16% of world dairy product exports (ADC, 2002). The sector is a cost efficient producer of high quality milk, with feed systems predominately pasture-based. Recent deregulation of the dairy sector, along with market forces, has applied pressure on dairy farmers to remain competitive (ABARE, 2001). Australian farms have generally become larger and more efficient in response to these competitive pressures. The majority of Australian dairy farms are family owned and operated, with farm numbers rationalising from 22,000 in 1979/80 to 11,000 in 2001/02, whilst herd sizes and annual milk yield per cow have increased (ADC, 2002). These performance increases were due in part to the contribution of Australian dairy RD&E, with a primary focus on achieving productivity gains through improving herd genetics, pasture management and supplementary feeding efficiency.

Dairy Australia (DA) is responsible for managing the sector's farmer-paid research levy and matching government funds, on a national and local level. DA invests around AUD$25-30M each year in research conducted by research providers, such as government departments of agriculture, universities and other research institutions (DRDC, 2002), covering all aspects of the sector from on-farm production to manufacturing, economics and marketing.

In recent years, the Australian Federal Government (and some State Governments) has emphasized a need to address rural and regional development initiatives in terms of a 'triple bottom line' that accounts for the economic, social and environmental impacts of change. The dairy sector has responded to this by using an inclusive approach to planning, design and evaluation of new project proposals.

Recognising the need to take a systems approach to dairy research and extension, farmlet research (small farms) was generally the tool of choice for farming systems RD&E, with farmlet projects established in most dairying regions across Australia. These used small dairy herds to research the impact of specific issue such as optimal stocking rate or supplementary feed levels. However, farming systems RD&E was threatened because of the escalating costs of such an approach, and questions as to the wider relevance of the research and impact of the learning. Such projects were state-based and regionally focused, with no concept of national farming systems issues (Figure 1). There were few linkages between projects other than some networking between projects leaders on a discipline basis, and no integration. It was recognised by many that this was a missed opportunity to increase the return on what was a significant investment.

The shift from farmlets to farming systems was not accidental, but driven by the key investor in dairy research, Dairy Australia (formerly Dairy Research and Development Corporation). The opportunity existed to link nationally. This could be more cost-competitive but was not going to be an easy task.

The existing suite of projects operated within different institutional boundaries, with different experimental protocols and framing of research questions, across different climatic zones and farming systems (eg rainfed perennial pastures vs. tropical grasses, year round calving vs. seasonal calving). The response to this challenge for integration was not about a traditional technical-scientific model, but can be considered within four key themes – integration, methodology, modelling, and extension. There has been significant learning and cultural change around these areas.

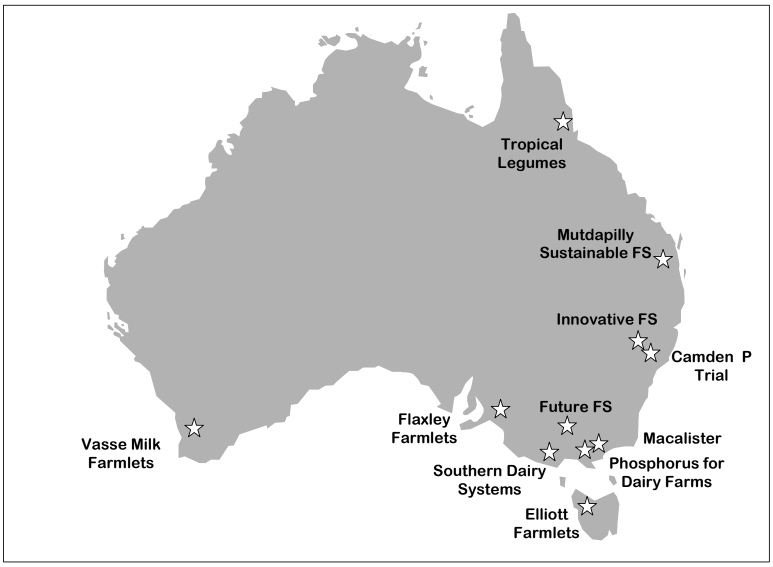

Figure 1. Location of many recent and current farming systems projects within the Australian dairy industry

Responding to Increasing Complexity

After extensive consultation with researchers, extension officers and investors, the National Dairy Farming Systems project was established, with three key objectives:

1. Identify and provide new knowledge on key national issues by cross-site integration, through the use of collective expertise and innovative farming systems tools;
2. Test new learning resources, and use existing resources more effectively, to improve productivity and environmental outcomes through advances in the design and evaluation of learning processes that operate in farmlet projects; and
3. Test a new framework for guiding investment in farming systems RD&E by real-time comparison of empirical, modelling and systems research approaches.

This was a distinctive and new approach to farming systems RD&E for the Australian dairy industry, and is addressed here through four key themes. The integration theme related to linkage mechanisms required for projects with different objectives and stages of development. Project managers' use of a common methodology (second theme) was a central aspect of this integration to ensure data could be exchanged between working groups. The third theme of modelling enabled projects to explore interactions and the dynamics of system behaviour at less cost than using the more traditional experimental methods. The final theme of extension was required because the investors were relying on this project to improve the capacity of the industry to change and adapt to new challenges.

Integration

Integration has provided the glue for a national approach. Unlike other Australian agricultural industries, there was not the benefit of a 'clean sheet of paper', rather the projects that required integration were at various stages of development and implementation. Furthermore, they were all state-based. The challenge here was to integrate existing projects, rather than initiate a comprehensive new RD&E project. This provided a test for the national approach, but also opportunities as there was the chance to learn from the experiences of project teams and implement an informal continuous improvement cycle. These challenges were addressed through methodology, modelling and extension.

Initial ideas for the national approach included a common database, virtual field days, workshops and discussion groups. Whilst these ideas were all exciting on paper, and had worked in other industries (eg Scott and Lord, 2003; Simpson et al. 2003), consideration of resource availability and maximising the cost-benefit equation soon focused activity. Ideas such as a common database were discounted when it was considered that the benefits for our situation were uncertain for the substantial investment of both funding and effort into such an approach.

Developing a 'national culture' was also a key objective for the National Dairy Farming Systems project, and any level of integration was unlikely to occur without this cultural shift. A significant tool for this approach was the annual NDFS project workshops, which involved the project team, representatives from Dairy Australia, research and extension officers from dairy farming systems projects across Australia, and more recently, key dairy farmers. These workshops have been viewed as instrumental to fostering a 'national' approach and developing capacity for farming systems RD&E. These have been held in different regional locations each year with a view to allowing participants to view a specific farming systems project first hand.

Participants were responsive to these workshops;

> *I am more focused on a national application (previously more state focused). I am looking for transportability and reducing redundancy of ideas/RD&E in which I am involved (to other states and between farming systems that operate throughout the nation).*
>
> (A participant's response to the value of attending the 2003 Annual Workshop)

Fostering a 'network' of farming systems practitioners has been seen as one of the greatest areas of progress for the NDFS project and has been well supported (Mason et al. 2003).

Methodology

The methodology used by the NDFS project aimed to improve the implementation of farming systems projects. Several developments were facilitated by the project that collectively built a national capacity to improve the performance of projects operating at a regional level.

Experimental protocols

Workers identified that a common methodology, or experimental protocols, for farmlet research was essential. This would ensure that research results would be comparable on a national basis as experimental data was collected using the same methods, attributes and units. The development of experimental protocols was coordinated by farming systems researchers in the first instance, who identified the need and self-organised. The protocols were then completed, refereed and edited by the NDFS project, and presented in a folder as an output. The protocols were designed in a manner which allowed revision, as it was important that they could be readily modified as advances in methodology were made. Whilst specifically designed for farmlet projects, they are now available as a resource for all new farming systems projects which involve the measurement of biophysical attributes around a dairy farm system.

Guidelines for Farming Systems RD&E

The move to farming systems RD&E within the dairy sector has left investors, providers and users grappling with the different design, implementation and evaluation approaches required to ensure that the expectations of all involved are equally met. To overcome these challenges, it was identified that the development of a framework to guide farming systems RD&E in Australasia would advance the national capacity to design, deliver and evaluate farming systems projects in a rigorous and efficient manner. A workshop was held in New Zealand in Nov. 2001 with Australian and New Zealand participants from industry, research and extension, representing 5 different grazing industries, 23 organisations and a variety of disciplines. The workshop included a combination of plenary and small group activities, based on participants' actual experiences, to develop aspects of the framework and guidelines. These were further developed through an iterative process with feedback obtained and incorporated from a broad range of participants. The published guidelines (Barlow et al., 2002) are now available for use by farming systems teams and investors.

Modelling

The increasing complexity of farming systems is likely to result in greater investment in confounded systems RD&E. The response to modelling varied from 'no place' in farming systems RD&E to 'the tool to solve all problems'. The potential identified by the investors and others has encouraged the exploration of using modelling to enhance learning processes (Weatherley et al., 2003) and assist with the associated planning, understanding and interpretation of project outcomes. There are also epistemological issues raised when introducing modelling into farming systems projects - there are different ways of knowing and this can be confronting for people working in knowledge industries.

One approach has been to support the use of DairyMod, a comprehensive biophysical model, within current farming systems projects, providing a stimulus for more innovative, intellectual and informed discussions about farming systems. DairyMod (Johnson et al., 2003) was a research tool developed as a parallel project in the dairy industry. Workshops with farming systems researchers provided a process to apply the model and allow people to identify opportunities within their own research projects. There has also been strong endorsement from investors that desktop studies to explore a specific research question are now integral to the planning and design activities for new farming systems RD&E. This ensures that modelling approaches are influencing both design and experimental protocols.

Extension

Historically, extension and learning has been viewed as the weakness in farming systems projects. A core objective of the National Dairy Farming Systems was to counter this, and ensure that extension and learning opportunities were maximised. One approach has been to standardise the development of extension strategies, using a facilitated workshop process which identifies objectives, key messages, resources and timelines for development and delivery.

Research undertaken on research farms has often been questioned as to the relevance to commercial farms due to the real, and perceived, differences in resourcing and business focus. It is also difficult to undertake true measurements of the impact of new technologies on business management, labour and social issues. To address these concerns, a popular extension methodology has been the use of ‘companion’ farms – commercial farms aligned with the farming systems project. There are a number of developmental issues to be addressed which include defining the role of the companion farms (farming system vs. management) and refining its place in extension strategies and research design, and contribution to the development of broader principles. This will be approached as a joint initiative between the National Dairy Farming Systems project team, investors and farming systems research and extension workers.

Other issues to be resolved include a greater understanding of the selection of extension instruments (the underlying drivers, principles and ethics, and the benefit-cost analysis of change management), and the role of researchers in extension, and how extension influences research questions. Extension skills, leadership and capacity are all important drivers for increasing the professionalism of the extension profession.

It is likely that there will continue to be a coordination role for the National Dairy Farming Systems project, to ensure that developments in the areas of integration, methodology, modelling and extension amongst farming systems projects in the dairy industry continue. However, we are now well placed to build upon existing achievements to further build capacity and innovation within the sector. Before expanding on these proposed initiatives, we’ll firstly outline some foreseeable new challenges for the Australian dairy sector.

New Challenges for the Australian Dairy Sector

Changes in the agricultural sector have occurred as a result of increasing competition, the privatisation of information sources, and the move towards a risk society. So how might this affect the future of the Australian dairy industry?

First, increasing competition. We are starting to see some changes in dairy production whereby the industry was once cooperatively organised and farmers helped other farmers out in times of need. In recent years the demand for greater efficiencies at the farm level has seen some erosion of this cooperative approach between some producers. One way farmers gain an advantage over others is to adopt innovations before others. It's common knowledge that the biggest gains come early in the life of new technological innovations, but in the end the long term beneficiary is the consumer or the supermarket. This process has been described as the 'Technological Treadmill', which means that farmers have to adopt more and more technology and intensify just to maintain their business profitability. It is not uncommon to talk with farmers who say they will need to be running herds of over 300 cows just to stay in the business. We know that the pressure on managers is not going to be just about feeding more mouths. It will also mean milking more cows per labour unit and utilising more feed per cow etc.

A European response to this increasing pressure has been to differentiate products in a way that ensures distinctive product quality features capture a price advantage back to the farm.

Privatisation of knowledge has been observed in a recent national study of the Australian dairy industry (Joly, 2003; Paine et al., *this conference*). The past two decades have seen an increasing trend for information to be supplied by the private sector, with the State Departments having to take more responsibility for services and issues relating to the management of natural resources. Private sector services are usually specialised and relate specifically to the shareholders' interests of those companies. Farmers are increasingly required to provide informed views on information preferences.

We will also see more property rights exerted over technologies in the future. For example, Monsanto controls 80% of the market for genetically modified plants. The economic and environmental impacts of such changes and the concentration of power among a few large global companies maybe quite far-reaching and we do not fully understand how this will work itself out. What is clear is that there will be increasing standardisation of farming practices and more dependence of farming systems on external technologies that are often controlled by patents.

We are entering the era of the risk society. What this means is that people are more aware of the costs of making errors in food industries, and that the consequences of errors are far greater than in previous years. We now need policy regulators to work with industry leaders and community representatives to develop more cooperative and reasonable solutions to manage the principal risks to our industry and society. A failure to work together will result in increasing conflict and division between sectors of the community such as 'those who are for' and 'those who oppose' bio-technologies, or who advocate more environmental protection as a basis for building a more sustainable future, or who view organic farming practices as the ideal (Joly, 2003).

In terms of the future of the dairy industry, one view is that farmers will have less control over their farms than at any time in previous history. Increasingly, decisions about the direction and development rates of farm businesses will be made by finance companies, processing companies, marketing groups and supermarkets, environmental policies, urban development interests and so on.

An alternative view is to say that there is a very exciting future for dairy production which will rely heavily on new innovations that do more to extend the product quality and product differentiation opportunities in a way that ensures dairy farmers capture and retain the majority of the benefits. These developments will require a form of branding and labelling that gives evidence of the care and skill involved in producing milk and dairy products to specifications that satisfy consumer expectations.

We are, and will remain a low cost commodity based industry, but a drive for increasing efficiencies from improved logistics management and through advances in food processing technologies need not conflict with the idea of *terroir*[1], as already demonstrated in the Australian wine industry. This may mean we will see even greater diversity in our farming systems and associated supply chains, with a focus on improving the recognition of the health benefits arising from improved land and animal management practices.

A Development Agenda for Farming Systems RD&E

A development agenda has been emerging from the work of the NDFS Development Group (including farmers, researchers, advisors and investors) that is charged with mapping a path for future farming systems RD&E that will cope with the anticipated challenges outlined above. These challenges are likely to involve stronger links between on-farm practices and innovation in supply chains, a capacity to better manage new innovations in relation to labour issues, management of critical natural resources like water, and fostering co-learning opportunities with our partners in south-east Asia.

Farming systems and supply chain innovations

In order to grow a sustainable dairy industry, we must continue to be innovative and responsive to new opportunities. This includes identifying real opportunities to value add, develop new markets, differentiate our businesses and respond to international directions and influences. A project planning activity was initiated in early 2003 to build on findings from a study tour and the European Farming Systems conference in 2002. These experiences identified new possibilities for Australian dairy farming systems that focus on the relationship between geographic location, farming system and supply chain innovations. This work is at the pilot study stage, working with the Atherton Tablelands, a well defined dairying region of Australia, and has considerable commitment from all participants involved in the relevant supply chain.

The Grow Malanda strategy, developed in 2000-2001, provides a strong foundation for identifying the future for the Atherton Tablelands dairy industry. An industry forum and specialist workshop was designed to assess the variety of opportunities that exist for the region. These opportunities included everything from niche branding to designer milk and specific breeding programmes, and presentations considered the market potential for each option, the costs of implementation and change, and how it fitted with the Atherton Tablelands dairy industry. These options were prioritised and further

[1] The mix of agro-climatic factors, local knowledge and specific genetic resources that create a unique product that is branded and protected.

development considered by industry partners such as Dairy Farmers (the local processor) and the Atherton Tablelands Sustainable Region Advisory Committee (ATSRAC).

A rural development view of the NDFS project recognises that among many stakeholders, farmers play a strategic role in the initiation and further elaboration of land management practices (van der Ploeg and Renting, 2000). Not surprisingly, modernisation trajectory (continual growth and scale unsustainable), access to available resources, and increasing work satisfaction were identified as key rural development drivers (van der Ploeg and Renting, 2000). Under Australian conditions we were interested in identifying new opportunities that did not over-expose farm businesses to further risk. Observing developments in European farming systems suggested some opportunities may arise from product specialisation. Concepts such as '*appellation controllee*' are not as well developed in Australia as Europe, and for the dairy industry, likely to occur on a smaller scale through individual farm businesses rather than regional organisation. Dairy farm businesses are essentially orientated to the production of a single product (milk), and for many farmers, dialogue and initiatives around multi-product development, regional specialisation or niche marketing is only a diversion from their key concerns of securing a higher milk price and a more adaptable and profitable farming system. Unsurprisingly, therefore, that key project areas identified as investment possibilities at the Advancing Grow Malanda workshop were essentially about improvements to the current farming systems to increase milk production, development opportunities to encourage young people to enter and stay in the industry (thereby increasing the longer term viability of the dairy industry in the Atherton Tablelands) and manipulating milk production to increase protein content as identified by the milk cooperative.

A development agenda is now emerging for the project that has attempted to address the issues and experiences described above. This agenda includes a conventional productivity focus accompanied by concerns for improving natural resource management.

Technology and new innovations

The 1.6% annual rate of growth in productivity (outputs over inputs) in the Australian dairy industry is a concern to the investors and leaders in the sector. The sector aims to increase this rate to 3%. One way of achieving these gains is through efforts to reduce labour and feed costs which account for over 50% of the total costs for milk production. This issue of labour efficiency relates to both the management of labour and the availability of skilled labour.

A new project is being established to address these issues. Though located in New South Wales it will be national in its focus and delivery to the sector. The design of this project recognises the interdependence of technical and social research studies. Investigations of new forage, feeding and milking options will focus on innovative technologies to address the efficiencies of labour to contribute to increased productivity. Developments will integrate technical, economic and social issues in the establishment of a national extension network. Support for learning between the research farm and farmers will be provided using an appropriate framework for the design and evaluation of technological innovations. These innovations need to be negotiated on a regional basis, and therefore are dependent on advances in the social research part of the project. Consequently, learning and adaptation processes are topics of research in their own right within this project.

Water

Recognition of water as a valuable resource has increased many fold within Australia during the past few years (The Wentworth Group, 2002). This has been exacerbated by recent drought across the country, increasing competition for water resources and changes in public attitudes to the allocation of water resources (Fullerton, 2001). This will increase the pressure on the dairy industry specifically as it is seen as a high water user, and low water use efficiency, enterprise.

The issue for farming systems is therefore to generate more productivity using less megalitres of water per hectare in a way that does not degrade soil, water or biodiversity. To date, most work in this area has involved the measurement of water use efficiencies of alternative forage species and modelling of biophysical and economic changes as a consequence of reduced water allocation. These studies are providing a basis for the design of field experiments. These experimental designs will form part of an inter-disciplinary study on water policies and farm management decision making.

Building dairy farming systems capacity in south-east Asia

We believe that we are sitting within the livestock revolution in south-east Asia, with an increasing demand for animal protein, driven by independent wealth, urbanisation and demographics (Steinfeld, 1998). To date, we have been focused on taking a national approach in Australia, but can now begin to look beyond the Australian shores. The ability to provide farming systems knowledge across a continuum of climate and farming systems ensures that we are well-placed to help develop the south-east Asia dairy industry, and also justifies investment in developing science capacity in more marginal areas of dairying here in Australia. This would provide the opportunity to utilise the intellectual property around the now well-coordinated Australian dairy farming systems RD&E and also provide opportunities to other researchers and assist with the integration of states, with growing interdependence within the farming systems network of researchers and extension specialists. For this to be successful, the Australian dairy industry would have to view our farming systems RD&E as critical to developing new markets and not just about improving productivity locally.

Moving from Agenda to Action

We have identified a number of challenges that must be addressed to increase the capacity for farming systems RD&E in the Australian dairy industry.

The development of systems thinking skills amongst researchers and extension officers is a significant challenge. We need to develop research and extension personnel with an ability to incorporate knowledge from experts into systems in a balanced manner and require experts with specific expertise to contribute in a context that is useful to farming systems RD&E.

Whilst a national approach has been encouraged through the vision and funding of Dairy Australia, around each individual farming systems projects exists a variety of funding partners. Each of these will have specific objectives and policy which can result in a mis-alignment of expectations. There are also power issues involved here, with conflicting objectives at a state and national level, and between private and public sector. Traditionally, research and extension personnel have also had different line management which hinders communication and collaboration across the RD&E continuum.

To date we have focused on a ‘ground-up’ approach, aiming to achieve national objectives through working with regional teams. However, there is debate as to whether this approach is sufficient to achieve the desired outcomes, or whether a greater voice in RD&E policy is required (Joly 2003). As a national coordination effort, the policy question is unavoidable, with respect to setting the agenda for RD&E. If we chose only to listen and respond to regional views, then it denies a national perspective across what is happening. This includes positioning with respect to other institutions. Agenda setting for RD&E within Australia is undertaken by a number of institutions, including Dairy Australia, the state Departments of Agriculture, and Regional Development Programs (RDP’s). Meaningful consultation and engagement with these institutions is desirable.

The project design essentially employs a Constructive Technology Approach (CTA) perspective to accommodate both regional and national technology development expectations (Schot, 1999). This, however, provides additional challenges for the resourcing of the project, and employment of a multi-disciplinary approach, where different roles and responsibilities require negotiation. Achieving consensus through a negotiation process with key stakeholders is also difficult in the area of technological innovation for the dairy industry as there is mixed agreement on the value of the innovations suggested. Project design, implementation and resourcing also requires flexibility to allow for the required anticipation, reflexivity and social learning (Schot, 1999) to occur in a meaningful way.

Wide engagement in the NDFS project has been difficult to achieve. Greatest success has been with researchers and extension practitioners embedded within regional farming systems projects, reflecting the ‘ground-up’ approach. Developing an appreciation for a project such as this one to allow effective participation for other stakeholders has been more difficult, and in part, relates to its breadth of scope and intangibility. The project team tried several initiatives including: a steering committee, which was effectively disbanded due to lack of interest in the very early stages of the project; and a ‘product development’ group - convened after the demise of the steering committee to include farmers, researchers and extension specialists (over time this transformed to be less about product development and more about ‘guiding’ the development of the project). Whilst an appreciated role, this assumed a level of representation back to the regions which was inappropriate. In the future this provides a challenge back to the NDFS project to interpret its role in industry as new entrants come on board.

There has long been a willingness to fund researchers with specific technical expertise with the expectation that they will develop a research program. This opportunity rarely extends to professionals with extension and learning expertise. Subsequently, the researcher may be in the position of developing a research proposal in the absence of appropriate extension and social research support – second guessing the extension requirements for a specific project. This also relates to the professionalism of the extension professional and how we address this (eg a cooperative Centre for Change is at proposal stage). There is a need for equivalence in professional status (with respect to science) if extension is to be a real partner in the development of future farming systems projects.

Maintaining an ongoing capacity for extension is also problematic, with a high turnover in extension staff. Lack of capacity and strength in this area can compromise a farming systems approach, as traditional science continues to be the dominant paradigm. This provides the challenge to more fully engage with private enterprise and consultants, but can add additional costs and complexity to project development and delivery. Addressing the issues of professionalism could go some way to maintaining an ongoing experienced extension capacity.

We suggest the following as a key attributes for the development of new farming systems projects:

- Core business focus and a target of 10% Return on Investment;
- Desktop analysis from outset;
- Interstate and cross-disciplinary project linkages identified and resourced;
- Extension methodology (learning and practice) integral to project design; and
- Best environmental practice embedded within on-farm research.

Conclusion

The National Dairy Farming Systems project is a distinctive and new approach for farming systems RD&E in Australia. It has been instigated in order to improve integration of existing farming systems projects, facilitate the adoption of innovative learning approaches, and establish guidelines for the design, implementation and evaluation of farming systems RD&E.

Improving our capacity for farming systems RD&E within the dairy industry has been a process of incremental change. The establishment of the National Dairy Farming Systems project has supported this progression, with advances in the areas of integration, methodology, modelling and extension and a concurrent culture shift amongst researchers and investors. However, by its very nature, a farming systems approach must transcend funding disciplinary and institutional boundaries which have provided practical barriers to the successful implementation of farming systems RD&E. Opportunities to further develop the farming systems capacity for the Australian dairy industry have been identified to meet the new demands and complexity of RD&E issues.

There is a very exciting future for dairy production which will rely heavily on new innovations that do more to extend the product quality and product differentiation opportunities in a way that ensures dairy farmers capture and retain the majority of the benefits. If these elements were incorporated at the design and planning stages, then the likelihood of meaningful and significant outcomes from the research and learning would be maximised. This will go a long way to assisting with future complexity and challenges to ensure a viable Australian dairy industry.

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Farmers'expectations of farmers' organisations in Minas Gerais, Brazil: Extension rhetoric or practice?

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Abstract

Research conducted into the nature of participation in farmers' organisations in Minas Gerais included a survey on farmers expectations from association to answer the question why farmers often prefer to carry out production and marketing activities by themselves. The farmers' attitudes towards participation in farmers' organisations were examined including their perceived training and skills needs. Implications of the findings for rural extension and related rural services are also examined in this paper. A total of 122 formal interviews were conducted with different categories of farmers: the associations' committee members ; farmers who market their production through rural associations; farmers who are not association members;, and the local extensionists in two rural communities in the south of Minas Gerais, Brazil. The comparative analysis of two case studies showed that socio-economic characteristics were not very significant in determining the farmers' level of commitment to the association. The abilities of the management committee members, mainly the directors,emerges as one of the most important factors in the success or failure of farmers' organisations. The presence of private competitors can also greatly determine the direction and destiny of the whole process. Another relevant conclusion is that farmers are more predisposed to participate when the organisation/association offers additional benefits such as tractor services and sale of inputs. However, technical assistance during the production process is also highly appreciated by the farmers. The research findings show that the role of rural extension should be one of providing more advice on participatory activities and management techniques to farmers' organisations. Rural extension services and other institutions involved in the development of rural communities and farmers' organisations, should put more emphasis on providing knowledge to local people in the technical aspects of managing collective businesses. It is essential to prepare directors and potential leaders to carry out administrative activities, especially in highly market-orientated communities. One of the roles of rural extension should be that of teaching techniques of management and marketing, instead of providing advice related exclusively to the farm daily activities. Written procedures and legal and bureaucratic know-how are crucial factors in the successful management of a collective business activity. Rural extension services can also assist in the creation and maintainence of a cooperative mentality among farmers and help to overcome farmer individualism in rural communities through the use of participatory methodologies.

Key-words: Rural extension, cooperative associations,skills and needs , marketing

1. Introduction

Strategies of development in many countries, including Brazil, have traditionally been based on the modernisation of the rural sector through capitalisation of the productive sector and economic growth. However, since the 1970s, these strategies have been questioned by politicians, researchers, and others

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involved directly or indirectly in the development process. The emergence of social movements in urban and rural areas, the growing income imbalance, and the difference between the costs and benefits perceived by the local population have brought about the redefinition of the earlier development model.

In this context, participation emerged as a mechanism of consensus to include the local population in development strategies with the expectation of bringing in more benefits for this excluded sector of small and poor farmers. The need to include farmers as producers and 'subjects' of their own histories, and not only as simple consumers and 'empty objects' in development strategies was the main assumption underlying the recognised importance of participation. Many participatory strategies have been implemented and participation has become an object of research and practice in different parts of the world. From the perspective of this paper participation is still an essential ingredient in the implementation of programmes, which aim to improve the quality of life in the rural sector.

Another important aspect within development strategies relates to the management of farmers' organisations. Associations and co-operatives formed in order to facilitate the development of farmers' activities, to increase their income levels, and consequently to improve the standard of living in rural areas, require farmers to act in a participatory mode to improve their production and marketing processes, which in turn are supposed to benefit the whole community.

Research studies have examined the positive and negative issues involved in creating and sustaining farmers' organisations. Some authors place emphasis on participation while others are more committed to technical issues involved in the growth of the organisations themselves.

Rural extension plays an important role in assisting farmers to sustain themselves, their communities, and their organisations: while private consultancy is now common in richer countries, the majority of 'small' farmers in many countries do not yet have the financial means to pay for private help. This paper identifies the nature of participation in farmers' organisations, with a particular focus on the skills and needs of farmers in collective/cooperative business, and discusses the changing or extended role of rural extension services in supporting such associations.

2. Literature Review

2.1. Farmers' organisations

To understand what is involved in the development and maintenance of farmers' organisations one approach is through review and definition. According to Garforth & Munro (1995: 28) in general terms 'organisations are structures of recognised and accepted roles established and performed by and for members'. This definition may appear to be simple, however it is very complex. As structure is performed by and for members, the formal and informal interaction between the roles and the people involved in the performance of these roles is crucial. The collaborative form of participation is also extremely important because people are perceived as 'beneficiaries' in the system. For Oakley (1985) and Midgley (1986) collaborative interaction is both feasible and desirable in situations that involve people. The process of 'empowerment' postulated by Oakley may be developed in rural communities and farmers' organisations through this interaction.

2.1.1. Characteristics of rural organisations

There are many models of organisations acting in the rural sector ; they may be grouped into two distinct categories, conventional and participatory, as defined by Oakley (1990). The conventional or traditional organisations are able to bring tangible benefits to the farmers because government, which emphasises economic growth, supports them. They are formally structured, have a large membership, and they normally have a professional management orientation. Their members support them with an emphasis on internal economic growth. On the other hand, participatory organisations usually have a small membership and the leadership depends on a collective basis. They are more focused on social development issues rather than on economic growth.

In Brazil, rural unions such as Rural Labour Unions, which emerged in the 1980s, are examples of participative organisations acting in the rural sector (Oakley & Marsden, 1980, and Oakley, 1990). According to Gaifani et al (1996), this movement emerged as one type of spontaneous political organisation formed by farmers and activists to resist unwanted changes and to promote their own vision of development.

2.1.2. Types of farmers' organisations

Farmers' organisations or associations may be categorised by other terms. The most common type, the cooperative, has a long history from the nineteenth century. According to ILO (1966), cited in Garforth & Munro (1995: 37), a cooperative is:

'An association of persons who have voluntarily joined together to achieve a common end through the formation of a democratically controlled organisation, making equitable contributions to the capital required, and accepting a fair share of the risks and benefits of the undertaking in which members actively participate'.

ILO (1981), cited in Oakley (1990: 12), states that rural workers' organisations present similar characteristics, including their formation process.

'A rural workers' organisation is a trade union or a trade union type organisation of, for and by rural workers… A rural workers' organisation is formed by the coming together of a number of workers in an association established in a continuing and democratic basis, dependent upon its own resources and independent of patronage, the purpose of which is to further and defend the interest of members'.

Other types of rural organisations also exist: such as farmers' groups, pre-cooperatives, farmers' associations, federations, farmers' unions, agricultural cooperatives owned and controlled by the members, and chambers of agriculture with a general assembly elected by farmers (IFAP, 1992).

Independent of the kind of organisation, they exist to offer services and benefits to their members. In a study conducted in Saint Lucia, the most common services provided by the 16 institutions analysed were farm inputs, information, training, technical assistance, credit, research, and marketing activities (La Gra et al, 1989). The organisations, in principle, provide a responsive service, reacting to the needs of their members The members should determine these services on a participatory basis, but this has not always happened in practice.

There are many arguments in favour of promoting rural people's organisations: these vary through a range of theoretical and ideological points of view including arguments from efficiency, equity and social/political development through the act of participation, self-determination and group action.

2.1.3. Creation of local organisations

Rural organisations have been created with a specific purpose and have become important to many people. In spite of this, they sometimes face problems related to costs and sustainability (Goldey, 1980; Esman & Uphoff, 1984; Uphoff, 1992; and Bebbington et al, 1994). Leaders usually prepare a plan of financial resources to minimise economic problems in their organisation, and to visualise its situation, which also helps to avoid dependence on external assistance. The main sources of finance considered in cooperatives and associations are membership fees, income generating activities, and buildings (IFAP, 1992).

Organisations, which have been created as part of a development project, with external help, have often failed. Here, there is neither the motivation nor the local social and economic context to allow them to survive. The organisations do not achieve sustainability, because development assistance amy act as an instrument of dependency. If rural organisations survive this first set of problems and manage to keep going, they may still face other problems during their lifetime. La Gra et al (1989) have identified three significant categories of problems in the associations studied relating to agricultural production, marketing, and management. In the first group, there are problems related to poor cultural practices, and insufficient capital. In the second category, one may find problems related to prices, lack of transport and storage facilities, lack of communication, and lack of a secure and guaranteed market. In the final group, when the associations are member-driven only few farmers understand the system of management, thereby placing a lot of responsibility in a very few people's hands.

Souza (1995) studied the dilemmas of collective management in small farmers' associations in the south of Minas Gerais. She considered participatory management to be a set of articulated intentional actions implemented to democratise the management process. The interest of people in organisational growth leads to the creation of instruments or tools that allows members' participation in the management process. She observed that the Poço Fundo Association has shown, in practice, that the organisation has grown stronger through participatory management and through the members' articulation, with regards to both short and long-term actions. The association's orientation is translated into committee members' and advisers' concerns in ensuring an educational process where 'everybody' has the opportunity of deciding the association's destiny.

2.2. Farmers' participation

According to Oakley (1985), Farrington & Martin (1988), and Mosse (1995) participation is a 'tool' that enables people to be involved with their own needs and problems through the decision-making process. Participation is a long process, which sees awareness as a fundamental pre-condition and not as an end in itself. As a result, participation needs to be developed, step by step, by the people, direct or indirectly, involved.

Effective or 'real' participation has its roots in the process of decision-making. The first step in the decision-making process is to identify the problem (McCracken, 1988). This identification may be carried out in a variety of ways: through an informal survey, group discussion, case studies, chain interviews, or intra-household analysis (Farrington & Martin, 1988). After this, the people concerned will try to find possible solutions, sometimes with external help, by identifying the causes of the problems and by pointing out possible solutions.

Mosse (1995) postulates that there are some social pre-conditions for participation in planning and it is possible to say that these pre-conditions may be applied in the development of other stages of organisational and community development. The process of working pre-conditions is similar to that of decision-making. The analysis of the problems is the most important pre-condition. The following step is to search for solutions with the help of other people involved in the problem. Finally, a co-ordinator or 'facilitator' should prioritise the items discussed, with the help of some participants, normally using one sort of ranking diagram.

Participation is, in the first place, a collaborative means of obtaining information about the local conditions, skills, needs, and attitudes. Without this information development programmes, projects, even the creation of farmers' organisations, can have problems of sustainability when external support stops. People are more likely to identify themselves with the project and see it as their project if they are committed before its inception. This is also important for getting local assistance in the construction or maintenance of the project. These two reasons are indirectly supported by IFAP (1992) which stresses the importance of avoiding external dependence in self-support associations. For some, the involvement of people in their own development is considered to be a basic democratic right.

2.2.1. Forms and models of participation

From the 1970s to the present, researchers have been investigating the forms and models of participation, aiming to develop theories about the ways in which farmers and others become involved in particular activities. Oakley (1989: 27) identified three different forms of participation:

i) Spontaneous: 'based on local initiatives which have little or no external support'.

ii) Induced: 'is arguably more common, results come from external initiatives seeking support or endorsement for external plans or projects'.

iii) Compulsory: 'people are mobilised or organised willy-nilly to undertake activities in which they have had no say and even which they have no control'.

Oakley's emphasis is upon rural social development and the forms of participation more concerned with rural development programmes,however, they are normally present in the creation and development of local organisations.

2.2.2. Stages in the participatory process

The process of participation can also be divided into stages. The stages vary according to the level of people's involvement in activities developed over a certain period of time. Oakley (1989) identifies three stages in the participatory process. In the first stage, participation is considered 'marginal' because people's participation is considered 'limited' and 'transitory'. At this stage people have little direct influence on the outcome of the activity carried out around them. 'Substantive participation' is found in the second stage when people are actively involved in the determination of priorities. People also carry out activities, although they are externally controlled by sponsors' institutions and other outsiders directly or indirectly involved in the process. Thirdly, when participation becomes 'structural' people have an active and direct involvement in the activity. At this stage, people have the power to ensure that their opinions are taken into consideration. In following this principle, one goes from the 'marginal' to the 'structural' participation discussed above , helping people to develop a structure and think about issues such as resources, decisions, skills, purposes, and publicity instead of trying to persuade them to implement a package of decisions drawn up by external agents. These considerations are relevant in linking social participation and the development of farmers' organisations.

2.2.3. Origins and levels of participation

In Brazil, Community Development Programmes supported by the governments of the USA were implemented in the 1940s: they usually offered subsidies for the creation of technical assistance and rural extension, rural education projects, and national plans of development (Amman, 1980; Sales et al, 1987; Demo, 1993; Costa, 1994; and Souza, 1995). The early programmes have been criticised as superficial and in general did not help people to achieve social participation nor political participation.

According to Bordenave (1987), participation can be situated at two different levels and conceptualised as 'symbolical' or 'real'. Symbolical participation occurs when there is a minimal influence on the decisions and the people involved seem to have power, however it is only an illusion. On the other hand, real participation exists when the individuals can affect and influence all the institutional processes. He also adds that the influence can be "expressive" when artistic and philosophical aspects are involved or "instrumental" if the emphasis is placed upon theoretical and professional aspects.

Valadares (1995) further identifies two concepts in analysing the level of involvement and participation of a cooperative educational committee in the formulation of politics and objectives, and in the operationalization and control of the services offered by the cooperative to its members. In his study, 'passive participation' occurs when the involvement of the members consists only in being beneficiaries of the cooperative assets and recipients of the offered services. On the other hand, 'active participation' means involvement as owner or co-owner of the cooperative business. The active participation of members in cooperatives, discussing everything from simple to complex matters, constitutes an institutional form of pressure upon orders and counter orders from the prevailing structure.

3. Methodology

The research conducted in Minas Gerais examined participation in farmers' organisations: to identify the nature of participation; farmers' attitudes towards participation; the factors which facilitate the participatory process; and problems which interfere with and inhibit the participatory process in farmers' organisations.

The research was based on a bibliographic revision, direct observation, documentary analysis, formal and informal interviews and fieldwork. A total of 122 formal interviews were carried out with the associations' committee members, farmers who market their production through rural associations, farmers non-members, and the local extensionists in two rural communities in the south of Minas Gerais, Brazil in 1998. This municpality was chosen because of the importance of strawberry crops for the economic growth of the region (SEAPA, 1998). The formal interviews provided the most relevant data and were compared with data from informal interviews and secondary sources of information.

A conceptual framework was set up to assist in answering the following research questions: (i) Who is participating in farmers' organisations and why are they participating? (ii) How is participation occurring in the social context? (iii) How do farmers' organisations affect the production process? (iv) How do farmers participate in the management of farmers' organisations? It also identified the main factors that facilitate the participatory processes in farmers' organisations, and the main problems faced by farmers which interfered in the participatory process.

4. Major Findings

4.1. Strawberry production in Pantano and Cruz Alta

The strawberry crop was introduced into the Pantano community in the middle 1980s. Up to that time, the community had been very poor and farmers used to rely on subsistence crops and temporary work to sustain their livelihoods. Nowadays, the majority of farmers are involved in strawberry production. It is very labour intensive and even children are welcome in performing different services such as picking and packing. The strawberry yield is normally high as each plant produces more than a kilo of strawberries during the harvest season and the resultant income can be considered high when compared with other common agricultural or livestock activities (SEAPA, 1998). Unlike other traditional agricultural activities, strawberries are easily perishable, cropping them requires many different abilities, and the harvest season last normally 6 months.

The creation of local organisations, which really was a challenge for new farmers, was soon accepted and implemented by them to improve marketing. The Pantano association is succeeding very well in its enterprise. The Pantano association is a new organisation, founded at the end of 1992, by a group of 25 farmers. In 1993, the first year of its operation, the association marketed 194 tons of strawberries from 65 farmers. In 1997, when the fieldwork was carried out, the association had 120 members effectively marketing their strawberry production through the association, and the quantity marketed was 650 tons. However, its best performance occurred in 1996, when the quantity marketed reached 780 tons. The association owns a 200 square metre headquarters built on a 440 square metre piece of land, a Massey Ferguson tractor, another 800 square metre piece of land, a computer, and furniture. All the association's belongings were bought with the 3% paid by members and the *quota* paid by partners, excluding the land where the headquarters was built, which was donated.

The figures above show that the association has been performing very well in this short period of time. It has a relatively high number of members and is marketing a considerable amount of strawberries. This association has a stable marketing system and is managing to offer additional benefits to members so it has not only attracted farmers but also has kept them committed to the organisation. The association sells inputs and delivers them to the farms, offers cheaper tractor services, and indirectly provides technical assistance. The directors also have a good educational background, and they have received technical support from the local extensionist to create and manage the business. These factors, along with the positive involvement of the community and loyalty of members have contributed to the growth of the organisation.

Nevertheless, the organisation located in the community of Cruz Alta, known as APROMOPA (The Strawberry Association of Pouso Alegre), where the strawberry crop was introduced earlier, has faced many problems over its 15 years of existence. These problems are mainly related to lack of capital and administrative knowledge in providing benefits to farmers, and a high sense of independence among the community. As a result, it is a small organisation in terms of membership and marketing. In 1992, the association had 73 members, but this number dropped to less than 30 members in 1997, and the trend is to decrease further unless a dramatic change happens in both the internal and external environment. The association marketed 116 tons of strawberries in 1992, 131 tons in 1995, which was its best performance in the last decade, and only 66 tons in 1996.

Another problem, which has affected the performance of the Cruz Alta association, is the presence of many private companies marketing strawberries in the community. Members and other farmers in the community have never been effectively committed to sustaining the organisation as they were always competing among themselves. The association had a brilliant start, with a farmer donating a piece of land and the extensionists helping to get funds to build its headquarters, but the management committees did not manage to offer constant benefits to members as most of the private companies usually do. The benefits offered by private companies include money loans to buy inputs and prepare the soil, and free boxes for packing the product. The disputes and constant rivalry did not allow the farmers to pursue a common objective. As a result, a considerable number of farmers, including the capitalist ones, have achieved a relatively high standard of living but many farmers, mostly peasants and neo-peasants, still rely on external help to grow their crops and market their products.

4.2. The nature of participation

The nature of participation in the communities studied in Minas Gerais is summarised below, in reference to the conceptual framework developed for the research (Vilas Boas, 2000:77). There were not many differences between associated farmers and non-associated farmers. Thus, this paper will address only the main characteristics of the farmers engaged in the associations and their attitudes to participation and related aspects.

- The community of Cruz Alta has specialised in strawberry production for a longer time. The farmers' characteristics are therefore different because the strawberry crop was introduced first into this community. The farmers tend to be older, to have lower educational levels, to own larger strawberry crops, and this in turn affects land tenure. Furthermore, they still tend to crop the same subsistence products, receive the same annual income, and work on the same size of lands. The personal and professional characteristics do not seen to be very important in determining the level of farmers' participation in organisations marketing agricultural products because non-members also have similar characteristics.
- On the other hand, how the organisation influences the production process seems to be directly related to the level of farmers' commitment to cooperative organisations. The Pantano association assists the farmers indirectly in planning, organising, directing, and controlling their production; thus Pantano's farmers are more involved in the association than the farmers of Cruz Alta.
- Few ordinary farmers of Pantano are involved in the association's management activities while members of APROMOPA have not helped the directors to manage their business. Analysing this information in context, it is possible to say that participation in the management process is more likely to occur when the organisation interacts with the production and marketing processes in the community.
- The Cruz Alta association was initiated with an induced form of participation and it is still marginal for different reasons, while spontaneous participation was one of the bases for the collective business in Pantano. People's involvement seems to be a step ahead in Pantano and it may develop from a substantial to structural participation in the future. Both internal and external environmental issues, such as the marketing mentality and infrastructure of the community, the kind of assistance received, and the technical knowledge of the directors, have affected the bases of participation both positively and negatively.
- The levels of participation are different in both communities. Pantano farmers are much more involved in the association than the majority of Cruz Alta farmers who wait passively to receive advantages from the collective business.
- With regard to the characteristics of participation, direct and formal participation is more proactive and effective in Pantano than in Cruz Alta. Farmers attend more meetings and lectures in that association and they positively contribute with their points of view to improve the association's activities. They are also more receptive to advice on improving their own activities. The same applies to indirect and informal participation because the effects of these types of participation have been positive in Pantano and negative in Cruz Alta. The Pantano community is generally more positive about its organisation. Cruz Alta farmers however who market their produce independently and also some private companies are not totally in favour of the presence of an association.

In summary, farmers of Pantano have developed a cooperative mentality with regard to their involvement in the association and other community activities. Organisational groups, such as directors, have a positive image in the society and consequently the organisation itself has benefited from the loyalty of both directors and members. In addition, the organisation has brought improvements to the strawberry crop and seems to have stimulated young farmers into getting involved in this crop. However, the organisation of Cruz Alta has neither helped farmers in the production nor marketing of their produce; thus some directors and committee members have a negative reputation within certain sectors of the community. This organisation is now weaker than the association of Pantano because the majority of community farmers do not have a cooperative mentality and there is a fierce competition among strawberry buyers in the community.

Theories about farmers' organisations and participation have been to a large extent 'proved right' in both case studies. Understanding the nature of participation in farmers' organisations is a very complex issue in which researchers should look at many distinct aspects simultaneously in both the internal and external environment.

4.3. Rural extension: related aspects

Farmers' need for rural extension in the communities under study is spread in different areas and they require assistance before, during, and after the production process. Most of the information required is related to the purchase of inputs, technical matters during the production process itself, and advice in marketing .Farmers also need to improve their skills of collective management ,including decision-making .

4.2.1. The role of rural extension in developing farmers' organisations

In the two case studies, individual farmers as well as associated farmers have received more advice in Pantano than in Cruz Alta. More than three thirds of the Pantano associated farmers received technical advice to help with their farming activities and about half of all non-members also received technical advice in 1997. Although the assistance in both cases is directed more to the production than to the marketing process, members involved in farmers' organisations seem to receive more assistance than non-members. The local extensionist usually visits the farmers on their own farms, but he also offers a great deal of advice in the local association. In this case, members are more willing to attend lectures and meetings than non-members. On these occasions, the most relevant techniques adopted by the extensionist to deliver assistance are explanation, demonstration, and the distribution of leaflets.

A very few farmers receive technical advice from the Technical Assistance and Rural Extension Company (EMATER), the governmental organisation which is in charge of providing rural extension in Brazil and about half of members and non-members did not receive any kind of advice in Cruz Alta, in 1997. Although some farmers complained about the poor quality of the services offered by the local extensionist, the majority of the farmers interviewed agreed that they already have sufficient experience with the strawberry crop and do not need any external assistance. A 32 year-old-man stated that 'I just uproot sick plants and throw them away instead of looking for technical assistance'. This attitude is not advisable and farmers should be instructed to search for help at any time, mainly during the production process.

Agricultural stores provide another source of technical assistance and farmers usually get advice from the salesmen. These salesmen usually assist farmers in choosing fertiliser, insecticides, and pesticides, but do not help at the marketing level. This source of advice is more available among the farmers of Cruz Alta than Pantano. The findings are in accordance with the studies of Carter (1999), Zijp (1998), and Bisaliah (1994); they state that farmers have searched for advice in different spheres including the private sector and 'fellow farmers'. In Pantano, as well as in Cruz Alta, the farmers also have access to other sources of private advice such as agribusiness and fund suppliers.

The findings also have shown that the community, which has benefited from public extension, is better equipped to sustain its own organisation. The extensionist has worked as an intermediary between the farmers and the association, and has provided orientation about the role of cooperative groups in marketing agricultural produce. Group advice offered by the extensionist has created a very positive and strong link between farmers and the association. This method also helps to increase awareness about participation in organisational activities.

5. Conclusions and Implications for Action

Fruit growing is usually very demanding and employs a considerable number of people. Consequently it brings many positive results, not only in terms of contributing to a decrease in the level of unemployment in the rural sector, but also by increasing the income level of rural families (Almeida (1998), Pozo & Gomes (1997), Ferreira (1997), and Ferreira (1996)). In this context, the strawberry crop was introduced into Pouso Alegre in the 1970s and it brought many benefits to the region. Farmers, who had previously dealt with corn, beans, rice, and milk, demanded external help to learn about the new production process and marketing system.

Rural extension played a positive role in this endeavour and a few years later extensionists assisted farmers to create their own organisations to market their produce and provide more benefits for themselves, instead of selling to private companies and merchants. One organisation was founded in 1984 and another in 1992. The first was created according to a more assistencialist philosophy and the second seems to be more professional or business oriented. However, the farmers' socio-cultural characteristics also contributed to this differentiation.

The major implication of the research findings for public rural extension and other institutions involved in the development of rural communities and farmers' organisations, has to do with placing more emphasis on providing knowledge to local people on the technical aspects of managing a collective business. It is essential to prepare directors and potential leaders to carry on management and marketing activities, especially in highly market-orientated communities.

One of the roles of rural extension should be to teach management techniques and the process of marketing instead of providing advice related exclusively to farmers' daily activities. Traditional farmers usually learn how to deal with new crops quickly but it is still hard for them to apply good management techniques .They do not usually have written control of their activities and this is one crucial factor in succeeding to manage a collective activity. Contacting NGOs, local schools, or university staff to produce lectures and short courses for potential leaders, innovative farmers, and even extensionists is a useful method of introducing administrative techniques into the rural sector.

Rural extension services should also aim to create and sustain a cooperative mentality among farmers through the use of various participatory methodologies such as Development Education Leadership Teams in Action (DELTA), Participatory Rural Appraisal (PRA), and Theatre for Development to improve the levels of farmers' participation in collective businesses such as associations and cooperatives. (Brito & Gomes (1997)). These strategies may also be helpful lin raising farmers' awareness in identifying and avoiding manipulative actions from other agents involved in the fruit marketing system.

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Learning new skills by French farmers. Evolution and unevenness of the beliefs

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Abstract

The evolution to which farming is assigned by the whole society requires acquisition of new skills. This paper focuses on the evolution of the beliefs which authorizes and accompanies the process of learning new individual skills by farmers. A preliminary study had been carried out with 28 Auvergne farmers. This paper focuses on the consequent longitudinal study of two cases carried out with two neighbouring farmers whose farming systems are very similar (industrial crops). One of them has acquired the new skills necessary to convert to organic farming, whereas the other one (which is a control farm) has not such an experience. With a management approach, we suggest that the different nature of their beliefs concerning their occupations explains, in the long run, the differences in their acquisition of new skills, and we proceed in three stages.

Björkman (1989) shows that the occurrence of important changes in the environment (reported to the manager through direct contacts) and the drop in the results are the factors which produce a radical change in the managers belief systems. We find these two factors with the farmer who acquires new skills, and not with the control farm. Moreover, the evolution of beliefs and skills we highlight is underpinned by studies lead on several mentors. Daft and Weick's approach (1984) brings explanations on the nature of the beliefs. Thus, they oppose the manager who believes that the right answer is hidden in the environment - and who passively accepts available information (which is the case of our control farmer) - to the manager who, considering that "nothing is written", exerts himself to influence the environment (e.g our farmer who has acquired new skills). In the last analysis, following Brunsson (2000), we maintain that all the belief systems are not equally efficient as regards the learning process. The clear, detailed and logical systems which integrate several dimensions of the business allow better and quicker learning. Following our investigations, we add that these systems are concerned with public interest, what would be the key to their efficiency.

In the light of Management Sciences, we want to describe and analyse a number of learning processes of new individual skills through personal paths among the farmers. Skills are not to be taken here neither as individual qualities nor as knowledge. Skills have to do with action (Minvielle, 1998), so that it is only by paying attention to what people do that we can trace such skills. The process of learning new knowledge depends on and finds expression in the evolution of beliefs. We want to understand what makes these beliefs change. The nature of beliefs (Boudon, 1999) - and more particularly normative beliefs- may be approached in two different ways. The first theory has it that beliefs are governed by irrational causes – hence the phenomena of inculcation (e.g Durkheim and Marx), affective (e.g Freud and Pareto) or naturalistic processes to account for their creation. But beliefs may also result from

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particular reasons that the agent has to understand, thus adopting comprehensive processes (Weber's stance). Now that such choices have been made, we shall go deeper into the causality chain.

A preliminary survey among 28 Auvergne farmers (Macombe, 2003) had shown the vital role of the belief systems in the acquisition of new skills. But only long period case studies (Yin, 1998) could allow to study the process. Therefore, we have carried out two-and-a-half-year-long longitudinal studies with two farmers. The main data, wich was complemented by actual visits of the farm and by exploitation of documents, consists in interviews that were tape-recorded and typewritten. The analyses were all corrected – when necessary- or authenticated by the farmer. Several questions were examined, but we are interested here in the farmer's account of the story of his farm. We noticed that the farmer learnt new skills as he thought he was able to do new things in his job. Such learning was confirmed by our recording of his activities. We tried to trace his normative beliefs (as we had a detection tool, see document 1). Then, we paid attention to the way these beliefs evolved as well as to the explanation given by the farmer to account for their evolution. But the study was not carried out with the aim of testing Björkman's theory; the farmers themselves mentioned the variables which were indispensable to the analysis as they told their story.

The action takes place in Limagne, an area of industrial crops (corn, wheat, sugar beets…) in the centre of France. Today, in 2003, the foreseeable evolutions of the CAP and the opening of European farming towards the Eastern part of Europe allow us to predict important changes. It should be known that the two farmers live in the same village, handle local traditional productions, and are both renowned for their technical and economic results, regularly ranking among the best of the Departement. The main part of both households' income come from the farm. Moreover, the two farmers have the same main production system (major part of the turnover) as when they set their farms up. But at present (February 2003) the one "Gérard" (who has been set up for 20 years) has acquired the necessary skills to turn to organic farming, the other one "André" (set up for 30 years) has not acquired any specific skill allowing him to anticipate the changes that are beginning to take shape.

In the light of our presentation of these cases, it is clear that the farmers have lived (during 20 and 30 years) in the "same" professional environment, but that they have not experienced it in the "same" way. We therefore adopt an interpretative approach according to which *"Interpretations of event or data is not determined by stimuli, but are rather the results of organisation members fitting the stimuli to their own beliefs and values."* (Björkman, 1989). We assume that the beliefs of these two farmers regarding the professional environment are not identical because they interpret it with differences beliefs about their occupation. The purpose of this research is therefore to understand why Gérard has acquired new skills and why André has not done so, and we look for the answer in the nature and the evolutions of their beliefs on their job.

In order to throw a light on the process, we shall mention first of all the synthesis carried through by Ingmar Björkman (Björkman, 1989) on the factors affecting the radical changes in the organisational belief systems, then the theory of Daft and Weick (Daft and Weick, 1984), before suggesting a third analysis, that converges on a number of works of Nils Brunsson (Brunsson, 2000) on the nature of the belief systems of organisations. Although these researches are concerned with the organisations themselves, these authors actually endeavour to analyse the beliefs of the managers : *"strategic-level managers formulate the organization's interpretation"* (Daft, Weick, 1984). We apply them to farmers, i.e managers of very small businesses. It must be clear that the decisions that are made in these very small farms are the result of a collective and interactive process – some of these decisions can be joint choices. They may seem to reflect the choice of one single individual – the interviewee – but this is a wrong impression.

Direct contacts and drop of the results influence the beliefs of managers

Ingmar Björkman was interested in the evolution of these beliefs, only in the case of sudden changes threatening the organisations (that is the case of our farmers). This author highlights two factors which can be applied to the farms: the occurrence of important changes in the environment and the drop in results.

He specifies that "the important changes in the environment" strongly affect the beliefs of the managers, provided that they emerge through direct personal contacts: the manager lets himself be influenced and convinced by mediators who tell him about their vision of the evolutions in progress.

During the preliminary survey, we had highlighted this effect among the farmers who had acquired new skills (which the cases A, B and C illustrate). Table 1 summarizes, for these three persons, the changes of the beliefs, the acquired skills and the direct contact (testified by the farmer) which convinced him.

Table 1: Modification of the beliefs, acquired skills, and convincing direct contacts

	Modifications of the beliefs	Acquired skills (in the family)	Direct contact	Extracts from the interview
	A has become aware that this local breed, up to now neglected, is worth being saved. It deserves to generate a range of new products.	- to negociate with the stock breeders - to make cheeses - to organize a joint sharing of the selling income.	The technician in charge of the preservation of the hardy breeds has convinced the farmer of the interest of it.	*So – Mr Laurent A…'s visit…, do you know him ? You've been told of it. Because… It is true that generally speaking a technician has not a very good image. Then him, on top of that, he* ***has had a passion*** *for that since '77, he has never left, he has never… he clings, he does, he is welded to the topic [the preservation of endangered breeds]. It is true, he has* ***brought a lot*** *()*
	B has become aware of the potential valorisation of the bulbs (garlic, shallot, onions) by direct selling.	- to transform the bulbs into soup, conserve, sauces - to sell on the countryside markets.	A retired woman farmer has encouraged B and has taught him the first recipes.	*And it is true that afterwards* ***by discussing with her…*** *it is true that she is rather a good cook, she told me :****"listen, you could try and make jams, things…all that stuff****". Then I said "ya" she had plenty of recipes that she… that* ***she gave me*** *( )*
	C 's membership of an association made him realise that he wanted to work on organically-ground produce.	- to work in organic farming - to sell organic farm produce (no organized chain).	The couple C has joined an organic farm producers' association which influences them a lot.	*the fact that we grow organic food, accounts for change and then besides, we belong to … an association of organic farm [producers], association "bio63",, therefore, we are still working together, we have a lot of meetings and… I mean ,* ***we learn a lot****, I mean. Therefore we are obliged if…by being* ***a member of an association****, of this association, we are obliged to do… to think alternatively, you see."*

We can find the trace of this direct contact with Gérard, whereas no such thing can be brought out in André's story.

> "It went hand in hand with an action of the farmer's union... it made a synergy. That's to say that the ideas we read were reviving something within our minds, they were speaking to us, it was going in both directions. And this is perhaps through them that we became aware that what we were doing had eventually to be done differently." (Gérard, February 2003)

Moreover, for A, B, and C and Gérard, the simple "contacts" were not enough, for a "learning by doing" has been testified: the farmer and his mentor have been "doing together" (document 2)

Then, Ingmar Björkman mentions the drop in results. Such a phenomenon happened for Gérard, not for André. The two farmers have always shown excellent technical results. But the economic results have not always been exemplary ones for Gérard. Established in 1984, he got into debt a lot in order to buy his family-in-law's land. The 1985 CAP seesaw movement, and the prolonged drop in prices, threatened his system of industrial crops (80 ha usable agricultural area). As soon as the promulgation of the "Farm Bankrupt Act", he therefore instituted a procedure. The excellence of his technical results allowed him to be pronounced right and to restructure his debt. Since then, the economic results have been as good as expected. On the other hand, André, a relentless worker, has always got good economic results and never felt threatened by a drop in his results. It seems indeed that the financial troubles of Gérard, at that time, have been the mainspring of an active search for solutions (at the first row of which the proactive bankruptcy) as Björkman predicts it.

The Björkman criteria (direct contacts and drop in results) are well adapted to explain the evolution of the beliefs of the manager Gérard, and to favour the acquisition of new skills. Mundane recommendations could be drawn from them, such as : the subject should be in contact with someone able to convince him, he should "do with him" in order to learn, and he should feel threatened by the drop in results of the business, so that the beliefs of a farmer can change and get the learning under way. However pertinent these recommendations may be, they do not exhaust the topic. The works of Daft and Weick allow us to refine the prospect by questioning the nature of the beliefs themselves.

Enactment and conditioned view

Daft and Weick consider the organisations as a system of interpretation of the environment and distinguish several possible modes of interpretation. The "enactment" mode refers to an organisation which experiments, tests, builds its environment and learns by doing. For the mode "conditioned views", the interpretation is made by traditional ways and the detection of the information is passive ; the manager applies the formula and works on formal data (Daft and Weick, 1984). The document 3 shows that these two type-ideal respectively describe the exploitation of the proactive Gérard for the first one, and that of André's, still applying the same formula, for the second one.

Daft and Weick characterize the organisational beliefs which underlie these models. We apply their analysis to the manager's beliefs. The two dimensions accepted by the authors are the beliefs in the characteristics of the environment and the "intrusivity" of the organisation in its environment;

The environment is understood as being more or less easy to analyse. If he thinks it is fit for analysis, the manager (it is the case of André) plays the game of interpretation by believing that the "winner" will be the one who will find the "right" answer, supposed to be hidden somewhere. He thinks that the external environment is "solid", down-to-earth and that the events and the process are unavoidable and measurable. On the contrary, if the manager believes that the environment is not to be analysed, (it is the case of Gérard) he will fudge it as unpredictable and he will not look for "the" right answer in it.

The intrusivity of the organisation is the other dimension. The manager's standpoint ranges from the passive acceptation of the information given by the environment (filtrated by the traditions and the unconscious imitation which is the case with André) up to experimenting various ideas in order to influence and to shape the environment (it is the case of Gérard, who constantly seeks to create the event rather to undergo it);

A certain number of circumstances confirm the manager in the idea that the environment is non-analysable (if it can be interpreted in several ways, if it is difficult to penetrate or to change it). Besides, a hostile environment generates «increased search because of new problems», whereas a friendly environment confirms him in his passiveness. Therefore, less mundane recommendations could be drawn from Daft and Weick's analysis. In order to make the learning of new skills easier among farmers, an unpredictable and hostile environment should be provided for them! The cocooning of the cooperatives and the associations towards their members should be avoided and the unpredictable side of the agricultural policies should be let to hang heavily over their heads. The survivors would definitely be endowed of new skills. The idea is not altogether valid ; indeed there is a point when the threat of unpredictability prevents any action. There is another less cursory way of making learning easier.

A number of beliefs systems allow to learn better and quicker

Nils Brunsson points out that all the beliefs systems are not equivalent in the face of radical changes (Brunsson 2000). Some of them own qualities that are of immediate interest for our topic. They have the ability to capture very early the “strategic drift”, that is to say the gaps between the strategy of the organisation and what should be done, considering the evolutions of the environment. They also know how to acquire the necessary skills – and so quicker than the other organisations – in order to correct this drift. Moreover, this phenomenon works the other way round: the organisations which capture and correct easily the drift thus reinforce their beliefs! But these are not any systems of beliefs. They are clear and narrow systems, integrating several analyses of the way the organisation works, complex and logical.

Provided he owns a system of belief of this type, the manager easily makes the necessary learning. But how compatible is the existence of this system of steady belief with the evolution of the beliefs necessary for the learning? One should actually reason by considering on the one hand a “hard core” steady within the beliefs of the manager (a hard core of possibly clear, narrow, integrator and logical beliefs) and on the other hand, the secondary, variable beliefs which proceed from the confrontation of this hard core with down-to-earth situations (to a particular competitive situation, or production management problem…). This hard core recalls the major values of the business, allowing them to last (Collins, Porras, 1998) or the invariant values of the Henokians[1] (Mignon, 2000) which will assure durability. Nils Brunsson’s conclusions can be reformulated in the light of these two categories of belief. Nils Brunsson would write that a manager whose beliefs conceal a steady “hard core” having the required qualities will make his secondary beliefs change very quickly if needed, and that the success of this correction will reinforce the hard core’s beliefs.

The contrasting cases of Gérard and André are evidence of the different possibilities of learning induced by different beliefs’ systems on their job. As we have already seen, André runs his business and makes his decisions by applying a well-proven recipe (document 2) whereas Gérard bases himself, in his long term decisions, on an ideology of his job which makes up a hard core of clear, narrow, integrator and logical beliefs. The rebuilding of the ideologies of the farmers on the whole of their career allowed us to compare the two systems of beliefs.

André sets himself the target - which will remain steady during 30 years- of “making money on the very short term”. His recipe to reach it is steady: he must work hard by doing numerous hours’ work, in the frameworks of contracts which secure a payment and the selling of large quantities, he must not hesitate to change the outlet and prove himself to be an opportunist.

Gérard’s targets, on the other hand, are going to evolve. When he set himself up, he wanted to fulfil himself by becoming the Limagne farmer who would best control production techniques. Twenty years later, his ambition is to be the most environment friendly farmer. His system of beliefs has changed in its outward signs (farming practices), but he remains steady about the taking into account of a collective interest : *“All the problems must be examined according to the public interest and this must be done at several levels”*. In the eighties, public interest was pertaining to the export calling of France, to be supported through a strong productivity in cereals. Today the new collective interest is to be concerned by the environment, and particularly by wildlife.

The application of a recipe does not give the opportunity of inventing new rules, of infringing them, whereas the framework of Gérard’s beliefs permanently incites him to show himself as “intrusive”. We

[1] The Henokians are the members of an association of businesses which have existed for more than two hundred years and which achieve a continuity of capital and management (majority held by the descendants of the incorporator and management assumed by one of them);

believe that the important thing is for Gérard to organize his beliefs according to public interest. We have already met this phenomenon with the same consequences, in the preliminary survey. Mr A thinks that the Ferrand breed should be saved in the interest of the group of concerned breeders, but mostly in the interest of the citizens as a whole, for whom this breed makes up a cultural heritage. Mr and Mrs B are convinced that Auvergne garlic can be better preserved than other varieties of garlic, a thing which benefits the consumers. Mr and Mrs C think that the organic farming produce taste better and are more healthy than the others.

André's system is not efficient enough for learning new skills. On the other hand, Gérard's system of beliefs does not only allow him, but also encourages him, to find out new skills. The managers of the farms should actually be helped to develop this type of system of belief in their jobs. In a more general way, the very propagation of the systems of beliefs taking into account public interest should be made easier. These systems are contagious, as we saw with the three farmers A, B and C (document 1). The public power can give an impetus through teachers and trainers. In the teaching or training fields, as Mc Gregor had highlighted it (Mac Gregor 1979 ; Bernoux 1993), the learners remember better the systems of beliefs of the trainers than the contents of the training session. Consequently, in order to transmit to them a clear, narrow, integrator and logical system, which takes into account collective interests, the teachers should convey beliefs of this type. On this basis (this hard core) each one will adapt his own beliefs to the circumstances (cloud of secondary beliefs).

Conclusion

The main weaknesses of our approach to beliefs and skills are the result of our restrictive apprehension of them. Indeed, skills are only seen through the farmer's assertion of his new capacities whereas we focus only on occupational ethics as far as beliefs are concerned. Thus, sociotechnical elements (Dubar, 1992) which participate in the development of skills are not mentioned. The skills of systems combining individuals, groups, language and objects (Girin, Journe, 2001) are not envisaged. But this should not lead us to consider that the acquisition of skills is an individual matter when dealing with the agricultural sector. This would be a wrong literal reading of the first two theories. The weaknesses are also linked with the method of case studies. Indeed, such a method prevents us from generalising the results we have come to. We could show that all the underlying hypotheses –that is also that of the "hard core" (Lakatos, 1995) - can be extended (Albert, 2000). We didn't develop the idea in our essay. Still, the main interest of this approach is to highlight the importance of the evolution of beliefs in the agricultural sector. Such an evolution will in turn lead to the improvement in the skills demanded by the whole of the society. We have also tried here to think about some ways of contributing to this evolution.

Björkman's review has highlighted the probable evolution factors of the beliefs among the farmers: direct contacts, learning with a convinced mentor, and threats on the farm results. Daft and Weick's model characterizes two opposite ideal-types of organisation as for as the environment interpretation is concerned, and consequently puts the question of the nature of the beliefs. In resonance with Brunsson's approach, for whom all the beliefs' systems are not equally efficient as regards the learning of new skills, the cases we have exposed show the differences between the beliefs' systems which integrate the reference to a collective interest and those which do not care. We believe that it is an important research track for those who want to understand the "predispositions" to the learning of new skills. Better chances of acquiring new skills and of meeting intentionally with new opportunities of learning would be given to the farmers by spreading these altruistic systems of belief. They would thus contribute to enrich the many dimensions of the farming activity in practice.

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Document 1: A tool for the detection of normative (ethical) beliefs on occupation

The specific tool that has been used to analyse various discourses of justification is indebted to Boltanski and Thévenot's (Boltanski, Thévenot, 1991) "grammar of justice". We take the word "ethics" as meaning the implementation of a conception of justice to an individual in a specific situation. In other words, justice is concerned with universal "common goods", whereas ethics has to do with a local common good. The "grammar of justice" is divided into six axioms, which are six proposals about the state of the world. Each proposal has been translated into the terms that suited the situation of research. Thus, we have been able to predict which ways of reasoning – and which phrases –would account for each particular axiom. The thought processes contradicting each axiom have also been anticipated. There only remained to look for the thought processes that confirmed or contradicted the six axioms in the various accounts. When an account about one and the same local common good possessed the characteristic proposals of all six axioms, it was said to be "ethical". It was called to be "sceptical" in all other cases.

Document 2: Reported speech of the farmers A, B, C and Gérard, showing that there has been "learning by doing"

By getting in touch with the breeders who still owned this breed, in order to set up the programme of breed preservation with the technician, Mr A has learnt to manage a group and to negociate with it. "*It's true, he brought a lot because… but however, he works alone, you see, he is a lot in the field. Then* ***we began to set up a programme,*** *from what remained; At that time.*"

Mrs B has learnt by doing the transformations of the produce and selling on the markets with her mentor : "*The garlic soup, it is because we have taken over from a person who was retiring…M.C…., a bloke from Montaigut and they had already settled it, this garlic soup and… we have* ***taken over their recipe****, and that is only afterwards* ***by discussing with her****… it is true she is quite a good cook, she said to me :* ***"tell me, you could try to make jams, things…all that stuff"****. Then, I said "Ya" she had plenty of recipes that she had...she had* ***given to me****, and* ***we settled it together****, she helped us for a while.*"

Mr C has seen changes in his representations while he was regularly meeting a group of organic farmers : " *First I must say that we were not the kind of people who…who were putting large quantities of…of inputs [forbidden in organic farming] so the change was not made [difficult to do] and then, I must say, we arrived to organic… almost naturally. And then, we have the… what would I say,* ***the mentality which is changing at the same time as we work organic,*** *I mean, our mentality…undergo a total change, even the way we see things…we are forced to…the fact that we work organic, makes us change... And that's the way we entered the organic chain of farming and that afterwards, all was done* ***in a natural way,*** *even our way of considering things which are done, I mean, it is* ***nearly the job itself which made us… see things in a different way****, I mean, do you understand what I mean ? I mean that it's not…we didn't overnight, we didn't get up and say :"OK, well, we're turning organic", it didn't happen this way, we are not… we have not arrived, like the purists who came before us, we are not among the first ones to be organic, those who arrived, those that have always… everything, done everything in organic, we came to it gradually, I mean, yes, the state of mind changes afterwards, yes, that's for sure.*"

Gérard explains his learning "on the job".

Q : "What had to be done in order to control, in order to be technical, in order to work properly? What sort of efforts did you have to make to get there?"

Gérard: "(silence) As far as I'm concerned, I had to ***learn****... I had several teachers for that purpose; I was taught by the former worker who was there. Each year,* ***it's new.*** *And then there has been the CETA technician, the one I knew very well and who* ***helped*** *me a lot indeed, and there is also a technical* ***research*** *there."*

Document 3: Intrusivity of Gérard and application of a recipe by André

Gérard is directly at the origin of 6 legal structures in 11 years : "GFA", a farm real estate company, under French law (Groupement Foncier Agricole) with his family in 1985, GEDA, an Agricultural Development Group (Groupement d'Etude et de Développement Agricole) in 1986, a cooperative and a trading company ("Société Anonyme") to market small bulbs in 1989, marketing cooperative of cereals in 1992 and EARL business company in 1996.

Within 30 years of activity, André created an EARL business company with his wife.

Gérard has tried 13 different activities in 16 years, in addition to his basic pattern.

André has tried two new activities in 30 years (see just below).

Gérard's intrusivity is such that he feels able, in case of need, to establish his four children on the farm! *"That is to say if my children – we have four children –if they all want to stay on the farm – I do tell them "it's feasible"…they'll have to adapt, they'll have to change the productions, they'll have to calculate and to plan all that, but theoritically, that's to say if they want it and if they feel like it, it's feasible, they have always been told so."*

André applies a well-tried recipe, which rules the general basic cropping pattern.

This cropping pattern has always been composed at its full, of crops under contract (seed corn and sugar beets). Which induces agronomic abnormalities, like the absence of rotation and the excess of weeds in the corn. In order to fight these weeds without paying, André and his wife apply the same recipe: they weed 25 ha by hand each year !

Over a total of 35 ha at its maximum, they have had up to 21 ha of grain corn, and their sugar beet quota represents the guarantee of 3,5 ha. A number of parcels have brought grain corn for more than 30 years, bringing about heavy weeding problems.

"As a matter of fact, we have always had problems of cropping pattern, ourselves, since we had so little land and so many crops which require, like sugar beet, 5 years [before being cultivated on the same parcel] as the corn ; we have put corn, corn, corn for more than 30 years, on the same lands, we have no cropping pattern. Having no cropping pattern, the big problem is weeding. But otherwise, there is no worry because we always bring what the crop takes off [as nutriments] but the trouble, it is true, is weeding with… it is weeding of our corn of course... It is all made with hands afterwards. So we have… during a long time, because the specific weeding products are very expensive, during a long time, still now we don't do, we do very little, we put half a dose, "Mikado" or things like that, we weed by hand. We weed before raising and all that is after raising, we always saved post-raising weeding by making manual weeding. Therefore, we use hand weeding of 25 ha each year… made by two persons. I can tell you that we have quite a few 17-hour days' work!"

They also apply this recipe to new crops. This was the case in 1985 with bulbs on the one hand, and greenhouse crops on the other hand, when they had to find an additional income to finance their children's studies.

"My children study therefore, they cost a lot so then, we take, we decide to work alone[2]...Because our children ask for more and I don't want them to become farmers because it's a real grind! and then…and then I want them to do what they feel like, I don't want them not to have the opportunity to choose what they want to do. Therefore, they choose to study and then we are here to pay, and that's all. I don't want them to help us... They do what they want and, well, they will come back if they want, but…So, I can tell you that from '85 till '95 it has been the real grind, because at the beginning, they were in Clermont ( ) because when you earn 5 000 F and that you need 3 000 F for the children… so, it's there, it is the need for money which persuaded us, let's say, to convert towards other crops (silence); We have never done many crops : 1,5 ha of market gardening, if you want, that isn't market garden, but these ***crops that were bringing us not far from 100 000 F still,*** *at that time, but then… [we were doing]* ***everything ourselves, without hiring workers."***

The setting up of the bulbs illustrates the quantity of work they had to subject themselves to, but it also illustrates the permanent antagonistic and opportunist research of both the guarantee and the best selling price.

Between 1985 and 1995, the couple decided to settle 1,5 ha of bulbs (onion, garlic, shallot) instead of wheat.

In 1985 and in 1986: the onions are sold under contract to wholesaler B., who also buys the shallots but without a secured price. The garlics are sold at the wholesale market.

In 1987: The onions are sold under contract to B., but the shallots are sold at the wholesale market. The farmers get crossed with B., so that in 1988 and up to 1995, all the production of the bulbs is sold at the wholesale market to R. The latter requires special preparations to sell the produce at a better price, he even demands it, lest he should not take them.

2 That is to say that André and his wife stop working in a community with their brothers-in-law and cousins (i.e.100 ha of crops linked to these various farms) for whom the couple were running the 57 ha of grain corn, castrated by up to 110 workers.

The onions must be peeled. B’s wife will peel 7 to 10 tons by hand every year (for 3 to 4 F / Kg)

The stem-onions to be plaited should be picked up by hand (for 2,80 F / Kg)

The garlics must be plaited for the Christmas period (for 15 F / Kg). The plaiting lasts 15 days (from 6 a.m. till 1 a.m. with 2 persons)

“I had more profit with R., so I quitted B.”

“On the other hand, we made a lot of money there ( ) That was what paid the kids’ studies. We didn’t do that for anything but our kids’ studies.”

The recipe was also applied in 1995, with the obtention of a wide surface of 600 m^2 in greenhouses and of production contracts of seeds (vegetable market crops). These contracts are still in force in 2002 with seeds of courgette and salad.

“We asked Limagrain for greenhouses. Then, of contracts, glasshouses-contracts. Then, so, I went to see a gentleman at Limagrain, as he knew I was working [well] …because it’s a little like the Michelin family there, I had a technician, in the field, who knew that I was working [well] so he must have told him : “yes, yes, they are able to run greenhouses, there is no worry at all” so ***we were entitled to have*** *600 m^2 of greenhouses. So, these are… These are seed contracts, well, contracts with Tézier, Vilmorin, Clause and we do grain seeds and as we needed money,,* ***we have been steered*** *towards tomatoes, there were three of us, working on hybrid tomatoes.*

From one-off events to learning systems and communities of practice

Chris Blackmore*

Abstract

This paper considers some of the challenges and skills involved in designing and facilitating events such as workshops, meetings and conferences as part of learning systems and Communities of Practice. It focuses mainly on processes of learning that involve interaction rather than on solitary activity though acknowledges the relationships between individual and group levels. Three examples from the author's experience are presented, two from the contexts of environmental decision making and rural change in the UK and one from direct involvement in an event that focused on Communities of Practice (CoPs) at international level. Three inter-related areas of challenge for learning system design emerged from this inquiry and are discussed. These areas are *distribution* with respect to both cognition and communities; the need to take account of *different systems of interest, timeframes and purposes* and the need for *continuity in dialogue* to support the learning of both individuals and groups.

Background

Three things prompted me to write this paper. First, an evaluative comment about one-off learning events that may reinforce the isolation of agricultural producers, received from a participant in a workshop I ran with my Open University (OU) colleagues. Second, a week spent in May 2003 with members of an organisation called CP Square, in which the importance of events was recognised in the context of cultivating Communities of Practice (CoPs). Third, a realisation that came from my own research in the UK - that the learning that people referred to as most useful to them in their environmental decision making came from their interactions with people and community. Events seemed to have a role in enabling interaction but other elements and processes were important too.

I think of these three things as 'critical incidents' in my own learning processes (Brookfield 1990, Flanagan 1954) with respect to designing and developing learning systems. They were all experiences that were significant to me as a practitioner who sets up and facilitates many 'learning events' i.e. events with a primary purpose of learning and that also use learning approaches as methodology. These incidents challenged some of my assumptions about what constitutes a 'good' learning event. Behind each is an example that I will go on to describe and analyse in more detail later in this paper. My examples all focus on the role of events in learning processes, albeit in different ways. They also highlight the place of processes of learning that involve interaction within learning trajectories of individuals.

Processes of learning that involve interaction have been of recent interest to many. For example Illeris (2002) notes that "It is characteristic that the interest in learning in recent years by the development of concepts such as social learning and, very radically, social constructionism, has moved in the direction of interaction processes. In this situation it is important to maintain a conception of the internal psychological processes as an integrated part of learning." Roling (2002), Ison (2000) Jiggins et al (2002) and others involved in the European project SLIM (Social Learning for Integrated Management

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and sustainable use of water at catchment scale), which includes me, have stressed the importance of social learning that enables concerted action. Cook and Brown (1999), in making a distinction between knowledge and knowing, describe knowing as 'the epistemic work that is done as a part of action or practice'. They build on observations of others, including John Dewey and Geoffrey Vickers, and point out that knowing does not focus on what we possess in our heads but on our interactions with the things of the social and physical world

In terms of the focuses of this IFSA workshop, my emphasis in this paper will be on some of the learning processes and skills that agencies, actors and communities need in the context of multidimensional agriculture.

Three examples

I will now expand on my three examples and subsequently analyse some of the learning process and skills-related issues they raised for me, drawing on a range of different theoretical and methodological perspectives.

Example 1 UK LEARNing events

The first example came from one of two exploratory workshops my OU colleagues and I organised in the UK as part of the second (WP2) of seven work programmes in the European project LEARNing (Learning in European Agricultural and Rural Networks: institutions, networks and governance). (Hubert, 2002). Our focus within the wider LEARNing project, which has eight European research teams and one Australian partner, was on exploring issues of managing increasing organisational complexity being experienced by participants in the context of rural change in the UK. In the WP2 workshop from which my example comes, held on May 1st 2003, participants drawn from a wide range of rurally-related organisations in the UK worked in a mixture of small group and plenary sessions to: (i) identify sets of issues for people and organisations concerned with agriculture and rural areas; (ii) develop systems maps of actors concerned with 'managing' current complexity in English/Welsh agriculture and rural areas and (iii) to consider how and why their organisations learnt or did not learn to manage change. Further details of this process are explained in another paper to this conference. (Ison, Blackmore & Shelley 2003).

The detailed evaluative comment that made me stop and think was made anonymously and stated that '*The issues dealt with at this workshop have generated approaches to the provision of learning …but such learning as has taken place has been event driven rather than in the form of continuous interaction. The provision of one-off learning events has reinforced the isolation of many agricultural producers, who need a framework to continue the dialogue which has begun*'. I surmised that the commenter included our own series of events for the LEARNing project in his or her observation as in discussion at the end of the event several participants requested continued dialogue and networking. It was suggested this could be done, in addition to further workshops, through email and a list server. I was unable at that time to find out what experience had led to the comment. However, our LEARNing project is current as I write this paper and there will be opportunity to find out more.

Our starting point had been the LEARNing project on this occasion but we were building on other projects (our own and those of others) and working relationships already established with some participants through their various connections with the Open University Systems Discipline. Our main brief with LEARNing was to identify a future research agenda of mutual interest to participants and ourselves. We had indicated some opportunities for continuing conversations begun in the workshop (both at UK and European levels) and had announced our intention to continue with theme-based round tables in the UK as part of the LEARNing project's fourth work programme. We had also indicated that we were trying to find synergy with and not to replicate work being done by others along similar lines. We had not however explicitly addressed the need for continuous interaction between events. Indeed as facilitators of the workshop, our previous experience had led us to believe there was a need to first identify more clearly our systems of interest and their perceived purposes and to map our own activity with that of other actors before assuming that as a group we wished to develop our network.

However, the comment did make me sharply aware that there were other perspectives besides our own and that there were needs for continuity in dialogue that probably extended well beyond our project. It raised an ethical concern for me about event-driven learning and made me question the place of our own events in participants' learning trajectories as well as within the objectives of the project. I began to wonder whether our process was too much driven by events and whether we needed to pay further attention to more continuous interaction.

Example 2 CP Square - the Community of Practice of Communities of Practice

Later in the same month (May 2003) I attended another event. I still had the question of the role of events in learning systems very much in mind. This time it was in Santa Cruz in the United States and I was there neither as designer nor facilitator, but as a participant.

Since reading the work of Lave and Wenger and their associates (Lave & Wenger 1991, Wenger, 1999, Wenger, Snyder and McDermott, 2002) on situated learning and Communities of Practice I had become aware of both widespread enthusiasm for and critique of the ideas of Communities of Practice. Enthusiasm was evident from the sheer numbers of people who seemed to be buying Wenger's 1999 book, finding the ideas useful and developing or at least referring to Communities of Practice. Critiques had appeared for example from Fox (1997, 2000) and Lorenz (2001) who compared and contrasted a Communities of Practice approach with other theories and approaches. In Fox's case the comparison was made with Actor Network theory and with traditional cognitive learning theory and in Lorenz's with information processing and cultural-historical perspectives, in particular looking at the influence of activity theory. My experience had been that I found Wenger's focus on 'learning as practice' both intriguing and useful in researching learning, as discussed in my paper to the 5th European IFSA symposium (Blackmore 2002). But an exercise OU colleagues and I conducted using soft systems methodology (SSM) to interrogate CoPs theory also highlighted some quite major theoretical differences between what was described in Wenger's book 'Communities of Practice' and a second book he had written with Richard McDermott and Bill Snyder called 'Cultivating Communities of Practice'.

Etienne Wenger and Bill Snyder had started the organisation CP Square to develop and strengthen Communities of Practice approaches. I joined the organisation as a member because Communities of Practice seemed to me a way forward in several areas of my work. I was struck by the emphasis Wenger, McDermott and Snyder had placed on 'events' as important in developing Communities of Practice and wanted to see for myself how they went about it.

My experience of CP week was a good one. I recognised the role this particular event was taking and the importance of events in general in the CPSquare community. Wenger et al (2002) distinguish a Community of Practice from other structures through attributes such as purpose and what holds them together. One key purpose of a CoP is 'to create, expand and surface knowledge, and to develop individual capabilities'. Holding them together is 'passion, commitment and identification with the group and its expertise.'. In the case of CPSquare the passion, commitment and expertise or practice of the group is around building and cultivating Communities of Practice. The purpose of the event seemed to be to build relationships and understanding of CoPs, individuals' roles and traditions, making it easier for this group to function as a community. I began to understand better how others had developed Communities of Practice, mainly allied to organisations but complementing traditional organisational hierarchies and supporting participants in their practice. Although I didn't come across many examples of multi-organisational Communities of Practice, which I felt may offer some ways forward for our LEARNing project participants, multi-organisational and distributed Communities of Practice appeared to be emerging themes. As Hildreth, Kimble and Wright (2000) had observed elsewhere there was a lot of evidence of 'people moving fairly rapidly from one situation to another as globalisation affected businesses and many companies take steps to downsize, outsource and deskill'.

Example 3 What helps and hinders learning for environmental decision making?

My third example comes from interviews I conducted with nine individuals involved in different aspects of environmental decision making in the UK in one phase of a research project I am conducting alongside my other research and teaching at the OU. The individuals came from different organisational contexts, ranging from multi-organisational to national and local government to small businesses. They had different roles with respect to environmental decision making ranging from very action-oriented and hands-on for example in managing woodland in southern England, to facilitating others e.g. managing the issues of flooding or waste management to policy making e.g regarding diffuse pollution and agriculturally related water issues. As part of these interviews individuals reflected on their own learning and/or practice and that of others working with them. Many comments on learning and making changes came out in accounts of people's activities and decision-making processes. Following Wenger (1999) and the approach I described in my last paper to an IFSA conference (Blackmore 2000), I did not distinguish too sharply between learning and practice in these interviews as I found it wasn't a distinction that interviewees were making. They were asked what had helped and hindered them in their learning and environmental decision making. Their answers included:

Specifically event related
- Tools, techniques and methodologies to help facilitation of events.
- Good venues
- Explicitly establishing ground rules for engagement with other stakeholders
- Space - physical and time

Interactions and making connections
- People who show us how to do things (eg use of chainsaw or how to coppice) rather than formal training and events
- Making connections among people, projects and other activities (eg between national agencies and local authorities)
- Networking
- Joining up different plans and strategies and working on them together
- Looking at parallel examples of processes (eg example of process of participation of stakeholders in radioactive waste management had lessons for water management)
- Skills in associating one thing with another - systems skills.
- Skills to look at cross-cutting issues
- Developing good relationships with others working on similar issues

- Sustainability and integrated policy appraisal tools

Overall process
- An evolutionary process - not trying to address everything at once

I realise that this list takes features that people found important to their learning and environmental decision making out of context which makes it difficult to draw useful conclusions but what I see here is a list of some of the elements and processes that make up learning systems. Most also seem to be about the 'interactions with the things of the social and physical world' that Cook and Brown referred to as knowing (see above). Although my interviewees did mention specific skills and tools that they found important to their learning they rarely mentioned formal training when they discussed how they had acquired skills or learnt how to use different tools. I was struck by the repeated reference to what could be interpreted as 'systems skills' - i.e. the ability to make connections and understand a situation within a wider context. Though what is recognised in education circles as the 'key skill' of 'working with others' was much in evidence also.

What do these three examples reveal and conceal?

A question arose for me from these three examples about the role of events in enabling processes of interaction and their place in individuals' learning trajectories, past, present and future. However, events clearly only formed part of the picture. In line with Open University and other (e.g SSM & Hawkesbury) Systems traditions (Open University 1997, 2000; Checkland; 1981, Bawden 1994), I have found it useful in my own practice to think of a learning system as a construct, a combination of interconnected elements and processes, which together form a whole that has learning as its purpose. At the OU we have found thinking of situations as if they were learning systems to be a good way of standing back and exploring issues before focusing on problems and opportunities, making it less likely that we concentrate on the 'wrong' ones. In our experience we have also found learning systems approaches can help to legitimise a learning culture where people accept there are uncertainties and unknowns and a need to learn a way to situation improvement rather than lay blame. Those who have used learning systems ideas in practice (e.g. at the Open University, Hawkesbury and University of Hull) have found them useful for working out what elements and processes need to be included or excluded in a process of inquiry so that learning can take place that may help improve a situation from the perspectives of stakeholders. Wenger, McDermott and particularly Bill Snyder with his interest in CoPs in cities, have considered aspects of 'world design' through considering the world as a learning system with a 'worldwide web' of interwoven communities that focus on various civic practices at different levels, including district, municipal, regional, national and global.' They have noted that this approach raises many challenges and questions regarding governance, and more generally for civic participation. On hearing this from Bill Snyder at CP Week I wondered whether there were similar or different challenges and questions applying to rural areas. That is still a question for me but I found that three specific areas of challenge had emerged from my incidents/examples that I will now discuss.

Three areas of challenge in designing and facilitating learning systems.

1 Distribution

There were elements of 'distribution' in all the three incidents. Both distribution of community and of cognition.

Wenger, McDermott and Snyder (2002) discuss the challenge of distributed communities and note that factors such as distance, size, organisational affiliation and cultural differences can make building and sustaining communities significantly more difficult than in local communities. They state that "Distributed communities need as much or more than local communities, a set of regular events to give the community a heartbeat." "Purely online connections can feel timeless and out of sync with the often urgent rhythm of everyday work."

Hildreth, Kimble and Wright (2000) also commented on the place of 'events' and noted how one group (the management team of IT support of a major international company) had managed to function as a Community of Practice in a distributed environment but met on a twice-yearly basis. They noted that 'the members of the group felt that during the face-to-face meetings they managed to get a lot of work done and develop much more quickly the relationships with their colleagues. During the periods of communication on e-media, they felt that the momentum gradually slowed until a physical meeting picked it up again.'

The roles and nature of Communities of Practice clearly vary a great deal. The examples of Wenger et al and Hildreth and Kimble did not come from agriculture but I see links between what they have discussed regarding distributed communities and observations on 'distributed cognition' that have been made in the context of managing land and water resources. They have also had insights that I find useful in thinking through the design of learning systems in the context of agriculture and rural change in the UK.

Roling (2002) explores how multiple cognition can grow into collective or distributed cognition through a process of social learning. According to Roling collective cognition emphasises shared attributes (myths, theories, values and collective action); multiple cognition emphasises totally different cognitive agents in one situation with multiple perspectives and distributed cognition emphasises different but complementary contributions that allow concerted action. He stresses that 'a sustainable society must be capable of concerted action.'

As a systems practitioner I have long extolled the virtues of valuing multiple perspectives as part of a process of systemic inquiry and am interested in processes of synthesis that bring them together. Roling's linking of multiple perspectives with multiple rather than collective or distributed cognition intrigues me. More so, his comment that 'multiple cognitive agents tend to maintain their mutual isolation' resonates with the first of my 'incidents' described at the start of this paper. Roling talks of 'perceived interdependence' as a crucial factor that drives multiple cognitive agents to collective or distributive cognition. He also describes influencing this move from multiple to distributed cognition as one of the main tasks of leaders and managers and declares an interest in how multiple cognitive agents can be *facilitated* in the direction of collective or distributed cognition.

In many ways I see the challenge Roling describes in moving from multiple to distributed cognition as very similar to that which Wenger et al (2002) describe in cultivating distributed communities of practice. Both seem to me to provide key insights into the design of learning systems. In the design of workshops that have been intended to bring multiple perspectives together as in my first example, or indeed in events intended to help individuals to develop skills or use tools of relevance to my third example, has interdependence been perceived? Has synthesis in perspectives really taken place or have apparent changes in people's perspectives remained fairly superficial? Have workshop participants increased their capability for concerted action? Perhaps not or only partially and this might partly explain why individual workshops can increase rather than reduce a sense of isolation.

Events have an important place within distributed communities of practice but if trying to develop learning systems that achieve concerted action then not just different but complementary contributions are needed. This point takes me onto the second area of challenge.

2 Different systems of interest, timeframes and purposes

In our first workshop for the LEARNing project (example 1) we started our process by exploring the context of issues of agriculture and rural areas. We were aware that participants all identified with the theme of how organisations can change and learn to manage emerging complexity but we were also aware that they had many different systems of interest, timeframes and purposes. Systems maps produced by participants as part of our workshop made some of these differences apparent. In our second workshop, in which we had some of the same and some different participants we looked more closely at timeframes of participants' critical incidents and key events in relation to agriculture, food, environmental and rural issues. As we go into the next stage of our project we have work to do in focusing on what we collectively and individually want to achieve - our research agenda. I am mindful of the point made by one of my interviewees in my third example - that we need an evolutionary process to support our learning and cannot address everything all at once.

I am uncertain whether social learning for concerted action can take place in such a situation. How can a group of people who are trying to work together because they identify with a particular issue achieve concerted action when individuals actually have very different systems of interest, timeframes and purposes? Our situation is very different from the much used example of navigating a ship presented by Hutchins (1995) and referred to by Roling (2002) when discussing the distributed cognition needed for concerted action. The metaphor of a 'concert' suggests that at minimum timing must synchronise. I suggest that iterative and evolutionary processes of inquiry are needed to ensure that even if systems of interest, timeframes and purposes are different then they are at least complementary. Otherwise a group may never get past multiple cognition and may depart from a situation where there may have been potential for social learning for concerted action with their separate (possibly slightly changed) multiple perspectives in tact.

3 Achieving continuity in dialogue

In this paper so far I have considered the importance of learning events. I have also suggested some other elements that have formed part of individuals' and groups' learning systems - people, relationships, skills, tools, on-line technologies and processes of inquiry. My third area of challenge concerns how to achieve the continuity in dialogue that individuals and groups need to support them in their processes of inquiry. The participant in the LEARNing workshop who I quoted in my first example called for a 'framework' to achieve this continuity and I have mentioned what could be considered as one such framework - Communities of Practice. Illeris (2002) describes Communities of Practice as a framework for social learning and my experience of CoPs suggests they could, and in some sectors already do, serve this purpose. The 'practices' of those involved in agriculture vary a great deal as there is a wide range of agencies and actors involved, as is well recognised by IFSA. There is also a range of understandings of what constitutes a CoP, as I became aware, from my interactions with other members of CPSquare. CoPs are not without some of the issues of other structures e.g. they require resources and people in key roles such as co-ordinators, to develop and keep them functioning. Wenger et al (2002) claim that CoPs 'evolve and end organically and last as long as there is relevance to the topic and value and interest in learning together.' This focus is certainly not far from some of the objectives of the LEARNing project and taking a wider community-based approach may well help us to provide the continuity in dialogue that participants feel they need.

The call for this IFSA workshop asked a range of questions concerning new ' skills (of relevance to)…… some of the radical transformations at work in individual identities and social structures such as professional bodies, farms, agri-enterprises and local communities.' This workshop brief also called for a wide range of disciplines in human sciences and bio-technical sciences to address these questions. However, I do not see on that list some of the disciplines working to address questions similar to those this IFSA workshop raises but in other sectors and wonder why not. In my current work with people from the agricultural and rural sectors, as well as those involved more widely in environmental decision making, I attempt to draw from three particular areas of academic writing with respect to knowing and learning that I find very useful in terms of both conceptual and practical ideas and processes, namely adult education, (second order) systems and (third generation) knowledge management (described by Snowden 2002). I am particularly interested in ideas from within these areas that take account of epistemology and ethics and find an increasing number that do.

Conclusions

I have come to two main conclusions as a result of my inquiries and reflections.

First, that skills in designing and developing learning systems that account for distribution, different systems of interest, timeframes and purposes and that also allow the continuity of dialogue that individuals need, are among the skills required to manage change for a multidimensional and multifunctional agriculture.

These are skills of both analysis and synthesis that may be learnt through formal and informal means such as:

- Open University Systems courses (Open University 1997 & 2000) which support students in learning how to manage complexity they experience in their own situations. Exploring contexts before formulating problems and opportunities and negotiating and representing boundaries of their systems of interest are among the systemic skills learnt.
- An advanced facilitation training programme in which I participated in the UK run by the consultancy 'Learning Edge' (Learning Edge Consulting 2000). Following an initial one-day event, participants tried out various techniques learnt in their own workplaces returning to reflect on their experiences at another event.
- A community-leadership programme designed as a critical learning system with residential and community phases run by the Centre for Systemic Development in Australia. (McKenzie 1997)
- Web-supported activities such as those that form part of the practice of the organisation CPSquare (see my Example 2 in this paper).

What these examples have in common is that they were designed to facilitate learning for managing complexity and change through encouraging reflective praxis. They incorporate one-off events but they also contextualise skill development within learning systems and communities of practice. They are not specific to any one domain of practice but are, I think, relevant to the domains of multidimensional agriculture and sustainable development.

My second conclusion is that there is a great deal to be gained by communities such as IFSA from looking outside the agricultural sector to see how others are learning to cope with challenges of emerging complexity and change as societies evolve. This point relates to my experiences of working with and reading the work of a wide range of sectors focusing on knowing and learning as described in this paper.

Some paths that I think are important for future research and also relevant to multi-dimensional and multi-functional agriculture are as follows:

1 Multi-organisational and distributed communities of practice. What purposes do they serve? How do they work? What supports them? What is the role of e-learning and face-to-face elements within them? What advantages and disadvantages are there in conceptualising groups that are working together as communities-of-practice?

2 Systems skills: what are they, how can they be developed and what is their role in decision making and managing complexity and change?

3 What further examples can be identified that could be conceptualised as people moving from multiple to distributed cognition through social learning? What and whose purposes have been served in doing so and how? Can we learn more from a range of sectors about how 'concerted action', as discussed by Röling (2002), may be brought about?

4 What further insights may be gained into multi-dimensional and multi-functional agriculture from other inquiries underway in the disciplines and communities of adult education, (second order) systems and (third generation) knowledge management?

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Preparing for a new agri-environment scheme in England: Influences on farmer participation

Chris Stoate*

Abstract

This paper describes some preliminary results of research associated with farmer training in agri-environment scheme participation, with emphasis on participation in England's proposed Entry Level Scheme (ELS). Research with farmers explores the influences on farmer participation in the scheme and their likely adoption of individual management options within the scheme. The research is intended to inform the further development of ELS and other agri-environment schemes. The project therefore enables shared learning by farmers, researchers and policy makers. Preliminary results revealed an association between farm size and farmers' attitudes to participation in the existing Countryside Stewardship Scheme, but not in the proposed ELS. There was some evidence that age and environmental values of farmers influenced their potential participation in the ELS, and there was a strong preference for management options that were independent of commercial crops. Design of the ELS should be adapted to accommodate the needs, interests and concerns of farmers in order to ensure their participation in, and commitment to the scheme.

Introduction

Latest reform of the Common Agricultural Policy (CAP) increases the amount of money available for environmental enhancement on farmland through agri-environment schemes. CAP funding is diverted away from production-linked payments, and towards support for broader Rural Development objectives. The new multidimensional approach to agriculture is intended to improve the diversity of farmers' skills, products and services, while also improving the rural environment. Included in this is the conservation of a wide range of wildlife species which are strongly associated with farmland habitats, and whose populations have declined as a result of several decades of production-led support for intensive agricultural management (Siriwardena et al., 1998).

In England, an agri-environment scheme is being piloted in four regions, with a view to extending the scheme nation-wide in 2005. The scheme is intended to attract farmers who have not previously participated in existing agri-environment schemes. For this reason, it is less ambitious than existing schemes and is intended to provide farmers with an entry into higher level schemes in subsequent years. This 'Entry Level Scheme' (ELS) was launched by the UK government's Department for Environment, Food and Rural Affairs (DEFRA) in a pilot phase in May 2003 (DEFRA, 2003a). A range of habitats on farmland gain farmers points towards a threshold which, if attained, qualifies the farmer for a standard payment per hectare across the farm.

Eligible habitats for field edges include two and six metre wide perennial grass strips in field boundaries, uncultivated field corners, and plants sown especially for wildlife ('Wildlife Seed Mixtures' and 'Pollen and Nectar Mixtures'). Within fields, other options include selectively sprayed crop edges

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(‘Conservation Headlands’), undrilled patches (‘Skylark Plots’), low grassy banks through field centres (‘Beetle Banks’), undersowing of grass leys in spring-sown cereal crops, and undisturbed over-winter crop stubbles. Although there are many other options, these are the ones considered in this paper.

Implementation of agri-environment schemes has been shown to change farmers’ attitudes in favour of wildlife conservation (Battershill & Gilg, 1996). In most cases habitat management requires a change of attitude away from crop production, and the development of new skills and environmental awareness, while other habitat options provide an opportunity for farmers to apply their existing skills to wildlife conservation. For example, wildlife seed mixtures enable farmers to apply their crop management skills to habitat creation, while Conservation Headlands and grass field boundary strips require a change of attitude and development of new skills, as well as the application of existing ones (Stoate et al., 2001a).

An existing scheme, the Countryside Stewardship Scheme (CSS) (DEFRA, 2003b), includes a similar range of habitats but requires farmers to create more new features, additional to those already present, makes greater demands on the farmer, and makes payments for habitat options, rather than across the whole farm area. Studies associated with previous agri-environment schemes in the UK have shown that small farmers are disadvantaged in their ability to participate in such schemes because of the complicated application procedure (Falconer, 2000). Costs incurred by the farmer in the application process include the recruitment of professional advice and the time taken to complete detailed application forms. These costs are more difficult for small farmers to absorb than for larger farmers who may employ staff and have access to better office facilities and other additional resources.

DEFRA administers agri-environment schemes in England. DEFRA awarded a contract to The Allerton Trust in 2003 to provide agri-environment training to small and medium sized farmers in the East Midlands region of England, in an attempt to equip such farmers with relevant information. Initially, the project is taking the form of a one-day event per month at the Allerton Trust’s research and demonstration farm at Loddington, Leicestershire. A separate company has been contracted to recruit small and medium sized farmers from the East Midlands region to attend these days, with up to 20 farmers attending each day. Although the organisers cover the main cost of the course, a charge of £30 has been made to discourage cancellations. The main target group is farmers who manage less than 120 hectares of arable land, and who are not currently participating in an agri-environment scheme. However, in practice, some farmers participating in the training managed larger farms, and some were already involved in the CSS. This relaxation of the pre-conditions for participation sometimes resulted in more informed discussions between participants on training days, improving the participatory learning element of the course.

The days at Loddington comprise mainly training in habitat management options from the ELS, information on Biodiversity Action Plan species that are targeted for conservation, and guidance on the responsible use of pesticides. However, the project also provides an opportunity for researchers and policy makers to learn from farmers about the issues involved in farmers’ participation in agri-environment schemes. This research element of the project is intended to inform the further development of ELS and other agri-environment schemes, both in terms of practical management and policy making. For example, the author is primarily concerned with research into agricultural ecology and the development of practical habitat management options at the Allerton Trust’s research and demonstration farm, and aims to learn from farmers about economic and ecological problems and opportunities associated with these habitats on *other* farms. The project therefore enables shared learning by farmers, researchers and policy makers.

Participating farmers are asked to complete questionnaires on their attitudes to issues relating to agri-environment schemes. The quantitative data collected to date were analysed using standard 't' tests to compare differences between mean values obtained from questionnaire answers, and non-parametric statistical tests (Mann Whitney 'U' and Wicoxon 'Z') to compare differences between median values (Zar, 1996). Sample sizes are given as 'N', degrees of freedom as 'df', and the level of statistical significance as 'P' values (ns = not significant).

The training days also have interactive components ranging from group discussion to pair-wise comparison of ELS habitat options (Pretty & Scoones, 1989) and this approach is intended to provide more qualitative data that might be missed using questionnaires alone. For the author, this project has provided an opportunity to adopt a participatory approach, previously applied only with farmers in West Africa (Stoate et al., 2001b). This paper presents some early results from the project.

Recruitment to the project

A total of 79 farmers participated in training events at Loddington across the first five months. Mean farm size (± se) of participants recruited to Pathfinders was 207 hectares (± 14), but there was a predominance of farms in the 101-200 hectare size range (Figure 1). Mean farmer age was 47 ± 2 (Figure 2).

Figure 1. Frequency distribution of farm size for farmers attending Pathfinders events

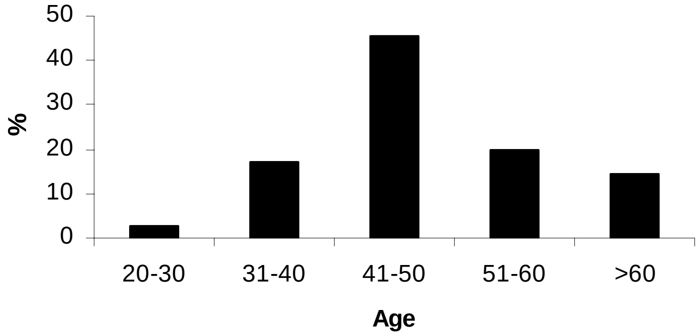

Figure 2. Frequency distribution of age of farmers attending Pathfinders events

Farmers' attitudes to ELS

Forty (50%) of the farmers attending a training day subsequently completed a questionnaire (based on the design of Davies and Hodge, 2002) which explored attitudinal differences between farmers with highly positive views about ELS with those who had less strongly held views. There was no difference in farm size between those returning the questionnaire and those who did not do so (t = 0.998, df = 68, ns).

For those who returned questionnaires, there was a significant difference in farmers' attitudes towards ELS and CSS (Wilcoxon Z = -2.87, P = 0.004, N = 40) - more farmers saw a role for ELS than for CSS on their farms (Figure 3). Farm size was correlated with the question score representing attitude to CSS, with farmers of larger farms being more positive about the scheme (r_s = 0.404, P = 0.016, n = 35), but there was no effect of farm size on farmers' attitude towards ELS. Farmers with positive attitudes towards ELS were significantly older (51 ± 2) than other farmers (42 ± 3) (t = 2.34, df = 29, P = 0.03).

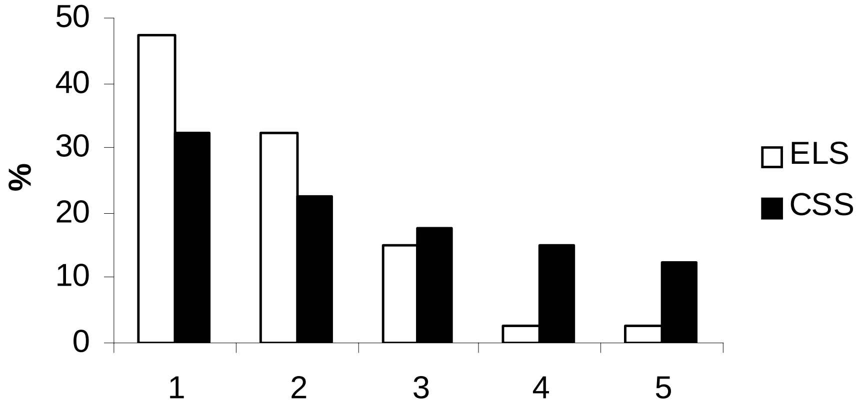

Figure 3. Frequency distribution of responses from 40 farmers to the statements, '*The Entry Level Scheme could provide opportunities for my farm*' (ELS) and '*The Countryside Stewardship Scheme provides (or could provide) opportunities for my farm*'(CSS). 1 = strongly agree, 5 = strongly disagree.

Significant differences between farmers with and without positive attitudes towards ELS were related to their environmental values (Table 1). Farmers with highly positive views about ELS were also more positive about having rare birds on their land, about the intrinsic and utility values of natural resources, and about the principle of paying for environmental management when this was affordable.

Table 1. Comparison of farmers with highly positive attitudes towards ELS with those who had less positive attitudes. Median scores (and interquartile ranges) relate to questionnaire answers provided by 40 farmers. 1 = strongly agree, 5 = strongly disagree

Statement	Median: positive attitude to ELS	Median: less positive attitude to ELS	Mann Whitney test statistic 'U'	P
All the earth's resources such as minerals, fuels, forest, should be used as sparingly as possible	1 (1)	2 (1.5)	83.5	0.001
Rare species can be a chore to look after and you are better off without them	5 (1)	3 (2)	103.5	0.007
The more money you can make from farming, the more you should be willing to spend on enhancing the environment	1 (1)	2 (1.5)	119.0	0.021
Natural things should be respected as valuable in themselves and not just for what humans can get out of them	1 (0)	2 (1)	125.0	0.022

Pair-wise comparisons were used with six groups of farmers to compare attitudes towards some of the individual habitat management options within the ELS. As well as providing feedback of farmers' attitudes, this approach encouraged discussion between participants and was therefore part of the learning process.

The pair-wise comparisons produced percentage scores that allowed ranking of the options considered (Table 2). Overall, the naturally regenerating field corner, 6 metre grass field margin, and wildlife seed mixture were the highest ranking options, followed by 2 metre grass margins and pollen and nectar mixtures. These are all habitats created in field boundaries, outside the cropped area. In addition, one of six 'in-field' habitat options was considered by each of the groups. These 'in-field' options consistently ranked lower than the field boundary habitat options, even though some in-field options were regarded as 'easy to do'. Comments made by farmers at the time suggested that in-field options were ranked low because they interfered with the cropping.

Prevention of pesticide drift into field boundaries and watercourses was identified as a valuable role for field boundary options, including compliance with legislation (Local Environmental Risk Assessment for Pesticides, LERAP). A value for wildlife seed mixtures was identified in providing food and cover for gamebirds for shooting, and for other seed-eating birds that were valued by the farmers. Other options such as field corners and pollen and nectar mixture were favoured because they could be used on unproductive land and encouraged desirable species such as gamebirds and honeybees. Some farmers commented favourably about skylark plots because they simply 'liked skylarks' and the attitudes of farmers to the species being targeted for conservation are likely to have a substantial influence of their behaviour in terms of implementation. More detailed comments from farmers are listed in appendix 1. The results of the pair-wise comparisons are presented to farmers at a follow-up event and their comments are invited. The exercise is therefore iterative and likely to stimulate further comment of relevance to practical implementation and policy development.

Table 2. Results of pair-wise comparisons of ELS habitat options (carried out by small and medium-sized farmers)

Habitat option	**% score**					
	Group 1	*Group 2*	*Group 3*	*Group 4*	*Group 5*	*Group 6*
Field corner	21	19	23	25	25	24
Wildlife seed mix	22	21	26	24	21	16
6 Metre margin	24	28	23	14	10	28
2 metre margin	16	15	16	17	14	11
Pollen/nectar mix	13	13	9	14	16	7
Skylark plots*	--	--	--	--	--	15
Winter stubble*	--	--	--	14	--	--
Undersowing*	--	--	--	--	6	--
Beetle Bank*	5	--	--	--	--	--
Conservation Headland*	--	4	--	--	--	--
CH (no fertiliser)*	--	--	4	--	--	--

* These options were considered by one group of farmers only

Discussion

The preliminary results presented in this paper suggest that some readily quantifiable, and other more qualitative factors may influence farmer participation in the Entry Level Scheme. This scheme appears to have greater appeal than the Countryside Stewardship Scheme to farmers with small and medium sized farms. There is an indication that there is some resistance to ELS from younger farmers, perhaps because they perceive the scheme as constraining or distracting from plans for future market-led initiatives they may want to develop. Older farmers may exhibit similar reluctance to participate in the scheme if there is a successor in the family business.

There appears to be genuine interest in, and agreement with ELS objectives amongst potential participants in the scheme, but there is clearly resistance to ELS management options that are perceived to interfere with commercial cropping operations. Learning about such issues is currently enabling policy makers to explore the potential for active management of set-aside to meet the environmental objectives of habitat options that would normally be implemented within the cropped area (e.g. undersowing and conservation headlands). Farmers could be rewarded for creating habitats on set-aside, albeit at a lower level than would be the case if such habitats were within the cropped area. In order to increase adoption of in-field management options, points could also be reallocated so that in-field options receive more points than are currently being awarded in the pilot phase.

The results from this study suggest that there is a need to ensure that the Entry level Scheme is compatible with business plans that may be developed by younger farmers. Some farmers in this study identified a use for the 'wildlife seed mixture' option in contributing to gamebird management for shooting (which could be let to paying guests). Other options may be compatible with added value to commercial crops. For example, 'conservation headlands' at Loddington are part of a selective pesticide use policy that enables wheat and oats to be sold as 'conservation grade' at a 16% premium. Such compatibility with market objectives needs to be explored. Similarly, there is a need for more information on the objectives of the scheme, for example in terms of the identification and conservation of 'rare' birds. The results presented here suggest that some farmers' values are compatible with the objectives of agri-environment schemes and that they are ready to learn and adapt to the new circumstances.

The results presented in Figure 3 suggest that 80% of farmers 'agree' or 'agree strongly' that the ELS could provide opportunities for their farms, suggesting that uptake of the scheme could be considerable. However, farmers accepting the invitation to participate in the Pathfinders project represent only a very small proportion of those originally contacted, and only half of those attending completed the questionnaire. Uptake of the ELS could be considerably lower than these results indicate. This project is enabling researchers and policy makers to learn from farmers about the problems and opportunities associated with ELS habitat options, enabling new schemes to be developed that have demonstrable environmental benefits and meet the needs of all parties.

Acknowledgements

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Appendix 1. Farmers' comments arising from pair-wise comparisons of ELS habitat options (carried out by small and medium-sized farmers).

Habitat option	Comments
Field corner	*Takes bad corners out* *Outside crop* *Takes out hardest part of field to work* *No establishment cost and little crop area lost* *Ease of machinery use* *Easier drilling in odd field shapes* *Round fields are the way to the future* *Field corners even less profitable than field headlands* *Very little management*
Wildlife seed mixture	*Good for game cover* *Less risk of weed invasion [than conservation headland]* *Outside crop* *Helps with shooting* *Helping wild birds, shooting etc* *Use for game cover as well as songbirds* *Can be put in irregular parts of fields* *Combines element of recreation with requirement to encourage wild birds*
6 metre margin	*Ideal for LERAP* *Outside the crop* *Easier to manage [than 2m margin] and more room* *By woodland* *Could clean up margins* *Preferable to 2m margin to meet LERAP* *Removes LERAP requirement and doesn't break up fields* *Better for fields bordering watercourses* *Easy to manage* *Combined with hedge management increases nest sites* *Our farm has lots of dykes* *Allows hedges to be trimmed in winter*
2 metre margin	*Helpful in prevention of weed invasion* *Better for small fields [than 6 m margin]* *Outside crop* *2m margin is preferable to Beetle bank as bank cuts fields* *More manageable [than 6m margin] in small fields* *Less crop area lost* *If using correct size nozzles, makes LERAP easier* *Protection of hedges from field operations* *Useful for enhancing existing feature such as hedge or ditch* *Creates corridors for wild gamebirds*
Pollen and nectar mixture	*Use as LERAP buffer zone* *Less husbandry [than wildlife seed mix]* *Easily established, lasts for years* *Outside the crop* *Good for bees* *[Create] where poorest crop grows* *Would encourage more birds and insects* *Increasing insects for chicks to feed* *Very suitable for difficult areas of farm* *Good nectar source for our hives of honey bees*
Skylark Plots	*Want to encourage skylarks* *Love to see and hear them* *Easy to do*
Winter stubble	*Fits into rotation for spring cropping* *Easy management*
Undersowing	*Useful way of establishing grass leys for livestock farmer* *Relevant to small fields*
Beetle Bank	*Reduced aphicide requirement* *For aphid control and grey partridge* *Good in some situations – divide large fields*
Conservation Headland	*Can sell crops* *Easy to manage and is rotational*
Conservation Headland (no fertiliser)	*Allows points to be gained without losing crop area* *Good LERAP*

An everyday tale of farming folk[1]

Colin Newsham*

In this paper I want to question what it means to be a farmer in a time of agricultural change. I want to document my own transformation and focus on the relationship between that and my identity and learning. I am focusing on my own experience but in a way that is applicable much more widely. I want to speak as a practitioner. It is important that practitioners voices are heard when it comes to formulating policy or making decisions. It is also important that we as practitioners are involved in the process of interpreting and making sense of our own experience. I am telling my story.

In 1929 the Newsham family moved to Lancaster to farm as tenants for the Sandam family, (who were known for their trade links with Portugal and consequently the importation of port). My parents purchased Banton House Farm (now Forrest Hills) in 1961. The farm is 70 hectares of undulating open grassland with 2.5 hectares of woodland. The river Conder meanders through the valley. The main production was milk from 80 dairy cows; some beef and sheep were also reared.

The first venture into diversification started with a 1.6-hectare fly-fishing lake. A 9-hole golf course followed a few years later, together with two log cabins for use as training and meeting rooms for the local university and other businesses. (Newsham 2001).

Since diversification, my work has changed. It still revolves around the farm but there are no animals and no food is produced. Instead I work with people; mowing golf greens; advising fishermen to which flies are catching best that day; organising corporate activity events for companies; administering outdoor training facilities and meeting space for departmental away days from the local university. Attending and presenting at local, national and international conferences, talking to the "neighbouring" farmer, whether it is over the hedge or in Sweden, and designing workshops for students and organisations. This change has taken place over a 10-year period and has happened organically and incrementally. To me, it has not been a difficult change nor has it been particularly remarkable in any way. Yet I find myself often held up as an example of 'good practice' or asked to speak to groups of farmers or academics about my experience.

A more common view of farmers is of them being resistant to change. They are often traditional in their work and thinking. A neighbouring farmer looking over the hedge at one of our overgrown fields of tall grass and weeds, commented that my late father worked hard to keep that particular field mown and in good condition. From an agricultural perspective it did look unattractive and neglected but he was not seeing what the farm had become nor seeing it as a wildlife specialist might.

What I want to do in this paper is explore this apparent difference and to try to understand my own experience and identify some of the factors, both in my family background and upbringing and in my wider social situation, that have contributed to my ability to embrace change.

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[1] The tag line from 'The Archers' BBC Radio 4 - a long running, rural, radio soap opera.

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I'll start with a story - a not untypical happening on the farm when I was around 10 or 11 years old.

The calf pen

SON Dad the tongue's[2] broken off the water bowl, it's been leaking all night, the calves bedding is all wet

DAD Bring the tongue to the workshop and lets have a look, it's cast iron so you could have a go at welding it, you'll need special rods, here they are, have a go.

****

SON I've got the tongue back on but its still leaking from the valve.

DAD You'll have to check the iron water pipe that leads to it. It's been in a long time, the inside furs up with rust. It could have some bits in it. There's some pieces of pipe in the old stable we don't need any more, rob them from there.

(I went off and found a spanner to fit the nut on the pipe but it didn't quite fit, so I put a bit of packing in to help it grip, at that point dad came along to see how I was doing).

DAD Watch that spanner doesn't fly off!

SON Ouch! It's cut my nose.

(The blood was dripping off the end of my nose. I still have the scar!)

DAD It's just a graze son, it'll soon stop.

SON I've attached the new piece of pipe dad, it's still leaking.

DAD Must be the rubber valve son, put a new one in.

SON Have we got any?

DAD No, but there's an old tractor inner tube in the workshop. Cut one out of that, the same diameter.

(Sometime later)

SON Dad, it's not thick enough.

DAD Cut a few out till you get the right thickness.

****

SON It's worked it's not leaking any more.

2 The automatic mechanism that allows water to flow when pressed by a cows nose.

DAD These calves will need their bedding drying out. Fork the front out so the water can drain away, then spread a couple of new bales at the back. We better make sure they don't get pneumonia or joint ill after being damp. We'll give each one 5cc of penicillin. There's a new bottle on the shelf in the outside toilet, go get that, a syringe and new needle. Shake the bottle, put a bit of air in first or it splatters out; hold the syringe upright, flick the bubbles out.

SON Where should I stick it?

DAD In the muscle at the top of its back leg.

SON Will you hold its head for me?

DAD Get away son, you might have to do it yourself one day, get on with it!

From a young age, this is what it was like to grow up as a farmer. I was learning for real. It mattered. The calves' lives were at stake. I had someone there giving me guidance but they made me do it myself, even making mistakes.

> "In these early hours she learns skills without knowing it is an education of one form. The way to hold down a ewe for clipping, with the upper body a brace and one leg an anchor, the strong arm free." (Hall, 2002)

But I wasn't just learning the immediate task at hand. I was also learning how to learn and how to problem solve more widely. So I learnt to trust my own judgement, try things out, sometimes getting things wrong. Then if that didn't work the first time try something else. In effect I was doing what Argyris and Schon (1978) have called 'double loop learning'. Looking back now I realise that all these skills have been important in making the change to what I am doing now and how I do it.

These skills of taking risks and trying things out were important as a farmer and even more important when it came to diversifying; from milking dairy cows, rearing beef cattle and breeding sheep, to constructing a golf course, excavating a fly fishery and building lodge style classrooms for away days and management development exercises from the local University.

It also seems to help if you are able to accept being different. Even as farmers we were doing something different e.g. trying out 'straights'[3] instead of relying on the manufactures compounds for supplementary feed and growing rye grass as an early spring bite[4] for the dairy cows was even reported on the front page of the national farming press. Our location meant that we mixed with different people – students of all nationalities would periodically wander off the nearby University campus and watch us milking. We read beyond the farming press (e.g. we first found out about BSE from a New Scientist article sometime before reaching the farming press and sold all our beef animals before prices plummeted). A farming community is a social community, a 'community of practice' (Lave and Wenger 1991). There are no explicit written rules but acceptance and belonging is subject to peer pressure; you are always judged by your neighbours. To do anything different you are talked about, maybe scoffed and ridiculed. By turning part of the farm into a golf course it was said that we had ruined a good farm. Some farmers may find this a stumbling block to change. Coming from a long-standing and respected farming family meant that

3 'straights' whole food e.g. corn, maize gluten.

4 'spring bite' cows first chance to graze in fields after winter housing.

we were more easily able to be different. You would also find support from family members; they would talk to you, not about you.

For many farmers, their view of themselves, their sense of self, there identity is closely tied to the work they do. This too can be a barrier to change. Sue Wrennal (Lancaster University) researching hill farmers and their identity found that it was often farmers wives who were more open to change, perhaps because, through children's schools and work outside the home they already had multiple identities. Having always lived and worked on the family farm I've always called myself a farmer. I still do even though when I recently went to a conference a representative from the National Farmers Union said, "a farmer is someone who produces food". Does that mean I've lost my identity? What do I label myself? What are the implications of this? For me though whilst identity is still important it is not about what I do but more about belonging to a place and community, being connected, being 'in place' (Hardy & Newsham 2004). This too has made the shift, from a traditional farming background to what I do now, that much easier. I still live and work in the same place. Much of what I do each day is very similar to what it was - managing the land, solving problems that arise, even the structure of my day is very similar - except I don't have to get up at 5.30am to milk cows.

So, in my own case, I can identify many factors that seem to have helped me make the changes I have made - individual psychology, family and upbringing and wider social context. Is it possible to learn from this and use it to support other farmers who either choose to or are forced to change and adapt as agriculture changes? Like me, most have qualities and experience that give them an advantage – they are independent and used to working long hours, and being fully responsible for themselves, for others and for their stock (as my story showed, responsibility is developed at an early age). But often these experiences and qualities can be taken for granted and not seen as important or significant.

One way forward is to be able to pass on my knowledge of what and how I've learnt.

The structure of the farming industry contributes to a passive structure, having reliance on other people, looking to them for the answer when they are able to help themselves. Take the farmer out of their day to day role, individually or collectively and involve them in active situations, workshops, mixing with different people. Identify, and make them able to realise the skills they have, react positively to their suggestions, and encourage ideas.

A local farmer said to me on a recent visit, weren't you lucky you already had a lake, but we excavated the lake, or others have said weren't you lucky to get out before foot and mouth. Is it being lucky, or is it by being active in decisions better prepares you for the unexpected. Being connected with what we are doing, actively seeking information, ideas, living in the real world.

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CTE as a process of competences' transformation?

T. Dupeuble*

Emphasis put on multifunctionality comes from the statement that agriculture is nowadays not fulfilling society requirements. On one side, if it provides enough food to ensure the food self-sufficiency of the European consumers, the various crisis (ESB for instances) that have been affected agriculture in Europe for the ten last years, at least, have highlighted the fact that food quality and safety were not as good as we believed. On the other hand however, it doesn't provide (anymore?) other products or services, which OECD call non-commodity outputs, such as landscape shaping; biodiversity conservation, etc. Moreover, some of those non-commodity outputs are undesirable: water pollution, soil erosion, etc. Consumers, environmentalists, taxpayers don't want anymore to support (with public funds) agricultural activities which wouldn't take into account all their functions. Taking into account multifunctionality means that adaptations have to be worked out in three major domains: first is the design of public policies which are supposed to enhance multifunctionality (as previous policies were accused of having ignored this multifunctionality); second is the construction of new competences; third concerns the adaptations of economic behaviour of individual actors. In this paper, we focus on the question of competences' transformation.

In France, a special procedure, called "Contrat territorial d'exploitation" (CTE)[1] has been set up in 1999 through an Agricultural Act (Loi d'orientation agricole, Loi n°99-574 of the 9th July 1999). Its objective was to enhance multifunctionality in farming by encouraging farmers to change their practices in order to meet new social requirements. Our concern is here to analyse this procedure from a competence point of view. For that purpose, we first propose a learning model which introduces the notion of intermediate collective competence and we precise what kinds of intermediate competences have to be built in order to enhance multifunctionality (section 1). Then we examine whether or not the CTE procedure, as it has been conceived (section 3) and as it has been implemented (section 4), is coherent with the preceding point.

Professional activities and collective competences

Agriculture is, among others, characterised by an extreme diversity of activities. This diversity derives from the contingent character of biological processes which agricultural activities rely on. Characteristics of the context also are of a great influence on these activities and as the context varies along with time and space, it increases again activities' diversity. Therefore, the farming tasks cannot be standardised, as they can be in car manufacturing for instance. However, diversity may be reduced by classifying activities in main generic categories such as fertilisation, tilling, cattle feeding, and so on. Farmers, all along time, have built this classification system which agronomists have normalised. Each category in fact covers knowledge which has been progressively worked out from both practicing and

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[1] Though it has been voted by the French parliament in 1999, it has been really implemented in 2000 within the framework of the French application of EU regulation n° 1257/99. France opted for a unique National plan for rural development (NPRD).

researching. Because it has also been codified, making it available for all farmers (especially the new ones), one can consider such knowledge as collective competences (as they are made of pure knowledge as well as know-how, which means they are designed to solve practicing problems) of an intermediate level. By intermediate level, we mean that such competences are continuously evolving through two different processes.

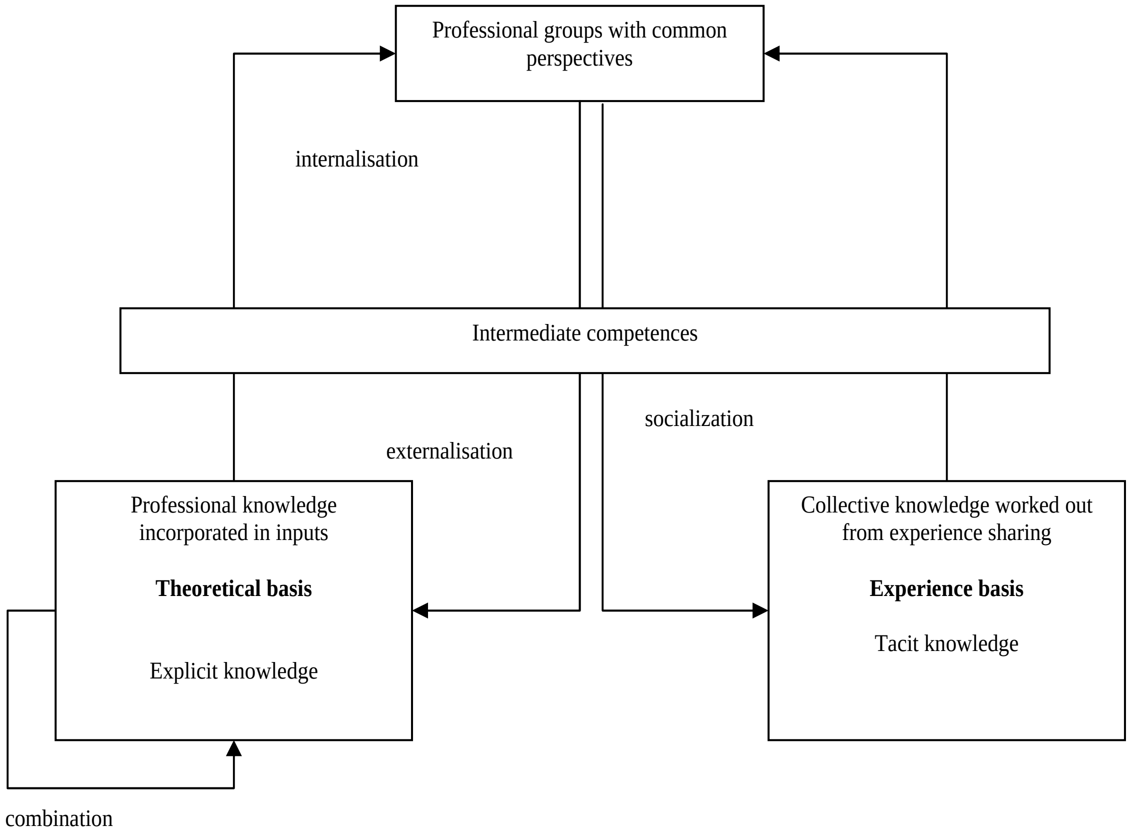
On one hand, they evolve because each individual farmer has to adjust them to his own work's context (farm, field) and to slight changes in the context along time. These adjustments aim at insuring a "good quality" of daily activities. Among these adjustments some may appear as real innovations. But to be considered as such, they have to be proved and codified. This happens within professional groups, when farmers are sharing their experiences (Allaire and al, 2002). Technicians, who are helping to share experiences, also are in touch with researchers and then are able to make them aware of these innovations.

On the other hand, competencies evolve due to researchers (private as well as public research) results. Innovations, worked out by researchers, have to be experimented. In fact, any innovation cannot be designed so as to work successfully in all places. It has to be adjusted to particular contexts. Professional groups are proceeding to adjustments in various but local conditions and then it is also a mean to save time and to share risks. By doing so, in return, innovations may benefit from these adjustments, as long as they are a little bit codified, because they are then applicable to a larger scope of situations. Sharing experience inside the group contributes to this codification. For instance, mechanisation co-operatives (CUMA) play a great role in mechanisation's innovation by doing so at different levels (Assens, 2002). Through this adjusting work, learning is continuous. Professional groups, in their diversity and each in its field, have a particular competence in the innovative processes, which expresses itself in their ability in operationalising vs generalising innovations.

More generally speaking, learning process relies on both a mutual conversion between tacit knowledge (rooted in experience and hardly transmissible) and explicit knowledge (codified, transmissible trough a formalized language) and on an enrichment of each category of knowledge by combination (of explicit knowledge) or socialization (of tacit knowledge) (Nonaka, 1994). Conversion of tacit knowledge into explicit knowledge is insured through dialogue among members of a community of practices (Darre, 1994). Conversion of explicit knowledge into tacit knowledge is running through experimentation or inquiries but, as both are costly (and as experimentation is risky), again the contribution of professional groups is essential. Such a dynamic of knowledge is facilitated through creation of intermediate competences, as we define them above, which operate so as to gather actors together towards knowledge creation. That means professional groups, needed to socialize or externalize tacit knowledge and internalize explicit knowledge, can arise (or be maintained) thanks to these intermediate competences (as their adjustments have to be processed within such groups).

However, these groups don't only need such intermediate competences; they also need a shared vision of their environment. That is to say actors need some common perspectives which give a common sense to informations which actors get from experience sharing. If not, the very same experience might be interpreted differently from one actor to another and then not lead to new knowledge. Such common perspectives operate as a system of reference for learning (through which learning is getting sense).

We try to summarize what appears as a model for learning as follows:



This can be viewed as a learning model. Our concern is now to analyse how multifunctionality modifies professional competencies and if these changes are susceptible to modify this learning model.

Local norms and hybrid forums

Taking account of multifunctionality in farming means that farmers have then to take care of both commodity outputs and non-commodity outputs. This means they have to modify their farming practices in a way that ensure a better multifunctionality: commodities of both good quality and security, less of undesirable external effects (such as water pollution) and more of desirable external effects (such as pleasant landscapes). But those external effects don't result from a simple addition of the farmers' various contributions. Indeed, most of the non-commodity outputs society is looking for cannot be produced without certain coordinations among farmers at various scales. As an example, one cannot improve the value of a landscape only through individual incentives to hedges' plantation. Its value will depend on what kind of trees will be planted, how they are going to be looked after, and, particularly, on the kind of grid of woodlands it will lead to. Local coordinations are then necessary to ensure public goods' production, which corresponds to what society is looking for. Hedges also have an agronomic interest which depends more or less on the same criteria than the ones described above, but they can lead to different technical prescriptions. Taking into account multifunctionality then leads to work out technical practices that ensure correct agronomic effects and improve landscape value. As these practices affect some natural resources which are multifunctional (which means there are used in different activities - tourism, fishing, hunting,... -and this is here one of the true reasons of multifunctionality of agriculture), those practices can be viewed as local collective norms: various users of these natural resources (and particularly farmers) have to refer to them. But working out such practices is not obvious. As a matter of facts, it supposes the integration of various knowledge, tacit as well as explicit. The elaboration of such norms comes from a learning process which leads to new competencies about natural resources management.

Difficulties also come from the fact that as long as a public problem arising from such or such an external effect is not precisely defined, it is quite difficult to identify relevant solutions. There's a need for a social construction of the problem (Callon, 1999), which leads to the circumscription of the problem (who are the providers of the external effect, who are the recipients, which are the media of its expansion and its manifestation). However, solutions are being worked out while the problem is being constructed (as it is difficult to construct problems we are not able to solve). As a consequence, the social construction of problem is part of the learning process and can be viewed as the phase through which a common perspective is being built among all participants (see section 1). This construction must involve all the stakeholders, providers as well as consumers of the public good (and future generations' spokesmen, if they do exist) because any solution won't be acceptable until it has been approved and, furthermore, constructed by all the stakeholders. For all of them have their own experience of the problem, then their own tacit knowledge about it. Experience's sharing, which appears to be a first step in the process of learning, must then involve all the ones that have this experience of the problem. This supposes that exist public arenas, which are then some hybrid forums, where stakeholders can be represented to take part in this social construction of problems. Frequently, such public arenas arise when problems are so acute that they are publicly exposed. But such public arenas don't have spontaneously the proper configuration to handle the problem correctly, namely in a perspective of problem-solving. It also supposes that the various stakeholders have the capability to participate to such a construction. That means each category of stakeholder has to be organised so as to be represented in the area and to expose in an understandable language (for the others) its own experience of the problem. This is not going at ease, for each stakeholder has its own language. For instance, it is quite frequent to observe that farmers and ecologists have great difficulties to share experiences about wildlife (let's say, when handling a problem of biodiversity), though they speak of the same reality. Beyond the language problem, these two categories of stakeholders aren't equipped with the same tools to take part in the social construction of problem. Agriculture is an old institutional sector (Allaire, Blanc, 2001) whereas environmental sector is still emerging (in France, ministry, technical and research institutes, associative networks in the environmental field are all quite younger than the same institutions in the agricultural field). This capability (to participate to social construction of problems in hybrid forums) has to be considered as part of the professional competences and is developed when participating. Therefore, public procedures which are set up to enhance multifunctionality can be evaluated in their capacity to provide public arenas that are needed to define the problem as well as means for construction of the new professional competences[2].

CTE, learning and competences

The CTE procedure

A CTE is contract signed, for a five years duration, between a farmer and the French State (represented at the department level by the Prefect). Through this contract, farmer is committed implementing various changes on his farm, within two major domains: the territorial and environmental area and the socio-economic area. State funds partly these changes as soon as they are supposed to reach at least one goal in each of these areas. List of goals is described in the following table (Ministry of agriculture,1999).

[2] One has to note that the need for new competencies is the same for the other kinds of stakeholders, as well as for administration

Table 1: Dimensions, themes and objectives of CTE

Socio-economic dimension		Territorial and environmental dimension	
Theme (issue)	*Objective*	*Theme (issue)*	*Objective*
Employment	Maintain and create employment Facilitate the installation of young farmers	Water	Maintain and improve water quality Improve water resource management
Work	Adapt farmer competencies and qualifications Improve working conditions	Soil	Prevent soil erosion Preserve the physical, chemical and biological fertility of soils
Product quality	Improve product quality Improve food health security	Air	Maintain and improve air quality
Animal well being	Improve the well being of farm animals (through infrastructural and building investment)	Biodiversity	Protect natural species and biotopes Preserve and improve the biodiversity of domestic species
Economy, autonomy	Strengthen the economic organisation of producers Diversify farm and non-farm activities Improve food marketing and transformation systems and networks Increase the added value by reducing production costs and making more sustainable use of natural resources	Landscapes and cultural heritage	Preserve and benefit from the built heritage Preserve and benefit from landscape quality
		Natural risks	Prevent erosion, flooding, fires and avalanches
		Energy	Reduce energy consumption Develop the use of renewable energy sources

The investments required by some of these changes are subsidized at a certain rate which varies from 30% up to 55% of the forecasted cost (the percentage is raised according to the farmer status, the location of the farm and also if farmer is committed increasing employment level), under a ceiling of 15245 € per farm. Practices' changes are compensated financially according to the income loss and/or the additional cost that they generate. Each individual contract is supposed to be referred to a 'Contract-type' which is itself established at a local level and which functions as a referent for all farmers of either a defined area. Through this local 'Contract-type', among all the themes (issues) of each dimension we have presented, those who are considered as essential are selected, and for each of them, changes which are recommended to be adopted through the contract to solve problems, are pointed out. These technical changes are called 'measures-type'. A 'Contract-type' is then a set of selected measures-type, each of them being referred to a selected list of relevant themes and objectives. 'Contract-type' must be elaborated through a local diagnosis of strengths and weaknesses of area. "Anyone" can initiate such a diagnosis in order to set up a 'Contract-type', but it has to be approved, at the department level, by the Prefect. This latter is being helped by a special committee, whose name is Departmental commission for agriculture's orientation (DCAO). It is composed of various stakeholders' representatives : farmers of course, who are in a majority within the DCAO, but also consumers' associations, ecological associations, local communities' governments, and so on. This committee has also to examine whether individual contracts can be signed or not. Administration has encouraged local actors to establish such "contracts-type" by financing partly the animation necessary to make the diagnosis and to identify themes, objectives and changes to be encouraged.

'Contract-type' as intermediate competences

Contract-type, as described above, can first be viewed as both a resource for addressing issues pointed out in the national framework (table 1) and as resource for elaborating a farm development project. As it provides a list of selected measures-type for each issue considered as relevant in the area that the contract-type is covering, it avoids farmer seeking by himself which means would be relevant to address these issues. However, all the suggested measures-types must not be implemented on the farm. The more relevant ones, in the particular context of the farm, have to be selected by the farmer. Thus the contract-type doesn't prevent the farmer from thinking of what has to be done on his own farm, but it helps him to identify what should be relevant. As each measure-type is precisely described, it also give to the farmer strong guidelines to implement it on his farm. As such, the measures-types also have to be considered as intermediate competencies, as they crystallised, in a transmissible language, tacit knowledge that has been worked out in other places (see below).

Otherwise, as agri-environmental commitments (in terms of practices' changes) are supported through compensation of additional costs and/or loss of income, it means that, unless there are some structural changes, in farm management and in the production structure, so that practice changes become irreversible, whether they are financially compensated or not, the farmers may come back to former practices at the end of the contract. Subsidies for investments can then be viewed as support to this structural transformation, which aims at finding elsewhere (namely on the market), premiums which could cover additional costs and/or loss of income due to agri-environmental practices. But such a structural transformation (i.e. a strong link between economic and environmental changes) is not easy to work out. As it is supposed to propose a coherent set of changes, economic as well as environmental, contract-type also offers a strong guideline for elaborating a farm development project in such a perspective. In that sense, contract-type is also an intermediate competence.

One also must note that elaboration of contracts-types is a way to set up the hybrid forums we previously put emphasis on. In fact, Contracts-types are supposed to be elaborated through a collective approach (which doesn't mean it has functioned as such, as we'll see in the next sections), anyone can initiate such a collective work but that must involve the various stakeholders. Moreover, the contract-type, in its final version, can be considered as the formalization of the common perspective which ties all actors involved in its elaboration. In that perspective, collective approaches are supported by public funds but on the condition that the initiator: informs local administration of his wish of working out a contract-type, justifies the need for this contract-type, lists the partners who will be involved in the reflection. If some stakeholders seem missing to the local administration, it can oblige the initiator to associate them. However, procedure in itself doesn't (and cannot) solve problems we underlined about difficulties of participants in exchanging their points of view (section 2.2).

Contract type as system of reference for learning

We said previously that contracts-types are focused on a limited number of issues and measures related to these issues. We would like now to underline the role of this focalization on the learning processes. For sure, the measures-types which are suggested within the contract-type are precisely described. But that doesn't mean their adoption is not problematic for the farmers. Indeed, they have been worked out in different locations within the framework of a previous public policy (see below), that means that if some farmers have already implemented them on their farms, they represent an innovation for the ones that are implementing them for the first time. And some problems may arise at the time of their implementation. That means there is a need of learning so as to master them correctly. For instance, among the measures proposed to reduce soil erosion and maintain soil fertility, a measure-type named "zero-tilling" has been worked out and proposed. The monitoring of the first signed contracts shows that problems of weed control frequently appear. This example shows that "zero-tilling" cannot simply replace a former tilling practice but has to be accompanied by other technical changes which may not have been described in the contract-type. The necessary learning will be much more efficient and rapid if numerous farmers of a same area are implementing the same measures. Contract-type, by focusing on a limited list of measures, creates conditions for such convergences. Farmers can constitute groups for sharing experience and these groups can become proper interlocutors for technical and research institutes, interlocutors which will be helpful for improving knowledge about "zero-tilling" and its application in various contexts.

To end this rapid analyse of the CTE procedure from a competence's point of view, it appears that, theoretically, it contains the required ingredients for learning process, knowledge creation and competence transformation. In that way, contract-type appears to be a crucial resource since it can be seen both as an intermediate competence for a evolution of farming, for farming systems' transformation and as a reference for learning process. Let's see now how it has really worked when implemented.

Analysis of the implementation of the CTE procedure in Southwest of France[3] ('Midi-Pyrénées')

In this section, we examine how the CTE procedure has been implemented in the South-west of France and if what has been previously said about its capacity to engage learning process and a competences transformation is verified or not. As this analyse is part of a an going research, the results are still partial. We'll distinguish two phases: the first is the period going from 1999 to 2002, which corresponds to the CTE period strictly speaking. From 2003 begins the CAD period, namely 'Contrat d'agriculture durable (Contract for sustainable agriculture)'. Below the change of name, the CAD procedure is an adjustment of CTE procedure, whose we describe the principal features further.

From agricultural competences to environmental competences?

CTE period

CTE implementation started with the elaboration of a list of measures-types related to the different issues pointed out in the general framework (table 1). European commission recommended the regional level for establishing such a list and zoning their applicability. Regions had only a few months to establish such a framework (called agri-environmental regional synthesis), i.e : to define homogeneous areas in terms of environmental issues; to select for each area, among a national list , the measures that would be the more relevant according to the priority issues; for each measure, to precise requirements and subsidy calculation.

In 'Midi Pyrénées' region, a quite light working group achieved the agri-environmental synthesis on time. It was composed of some representatives of the regional administration for agriculture and the regional administration for environment, and of technicians working at the Chamber of agriculture. They established the environmental zoning by using a former one, which had divided the regional space into what is still called 'small agricultural regions' (SAR). Those had been designed in the fifty's, in an extension perspective and were then homogenous in terms of topo-pedo-climatic conditions for agriculture. Thus, the environmental areas designed in 2000 are made of one or more of these small agricultural regions. How do we have to assess this choice (made under the time and cost constraint)? Obviously, it doesn't appear as a relevant zoning in terms of environmental problems but it cannot be considered as to a totally non-relevant zoning. We can consider the SAR zoning as a cognitive device which had the huge advantage to be ready to use (statistics are regularly worked out on this basis). . But, on another hand, actors who are outside the agricultural professional system can have more difficulties to appropriate themselves such a resource, since they have not been associated to its construction (one can notice that the representative of the regional administration for environment involved in this working group was previously working in the field of agriculture).

Probably as a consequence of this choice made for zoning, this working group decided to address a not limited but quite large number of issues in each area, : beside priority issues, some secondary issues have also been pointed out in each area. In fact, as no true environmental diagnostic had been made, it was difficult to focus on a limited number of issues and on a limited number of measures. As a result,

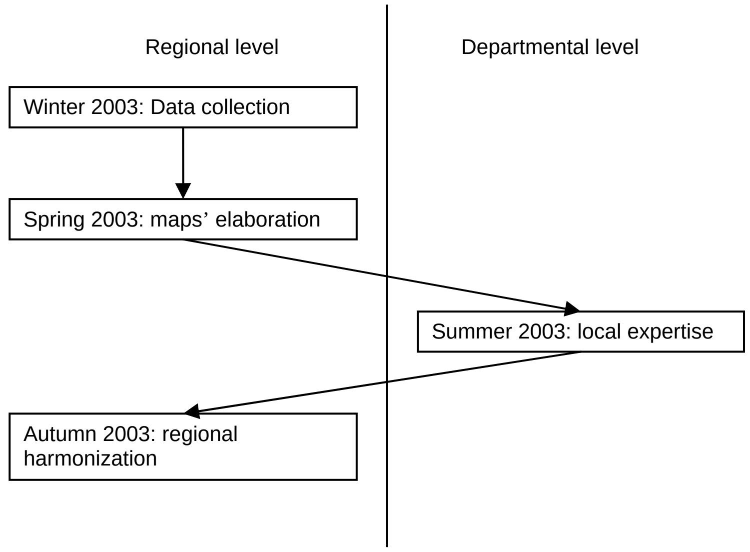
3 This paper presents intermediate results of an on-going PhD thesis (beginning of second year), based on a analysis of the all 'contract-type' of Midi-Pyrénées (around 75 different Contract-type). Six of them have been deeper analysed, through interviews conducted by various representatives of stakeholders involved in their elaboration.

there were many measures available in each area (even too much according to some people). Among the measures selected, some were quite well-defined (in terms of requirements) and left no place with local adjustments. But for some others, ad hoc local committees had to be implemented in order to specify more precisely these requirements. Again, we can considered the Regional agri-environmental synthesis as an intermediate collective competence since it has become, after the Commission's approval, the referent document for setting up the 'Contracts-types' within the departments. This collective competence, as we mentioned it, has been built starting from two older competences: The first is the "older" collective representation of agricultural territories (LAR) which has been used to elaborate a new zoning. The second former collective competence is the compilation of the "older" agri-environmental measures that have been designed, in many different locations all around France. Through this compilation process, as a matter of fact, specific knowledge have been converted in generic knowledge, as the national list of measures is a result of it. This generic knowledge is in return converted in specific knowledge when elaborating first the regional synthesis and second the contract-types. This illustrates what we have described as the learning process in section one.

CAD period

In 2002, new French government decide to adjust the procedure. Then came the time for CAD. Beside political reasons whose we won't discuss here, the lack of focussing on environmental priority issues was the major argument for this adjustment. The CAD procedure emphasizes the need for focussing in terms of environmental efficiency (focussing favours local coordinations towards common goals (see section 2). Region had then to revise its initial zoning. Midi-Pyrenees decided to proceed in a different way than previously. Firstly, the data about various environmental issues concerned have been exhaustively collected. Different administrations as well as local agencies and different associative networks (particularly in the field of environment) have been implicated in this collection. All these data have been compiled so as to work out, for each issue, a map of risk. For instance, risk affecting water quality has been calibrated from one to four and each SAR has been divided, if necessary, in homogeneous area from a risk point of view. Second, these maps have been submitted to experts approval in each department. Those experts have proceeded to adjustments, sometimes using data that had not been collected at the previous step, sometimes using their own experience and knowledge of the region. Thirdly, based on these revised maps, each DCAO have defined the priority issues to be addressed through the CAD. The new regional environmental synthesis has been finally worked out after a last harmonisation between representatives of departments. Let's analyse this second phase. Unlike to the previous phase, issues has been circumscribed by sharing knowledge between various stakeholders (in the first phase, as we underlined it, only members of agricultural sector had been mostly implicated). By putting together different data, they enriched generic knowledge (combination). This new knowledge, by being submitted to local expertise, has been again enriched. Here, the process is more complex. Local experts had to convert their tacit knowledge (what they knew about water quality risks for instance) in the same language than the one used for the maps. This means the enrichment of knowledge came from a two-steps process: conversion of tacit knowledge into a generic knowledge, then combination of the generic knowledge.

Chronology of the elaboration of the cnew environmental zoning



At end, the regional synthesis constitutes a new collective knowledge which reveals a quite important change of competence: the ability to represent a large territory from an agri-environmental point of view, what had never been expressed before.

Different departments' strategies…

CTE period

At the department level, based on the regional agri-environmental synthesis, actors had to proceed to a more accurate zoning that could be used to define areas for the 'Contracts-types'. As a matter of fact, we have observed various strategies towards this objective that however we can put together in two groups. On one hand, a majority of departments actually proceeded in this zoning and most of them chose, as a beginning, to use SAR limits to subdivide the department territory. This way of zoning was obviously coherent with the regional approach but in facts, it didn't reduce really the scale of problems' circumscription. But, after a certain time, local actors took some initiatives and proposed to work out other 'Contract-type'. Some were based on smaller territories than SAR; others were based on territories that have been identified according to specific environmental problematic. For instance, in the department of Gers, the "Auradé" 'Contract-type' concerns only two "communes" (councils, districts), which is a very small areas for applying the procedure; it can be explained as an extension of a local dynamic which farmers have been involved in for several years. Another is example is the "Etangs d'Armagnac" 'Contract-type', which concerns 77 'communes', all located in the Northeast of the department. This contract has addressed the ponds' preservation as a priority, considering that ponds were important but threatened biological resources. As time goes, in those departments, more and more 'Contracts-types' have been set up, especially through the implication of economic organisms, such as co-operatives or private agricultural wholesalers . Still in the Gers, one reaches in June 2002 (two years and a half after the beginning of the procedure) the total amount of 34 'Contracts-types'! Which means that a farmer may have two or three 'Contracts-types' as references. We'll come back on this point further. In those departments contracts-types are available to farmers as real frameworks to set up their own coherent set of transformations. In that way, since transformations in the field of environment are coherently tied to transformations in the field of socio-economic, we can argue that multifunctionality is then enhanced, as CTE was purpose-built. However, analysis of the various 'Contract-type' reveals a graduation in their capacity to enhance multifunctionality and two difficulties have to be emphasized.

- The first is that other stakeholders have not been involved so far in the collective dynamics which have led to the 'Contracts-types'. As a result, 'Contract-type' doesn't reflect a collective circumscription of problems which have to be solved (as we exposed it at the beginning). That could explain why it has been sometimes difficult to point out real priorities. Different reasons may be put forward to explain this lack of participation, we'll expose only two of them. For a start, stakeholders may not be organised enough for being represented locally, which rejects this task on higher levels. In this case, representatives may use essentially rather generic than tacit knowledge because of a lack of local references. This kind of distance from the base might have been an obstacle to integration of these stakeholders' point of view by the other ones, because they are not considered as local actors as such. Secondly, initiators of collective dynamics may have not taken time or made efforts to look for representatives, maybe considering that they knew what was these stakeholders' point of view on problems (for instance, a local group of farmers has identified landscape integration of farm households as a problem, but has never discussed with representatives of inhabitants or tourists, to explore further this problem and decide of what should be implemented to solve it).
- The second is that it is not easy to conceive, in a given area, a 'Contract-type' that can fit a wide range of farming systems. In such cases, i.e. when a zone is very diversified with regard to the farming systems, a way of designing 'Contract-type' was to make it quite wide enough to fit all systems. But we observed, in some departments, another strategy . As some 'Contracts-types' were designed on a territorial basis, with strong recommendations for certain environmental concerns (compulsory measures) and, beside, weak recommendations for socio-economic concerns, some other 'Contracts-types', available in the whole department, were on the contrary designed with strong socio-economic recommendations, classified according to the production sector. In these latter 'Contract-type', weak environmental recommendations are offset by an obligation to refer also to a territorial contract. In such cases, a farmer has to deal with two 'Contract-type' as references: one is more "market oriented" and the other more "territory oriented". We think that this double reference may be more useful to tie in a coherent set socio-economic changes and environmental changes at the farm level. Thus, we can here consider that the set of 'Contracts-types' (and not only any single 'Contract-type'), as they are linked together, constitutes a collective competence.

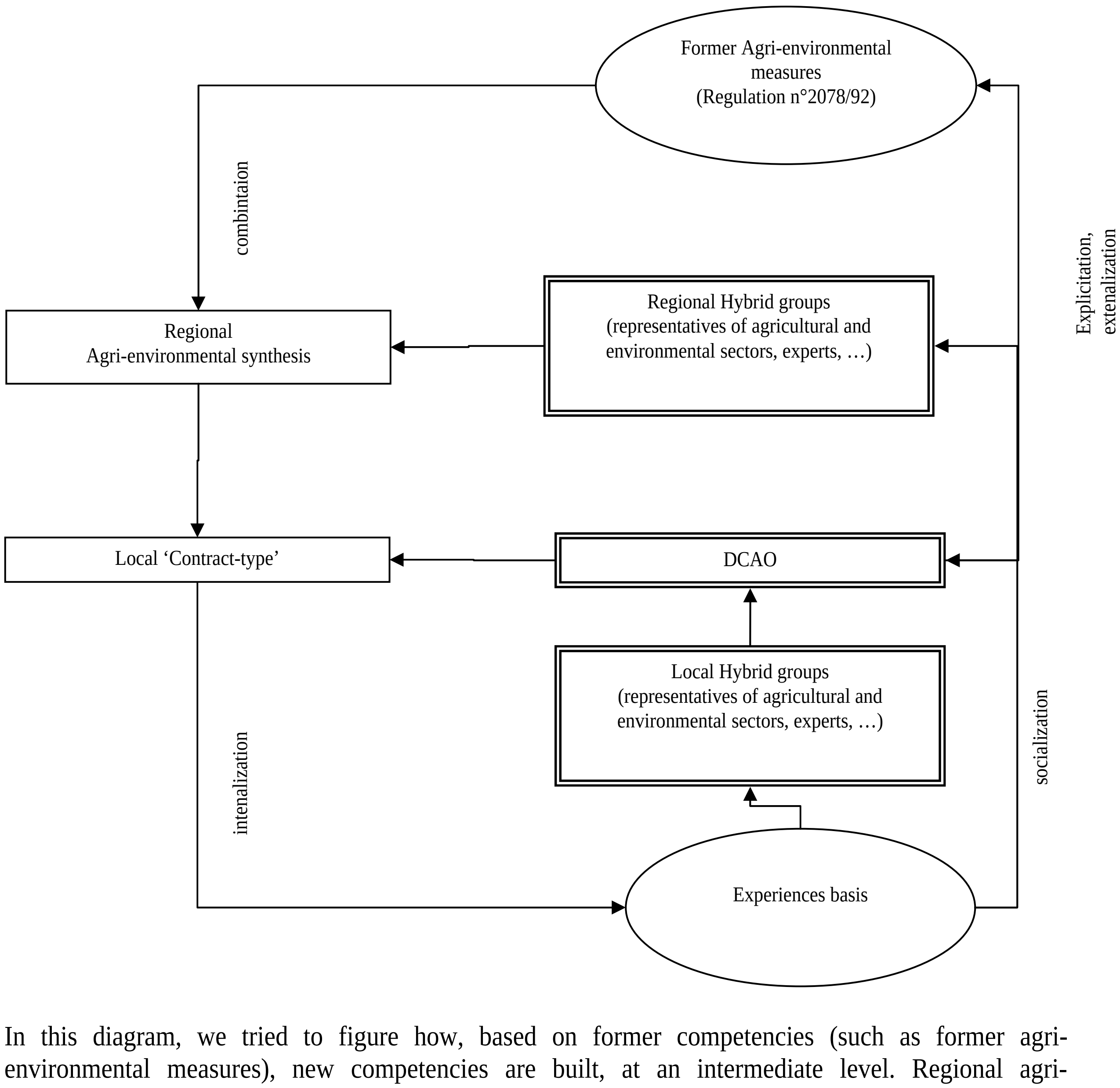
On another hand, some departments have chosen to set up a departmental 'Contract-type', as a unique reference for individual contracts. In such a 'Contract-type', there are much less constraints, in the field of environmental commitments, than in the other one. In one department, whose departmental contract has been split into as many contracts as major productions, there is even a total lack of recommendations: it is only mentioned that any measure which is available in the regional environmental synthesis, for the concerned area, will be suitable. The major explanation that has been given to this strategy was that it would be less selective: Farmers wouldn't have been afraid of contracting, due to heavy environmental commitments. This reveals that those departments didn't seize the stakes of contract-type. By doing so, contract-type could hardly function as referent for learning and as intermediate competence, as we tried to demonstrate above, because of their lack of focussing on a few measures-types related to a limited number of issues.

CAD period

It is too soon for analysing CAD implementation since contract-types have been designed from December 2003 to January 2004. Nevertheless, we can make some observations from a general point of view. Cad procedure doesn't hold anymore that any collective actor can initiate a process to design a contract-type. All contracts-types have to be designed at the departmental level, based on a zoning which addresses a maximum of two environmental issues per zone. What has occurred during the CTE period, even though it has not been systematic, will not now occurs, namely local dynamics involving farmers (and other stakeholders) for thinking about problems and defining by themselves solutions to be implemented. This doesn't mean that learning processes won't occur but as contracts-types are now designed at a upper level, its role of common perspective is weakened.

Conclusion

To conclude this presentation, we come back to the learning model we have presented in section. If we tried to apply it to what can be observed during CTE and CAD implementation, we can draw the following diagram:



In this diagram, we tried to figure how, based on former competencies (such as former agri-environmental measures), new competencies are built, at an intermediate level. Regional agri-environmental synthesis, contracts-types are the new competencies that have been built through the CTE procedure. These competencies are being built within professional groups (especially during the CTE period) and hybrid groups (during the CAD period). Further investigations, at the local level, are planned to examine through which process new competences (and what kind of competences) have been built.

We'll particularly try to analyse the effect of the characteristics (we could say the quality) of intermediate collective competences within these processes.

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The Response-Ability of Networks: Healthy and Sick Agricultural Knowledge Networks in the Netherlands

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Abstract

What makes a network of individuals or institutions capable of finding appropriate answers to the challenges that it faces? This question exceeds the quest for innovativeness. Responsiveness does not only require a conducive environment for finding new technologies or opening up new markets. It also calls on every actor for taking responsibility of his share in society and his care for the ecological environment.

In this paper I will argue that the responsive capacity of a network depends on the way it is structurally coupled with its environment. I explore the view in which networks are seen as living organisms that can be healthy or sick. Many of the mechanisms behind biological life can be observed in human networks as well. The theory of 'Living Networks' has consequences for people who want to intervene in networks that are not functioning well, at least in their opinion. According to this 'ecological rationality' the goal of intervention is not to gain control or to win, but to restore relationship. Ultimately the ability of a network to respond appropriately depends on the responsibility individuals take for doing their share.

A few basic principles of the 'Living Networks' approach will be explained. Then it will be illustrated in three different ways. The first illustration pictures the recent history of Dutch agriculture[1]. In the sixties and seventies the Dutch agricultural sector has developed into a huge human network. It is generally believed that the intensive knowledge system has contributed substantially to its impressive innovative capacity. However, in the eighties it appeared that the sector had lost its connection with society, resulting in overproduction and unacceptable levels of pollution. Since that time the sector has difficulties in finding an new 'contract' with society. The question to be answered is whether the metaphor of living networks helps to understand what happened and whether it provides hints in what direction new perspectives possibly could be found.

The second illustration compares the ecological view of living networks with three different mainstream rationalities that have dominated the debate on agricultural development, at least in the Netherlands. The instrumental, strategic and communicative rationality each lead to quite different outcomes on questions like: "What is knowledge?" or "How to induce change?". The ecological rationality might be complementary to contemporary communicative approaches that often are disregarded as 'soft' by decision makers.

The third illustration shows the 'Circle of Coherence'. This model clarifies a bit more of the theory of 'Living Networks' in order to show its practical use in finding appropriate answers in sick but essential networks. The process of life is self-organising. The process gets blocked when structural couplings are

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1 The paper is based on the PhD thesis of the author, who studied the role of knowledge, leadership and government in Dutch agriculture in the period 1945 – 2001 (Wielinga 2001).

being distorted. This occurs in human networks when people develop reasons for not taking responsibility, either for their input or for attuning to others. This leads to loss of response-ability of the network they are depending upon: then the network can no longer respond adequately to changes. Leadership means restoring relationship. This is an intriguing conclusion in a period of time when perceived threats rather push people into self defence and efforts to gain control.

Living Networks

Structural coupling

There is a general pattern in all processes of life. A living organism consists of elements that reproduce the organism while the organism allows for reproducing the elements. Within the organism tasks division and specialisation develops, thus creating synergy. The process is being maintained by interaction patterns that include numerous feedback mechanisms that couple the elements structurally together (Maturana and Varela 1987). An organism like a bacteria cell can be seen as a network with an identity. Higher organisms like plants or animals consist of many cells that developed specialisation and task division at a higher level. They make part of communities and ecosystems that could be considered as networks of an higher ordering again. Lovelock (1979) postulated that the entire biosphere of the world actually is a huge living network, maintaining itself by an extremely complex but also vulnerable system of feedback mechanisms.

During the evolution life developed into an ever increasing complexity. It is important to notice that every phase of development created on its turn the conditions for the step that followed, up to its actual stage with a climate people can live in. Another interesting feature is the autonomous tendency to grow towards more task division, diversity, complexity and beauty, although the process might include shocks and periods of regression (Capra 1997).

The human society can be seen as a complex of networks within networks, in which the same principles of life are valid. Within the identity of a human network task division and specialisation develops. In the history of mankind we see a growing complexity and diversity up to the interwoven world community of today where global communication is just a matter of pushing a few computer buttons. During the many millions of years of evolution the living community grew slowly, learning by trial and error and adapting genetically. Since humans developed communication by abstract language, they were also able of adapting culturally, which went much faster. Today, people have gained a substantial impact on their ecological environment[2]. Now it is also their responsibility to improve the feedback mechanisms as required at this level of complexity. Basically this is what the quest of sustainability is all about. It is a breathtaking question whether mankind will do so in time. So far, the complexity of the human society grows faster than the dominant ways of thinking that should enable people to bring their behaviour in line with the carrying capacity of their ecological environment, thus restoring the structural coupling.

Healthy or sick networks

After this broad picture as context, let us look at a level of human networks where we might able to do something ourselves. Everyone is part of many networks at the same time. Organisations might be seen as a special type of network that possesses a formal structure and hierarchy. Some networks generate

2 Jane Lubchenco (1998) in her 1997 presidential address to the American Association for the Advancement of Science.

energy: people like to be part of it. They are willing to give their input and to attune to others. This is a self propelling process, because when people do more effort, the reward is higher and the willingness to give input an to attune increases again. Consequently the identity of the network gets stronger. We could call such a network ‘healthy’. The opposite occurs as well. Some networks take more energy then they generate. This can be noticed for example when procedures are ruling the agenda, and tasks feel as obligations. People become less willing to do effort and to keep account with others, making the reward of cooperation lower. Such a network could be called ‘sick’.

Usually a life cycle can be observed in networks. It starts with people who share the ambition to tackle a problem or who inspire each other with a new idea. They form an informal network that attracts others. Over time they turn to action, requiring a structure with task division, specialisation and communication procedures. As long as the members remain interconnected and keep on learning the network develops in a healthy manner. The maintenance of structure always costs energy, but the synergy that is created keeps the balance positive. Sooner or later however the structure cannot keep abreast with the growing complexity, the reward decreases, and the energy balance turns negative.

The difference between healthy or sick is connection. When essential feedback mechanisms become distorted, the network looses its capacity to respond adequately to new circumstances. In animals and plants the structure looses its flexibility over time, ultimately causing death. By dying they make place for new life. Human networks can dissolve into chaos, or turn into inert structures when the powers that control order happen to be strong. Revival is only possible when someone takes up leadership and does what is needed to restore connections again, bringing new life into the network.

Vital space

This relatively simple metaphor has an interesting consequence. The process of life is autonomous and cannot be controlled. This means that inducing change is not a matter of gaining control, but creating a conducive biotope for the forms of life one hopes for. A crucial element of the biotope for any kind of healthy network is trust. People only engage into task division as they can trust that others will do their share, and they are only prepared to engage into a learning process with others as long as they can trust that their relative uncertainty will not be abused. This trust creates a space where people are curious and like to experiment. I call this the ‘Vital Space’ since it is essential to healthy networks.

One can hope that vital space will grow, but the harder one tries to achieve it, the less likely it is that he will succeed. By the way, this is true for most good things in life such as spontaneity, joy, creativity, trust, natural authority, and last but not least: love. Elster speaks of by-products because they cannot be manufactured directly (Elster 1983). On the other hand one can do a lot of things to spoil it. “Trust comes by foot but goes by horse”, as an old proverb says. This is where we should look for opportunities to intervene. If we can discover what blockages are hampering the living process, and if we can do something to remove them, this is the way to improve the biotope for a healthy network, and to restore its responsive capacity.

At this point, the principle statement in this paper has been made. The metaphor of living networks offers a perspective on strategies for change that is not yet common: instead of the well known project approaches, applying strategies and instruments for reaching clearly defined targets that can be accounted for, it advocates the creation of space by removing blockages, requiring tailor made interventions in order to link people together. But: is there any empirical ground that supports such a theory? How precisely does it differ from mainstream ways of thinking? How do you assess the nature of a blockage, and what kind of leadership will be required in different cases? The following paragraphs will briefly address these three questions.

Dutch Agriculture as a Living Network

The biotope of a 'Golden Age'

In the period 1960 – 1985 the Dutch agricultural sector conquered a strong position in the world market as third largest exporter of agricultural products. This is remarkable for such a small and densely populated industrialized country. The average productivity per farmer became the highest in the world. How can we understand this success? And also the problems that occurred later on?

The basis was laid right after the Second World War, when food security was top priority. Mansholt, as minister of agriculture, emphasised the creation of strong farmers organisations that were given far reaching responsibilities in agricultural policies. Furthermore, the agricultural knowledge system including extension, research and education (under the management of the ministry of agriculture) was upgraded and given plenty of room to do what was necessary. All efforts were focussed on creating conducive conditions for average farm households with perspectives (the 'stayers'). Technology was made appropriate for their circumstances, and market conditions were manipulated in order to ensure stable prices and reduced risks.

The policy was so successful that at the end of the fifties the national market became saturated. Then the focus shifted to the world market. This required a major effort cost effectiveness and by consequence farm scale had to be increased. Many small farmers had to leave, but at that time employment was no problem. Nevertheless, the policy remained basically the same: strong influence of farmers organisations on policies, generous support from the knowledge institutions of government, and the focus on relatively small family farms with perspectives. Meanwhile Mansholt moved to Brussels to repeat his success story at the level of Europe as the first commissioner for agriculture.

The agricultural sector became a network with a strong identity: task division and specialisation developed autonomously whereas the connections were maintained by the knowledge system. Notably the extension service kept communication lines between farmers and research short. Likewise extension personnel facilitated the policy making process as well respected partner in farmers associations at all levels. The steering network consisted of farmers leaders, politicians, high ranking officers and scientists who all shared the same background and ambition, and who regularly changed position amongst each other.

Loss of responsive capacity

The first signals of trouble appeared at the end of the sixties, when environmental protection became an issue for critical groups in society. However, farmers control over the market (cooperatives dominated the retailing system), politics and science had become so strong that these signals could easily be ignored. It took until 1984[3] before political pressure overruled the resistance and the first restrictive

[3] In this year the first restrictive measures were being taken: quota for milk by the European Economic Community, and a stop on investments for animal production on sandy soils.

measures were taken by government to reduce overproduction and pollution. By then, the bill to clean up the mess had become very high already.

Although the agricultural network could be considered as internally healthy, it had built a structure that had made itself too much independent from the outside world. So, at the level of society the system had become ill, resulting in high costs for the environment, for the taxpayer paying for overproduction, and for the Third World that could not cope with the unfair competition at the world market.

Desperately looking for new answers

Today, 20 years later, many farmers struggle with low or negative incomes and poor market perspectives, although they heavily invested in the latest technologies for efficient and environmentally friendly production methods. They lost their once so strong political influence. The market is no longer dominated by farmers' cooperatives but by supermarket chains instead that show no loyalty to farmers. As if this is not yet bad enough, farmers are plagued by one disaster after another: swine fever, phytophtera in potatoes, foot and mouth disease, and recently (2003) bird pest for which more than 20 million chickens (one fifth of the total population) had to be destroyed.

Most people realize that the agricultural sector cannot continue on the current track. The costs of labour, agricultural land, and the expenses for a clean environment are too high for bulk production such as grains, milk, eggs and meat. The capital- and knowledge intensive agricultural system should turn to specialities, niche markets and high quality genetic material, whereas another part of the farming community should re-integrate with its environment in order to maintain the landscape and to satisfy the needs of regional consumers. Although this already was the outcome of a national debate in 1994 -1995, serious reforms did not yet break through. It appears to be really hard to change patterns.

Yet, roles have changed dramatically within the system. The sector no longer sees government as the partner that stimulates growth, but as the bureaucrat that is limiting its possibilities by a forest of partly unrealistic rules. The knowledge institutions have become independent and they are struggling to survive at a competitive market for knowledge products. The strong identity of the sector made way for a much more fluid complex of smaller networks that compete each other. Nevertheless healthy networks of innovative entrepreneurs still exist, but they have the feeling they are rowing upstream.

Perspectives for healthy networks in agriculture

The glue is gone and needs replacement. In the past there was an army of free running intermediates (extension workers, researchers, teachers), provided by the knowledge institutions, who maintained the connections between all relevant stakeholders in the agricultural network. They facilitated the social learning process, both for the technical and the political aspect. The old system had to change, because of the changed position of government, the grown complexity of the system, and the fact that new stakeholders entered the field to claim their share of the rural area. Now new intermediates are needed to do what is necessary for stimulating new networks to develop and to keep them healthy.

At this point in time, the biotope is not yet favourable. Too many actors, including the knowledge workers, are forced into a survival mode, leaving no room to do what is necessary at the network level. There are government funds for stimulating innovation and participatory development. However, the culture of accountability determines to a large extend the possibilities for action, and most often leaves little room for tailor made solutions. Furthermore, the bureaucracy poses a threshold that is difficult to overcome for many initiative takers.

The perspective of living networks suggests that the seeds of new life are everywhere: one can always find people with good ideas and the willingness to get into action. For getting new networks to flourish, a new generation of intermediates is needed with sufficient room to do what is necessary to remove blockages. Probably it is also necessary to reconsider the ways of thinking that are dominant in circuits of decision makers. The step from gaining control towards creating room is not an easy one.

Dominating arguments

Rationalities

People tell stories about the way the world is functioning. Some of these stories, paradigms or rationalities as they can be called, become so dominant that many people act accordingly, thus making these stories true. To a certain extend, that is, because reality is always more complex than any story could describe. When the disparity between rationality and reality becomes wider, people are no longer capable of solving their problems along the lines of thinking they are used to, because this was how these problems were created. Then a new rationality can break through and become dominant. Although any description of dominant rationalities runs short, the following mainstreams can be recognised in the post war period, at least in the scenery of Dutch agriculture. In this paragraph I will indicate where the ecological rationality is different from the others.

The instrumental rationality

In the instrumental rationality the world is a technical challenge. The more people know, the better they are able to set the right goals and make the appropriate instruments. This rationality dominated from the fifties until the nineties. There was great optimism that science would solve all problems and bring prosperity for all. Knowledge is equal to the objective truth, or the best way. Change is achieved by developing appropriate knowledge and disseminating it to the beneficiaries.

When during the eighties serious problems surfaced, people kept on believing strongly in technical solutions. For example, research was expected to develop such solutions for the massive surplus in animal manure. Thus, painful measures like reducing the number of animals in the national livestock would not be necessary. At least such measures could be postponed as long as the search continued.

Beyond a certain complexity systems become inherently unpredictable[4]. Then science looses its capacity to generate firm answers that could guide decision makers. This is aggravated by conflicts of interests. At a certain stage, opposing parties each call on their own scientists to support them in their battle. With conflicting interests it is hard to agree on the truth. After twenty years of debate in the Netherlands opposing parties still do not agree on reasonable norms for minerals and nitrate that should be allowed while fertilising the soil with organic manure.

[4] This is the basic statement of the chaos theory: Gleick 1987.

The instrumental rationality is effective as long as actors have a shared interest, and as long as there is confidence in expert knowledge. Whenever is not the case, people need another rationality to find effective answers to changes in the environment.

The strategic rationality

In the strategic rationality the world is a jungle where the fittest will survive, an arena where one can win or loose, or at best a market place where people seek mutual gain, based on well understood self-interest. Knowledge is a product, that can be produced, traded and purchased. Its value is not necessarily determined by its scientific validation, but by the value for the client. Change is achieved by influencing the market conditions. The free market stimulates all actors to concentrate on their specific qualities, and punishes inefficiency.

When it appeared impossible to take necessary but painful measures to clean up the trouble that was caused by instrumental thinking, the strategic rationality became dominant in the early nineties. Government put itself at a distance from other stakeholders, extension was privatised, and also research had to deliver products in search for funds. Government transformed itself to a client of knowledge products, paying for specific extension activities or research projects. Researchers became producers who had to deliver what the market demanded. Barriers should be removed in order to let the free market forces do its work. Government had to determine the borderlines of the arena, and repair the "market imperfections". In fact, the dominance of the expert was being replaced by the dominance of the financer.

When market forces are pushing actors too far into a survival mode, collective interests become the victim. Individual interests and short term goals tend to come first. When government tries to repair this, i.e. by investing in programs of public interest, its effectiveness is hampered by the fact that it is no longer able to attune to actual needs. The short information lines have been broken up, and the strong emphasis on equal treatment of all and accountability of public spending brings along bureaucracy and the inability to support tailor made solutions.

The strategic rationality is effective when actors can compete in an open market with effective procedures to prevent monopolists or drop-outs. However, when power struggle escalates, it is hard to see how this can be stopped. The capacity to solve problems of collective interests and long range risks is limited as long as strategic thinking is dominant.

The communicative rationality

In the communicative rationality the world is a village of interdependent people. As long as they are not aware of this, they are digging their own grave. Sustainable solutions will only emerge from social learning processes in which the stakeholders take each other as well as their ecological environment seriously. Knowledge in this view is not the objective truth or a product to buy. Instead it is an individual construct: a complex of language and theories that individuals use to understand what they see and to decide on what to do. When people in a network share the same constructs, we could speak of collective knowledge. Change can be stimulated by facilitating social learning processes.

Already in the seventies and eighties development workers in Third World countries found out that, in spite of their 'advanced' western knowledge and technology, they stood with empty hands trying to help people under conditions that differed too much from the situation for which that technology had been developed. They had to learn how to learn together with their beneficiaries. In the nineties rural development in the Netherlands had become a multi stakeholder process that could only lead to satisfactory results when stakeholders would be prepared to learn together. Where communication between stakeholders like farmers, consumers, policy makers, researchers, nature protectionists and others fail, people get locked up in self-referential circles where they nurture their prejudgements about the others and become incapable of understanding viewpoints that differ from their own[5].

Although communicative approaches as a possible escape from the current problems recently are gaining attention, it is still hard to see how this would translate into structural measures such as a better financial regime for research, extension and education programmes, or a revision of tasks of public services. This is a serious problem, because strategic thinkers are not easily convinced that communicative approaches will be more effective than restrictive rules set by government in combination with the hard lessons that are imposed by the free market.

The communicative rationality is effective as long as actors are willing to engage in a social learning process in order to work towards agreement on collective action. However, such processes are easily obstructed by actors who hold hidden agendas or refuse to cooperate.

The ecological rationality

In the ecological rationality the world is a huge living organism, consisting of countless living networks (Lovelock 1979, Capra 1997). Also human networks behave as living organisms that can be healthy or sick. The term "ecological rationality" is borrowed from Röling and Jiggins (2000), who called for a new way of thinking that would enable mankind to respond to the enormous ecological challenges that are being caused by human activity in recent time.

The ecological rationality entails a different view on the role of knowledge again. All living organisms, however simple, are capable of perceiving signals and giving responses. Varela (1999) defines this principle as cognition: the mechanism through which living creatures are being structurally coupled to their environment. Humans have developed the capacity to communicate in abstractions. This has enlarged their range of perceptions enormously, because they can form very complex images of reality and they can exchange these images amongst each other. Therefore they can learn much faster than any other living creature. Still, the basic function of knowledge in this view is to ensure structural coupling with the environment, or as Maturana and Varela (1987) put it: "Knowledge is effective action in the domain of existence". This includes explicit and implicit theories, but also skills, behavioural patterns and intuition, in short: everything an actor uses to respond on signals. This applies to individuals as well as networks at a higher level.

This view on knowledge could be seen as a wider version of the one in the communicative rationality. The notion of vital space deviates more substantially from other rationalities, especially when it comes to the purpose of intervention. An instrumental goal is legitimised by its uncontested scientific value. It indicates the best way to gain control over the circumstances. A strategic goal is legitimised by the interest of the one who sets out for action. It is the way he thinks he can win. A communicative goal is legitimised by the participants. It is their understanding of serving their collective interest. In all three cases goals define a desired situation that should be achieved by gaining control.

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5 See e.g. Van Woerkum (1997, 2000)

The purpose of intervention in the ecological rationality is to restore connection, in order to allow vital space to grow. When the process is blocked because there is too little focus and coherence, targets and rules might helpful. However, the process can also be blocked by too much structure. Then intervention is needed to break down unproductive procedures and to allow for new experiments. For a healthy network is not necessary that actors agree with each other. A certain doses of conflict is useful for growth, as long as actors stay in contact. Sometimes it is even necessary to fight, if important collective issues are at stake. In contrast with strategic approaches the purpose of fight is not to win, but to force others into positions where they have to take each other and their environment seriously again.

This comparison leaves many options open for intervention from an ecological perspective. The last paragraph sheds some light on the practical use.

The Circle of Coherence

Interaction patterns

If intervention is to remove blockages in the collective learning process, we need to identify such blockages and we need to know what intervention might help to remove it. The Circle of Coherence *(figure 1)* is a model that clarifies how knowledge develops in a network. It distinguishes between interaction patterns that can become dominant and turn into regressive forms of escalation.

The model displays two dimensions:
<u>The knowledge dimension</u> refers to knowledge in the broad sense: images of reality, capabilities, behavioural patterns: in short all that is being used from perception to action. Knowledge development can take place between two poles:

- *Similarities*: There must be sufficient recognition in order to interpret new signals.
- *Differences*. There must be a certain degree of confusion in order to be interested to learn.

Between the poles people can be curious and develop new knowledge. Upon too much confusion people limit their perception, whereas upon too many similarities healthy people respond by looking for new differences that can always be found.
<u>The position dimension</u> refers to the relations between actors in a network. There must be a certain degree of trust to allow others to get involved in individual learning processes. Again collective learning can take place between two poles:

- *Individual*. There must be room for authentic individual input.
- *Collectivity*. There must be sufficient attuning to the needs of the collectivity of the network.

Too little room for individual expression and safety drives aggressive. Too little attuning leads to loss of collective protection and added value. This causes fear. Aggression stimulates to enlarge individual space, whereas fear stimulates to more attuning. The borderlines of trust are constantly shifting and need to be probed all the time. This is the natural drive behind games, and it is satisfactory to do so.

These two dimensions are similar to the well known phenomenon that every communication contains messages at two levels: the level of contents and the level of relations. The added insight is that healthy systems are self-regulatory. Children are curious and like to play. The mechanisms to return to the middle are built-in. This central part of the circle is called the *"vital space"*.

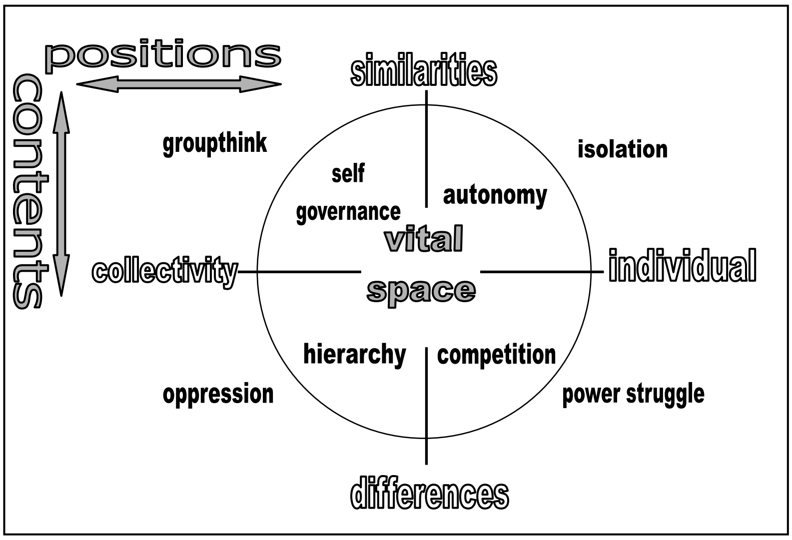

Figure 1: the Circle of Coherence

In the Circle of Coherence different interaction patterns can be distinguished.

- *Autonomy*. Actors interact on the basis of exchange. The balance of give and take should be positive.
- *Competition.* Actors feel challenged to give their input, striving for a better position.
- *Hierarchy*. Actors accept differences in influence and a certain discipline for the sake of the network.
- *Self Governance*. Actors take their responsibility on the basis of dialogue from equal positions.

These four interaction patterns contribute to healthy networks where social learning takes place, because they all stimulate actors to give more input and to attune better. Thus, they take responsibility for the network. The patterns will alternate over time, because in case one pattern becomes too dominant there will be actors taking up leadership to balance the situation again.
Each of the these patterns have also a regressive variety in which actors find different reasons for not taking responsibility. Their attitude provokes behaviour amongst other actors that will reconfirm their reasoning. Consequently such patterns escalate towards regression.

- *Isolation*. Actors flee from interaction and create their own security. They feed their illusion of being be free by minimizing the influence of others.
- *Power Struggle*. Actors fight to gain influence to the detriment of others. They feed their illusion of not being free until others have been beaten.
- *Oppression*. Actors are passive in resignation. They feed their illusion of not being free until others have made it possible for them to act. This goes for the oppressed saying that every move will be punished by their oppressor. It also applies to the oppressor who fears that his subordinates will abuse every freedom he would allow them. Both parties are prisoners of their mutual behaviour.
- *Groupthink*. Actors are passive in adjustment. They feed their illusion of being free as long as others secure their freedom. They cannot take the risk of being authentic because critics could put the collective values at stake and marginalize their position in the network.

The term "illusion" is a judgement from the point of view of the actor that intervenes. He assumes that actors are interdependent and should restore interaction. Whether his assumption is correct remains to be seen: actors might have good reasons to act as they do. The point is that in the view of the intervening actor something needs to be done to restore the responsive capacity of the network. This responsiveness is being blocked by an escalating pattern in which actors refrain from taking responsibility, either for attuning (isolation and power struggle) or for authentic input (oppression and groupthink). Lack of attuning leads to chaos, and lack of authentic input leads to inert structures. The networks capability to respond depends on the responsibility its constituting actors take. We might as well call the Circle of Coherence “the Circle of Response-Ability”.

Contrary to healthy interaction patterns the regressive ones do not correct themselves because actors feed the illusions of one another. That is why such patterns tend to escalate. It takes leadership to break out of the vicious circle. At least one actor should change its attitude in order to alter the pattern, either independently or with help from an intervening party from outside.

Effective leadership must be tailor made. An intervention that helps in one case might be counter-productive in another. For example, in the case of isolation it might help to bring in inspiring views and opportunities. This can change the perception of actors who feel that the network takes more energy than it generates. In the case of power struggle such an intervention would be counterproductive, because there are already too many conflicting views on what should happen. In the case of oppression it would not help either, because actors will always find reasons why any effort will be frustrated by the other party. If groupthink occurs, people deny having a problem and will not be interested in views on how to solve them. A complete overview of leadership roles related to each interaction pattern goes beyond the scope of this paper. The issue here is that leadership essentially is appealed to restore the connections between actors in order to make the network responsive again. Every blockage requires its own specific approach to break through the illusions that keep actors from taking their responsibility, assuming that they have a common faith.

Communicative interventions are effective as far as actors are open for communication. If they deny the problem or blame others for causing it, they will be less accessible for communicative messages. This is of course a gradual scale, ranging from curious actors to those who will abuse every information to feed their own illusions. If the latter is the case, communication does not help anymore. Then only position game is left to influence them. This however is a risky approach because the use of power easily feeds escalating patterns as well. The intervening party that is exerting power should be well aware of what he is doing. The difference between further escalation and restoring responsiveness is respect. The ultimate goal of leadership should not be to win, but to restore relationships. The effect should be that actors take positions in which they treat others, as well as their natural environment, with respect.

Conclusion

One step in a row

The ecological rationality as explored in this paper is again a story about the way the world is functioning: a simplified image of the complex reality. It will not be the last one. It is an effort to become more effective in meeting the huge challenges we are facing. It provides tools to be elaborated further. Tools for those who are willing to give up their ambition to control and who dare to enter into a dance with life. On every step life will respond, requiring a new authentic step from our side. This dance can only partly be learned, and dancing schemes offer only limited repertoires. People who go blind on models create accidents, because they are unable to perceive the signals that do not fit into the model. Probably we have to learn to respond more by intuition. However, that intuition can be sharpened by models that help to recognise and to distinguish. This is the intention of the Circle of Coherence.

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Learning Innovation: Teacher Education for a Multidimensional Agriculture

Edvin Østergaard and Erling Krogh*

In this paper we explore the challenges in the education of teachers for an agriculture that undergoes profound changes, in Norway as well as in the rest of Europe. We argue that this new situation requires a new awareness of and emphasise on the skills of change and innovation for both farmers and teachers who are to train pupils in becoming farmers. We discuss some pedagogical perspectives on the education of teachers using phenomenology as a point of departure. Phenomenology in this context is a tool for learning, in regard to both understanding the diversity of current Norwegian agriculture and training the basic skills of teaching. Finally, we argue that emergence of the multidimensional agriculture must be accomplished by a teacher education emphasising the training of multiple skills. In a world of constant change and development, the students learn how to become agents of innovation.

Agriculture's complex and changing situation today, from a narrow-oriented private food production sector to a broader societal activity, poses challenges to the education of teachers in agriculture.[1] One of the main challenges is to focus on the skills of change and innovation as key qualifications, for agricultural workers, as well as for teachers who are educating these persons. The farmer requires a competency of change and innovation in order to cope with processes of change, which characterizes the everyday of a practitioner. In addition, the skill of seeing new possibilities and adapting to new societal trends and demands seems to be of current importance. Similarly, the teacher educating pupils in agricultural schools also requires such a competency. Norwegian teacher education in agriculture has always had a perspective on the *dual teacher competency*; on the one hand the competencies connected to the actual occupation or profession, on the other and the multiple competencies of teaching. In this paper we discuss the dual challenge of educating teachers in agriculture that is changing. Which skills of innovation and change are demanded, both for farmers and teachers?

The Agricultural University of Norway has offered teacher education in agriculture, fishing and forestry (hereafter called agriculture[2]) since 1965. Since 1999 the teacher education at the Norwegian Agricultural University also include life sciences in addition to agriculture. This teacher-education program can be taken as a one-year full time study, or as a part time education over two years. The latter is more suitable for most of our students because it enables them to combine education and work. Most of the students are already engaged in teaching or other occupations. Those who are teachers mostly work in upper secondary schools, while a lesser number are from lower secondary schools. The education is practice based, emphasising training of basic competencies and skills in the process of

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1 In this paper we distinguish between teacher *education* and teacher *training*: We use the term teacher training as a subset of education, emphasizing the training of skills. This distinction is in accordance with Codd (1997) who defines training as competency-based, skill and vocationally oriented learning, whereas education more is connected to learning of attitudes and transferable knowledge.

2 We use the term *agriculture* as an overall concept which includes all the traditional trades, as horticulture, fishing and forestry, but also the more recent farm professions as "farm teaching" or health care advisory. In Norwegian, the current term for this is "naturbruk", literally translated "nature use", which emphasises the use of nature in a broad sense, from management of natural resource to facilitating children's learning on the farm as a classroom.

becoming a teacher.[3] Main aim of the teacher program is to educate teachers and learners for the current and future Norwegian society.

The Current Situation in Norwegian Agriculture

Norwegian agriculture experiences much of the same economic and structural changes observed in other affluent western European countries. The share of population working in agriculture is decreasing at a steady rate. In 1900, some 85% of the people lived in the countryside - closely associated to agriculture. In 1950, around 50% of the population lived in rural areas. Today 25% live in the countryside and only around 10% of rural inhabitants work within agriculture. The number of operating farms is rapidly decreasing and farmers increasingly become part-time operators. Some 60% of the farmers that took over the farm from 1993-1997 take less than 50% of their income from the farm (Tviberg and Haanes 1999). Many farmers now diversify both with respect to on-farm and also to off-farm activities, combined with part-time agriculture. This may involve daily or weekly commuting, often accompanied by “Farm Office Online” activities. Others may take over the farm, but rent out land and other capital assets, such as the barn, storing facilities, machinery etc. Two thirds of the Norwegian farm owners do not send in the Farm Tax Form, implying that they do not have substantial operational income from the farm. This opens up possibilities for entrepreneurial machine farmers. The peak labour and harvest periods in Norwegian agriculture of 2003 are dominated by this group of farmers, with their large machines, travelling between the farms to plough, sow, spray and harvest the areas they own or hire and manage around in the villages. In spite of this process of structural changes and “monoculturing” of Norwegian agriculture, we still find smaller farms with production diversity. This is most likely due to governmental subsidies to smaller animal production farms which the farmers still received up to the middle of the 1990`s. In recent years, such farmers have had possibilities for new sources of income.

Parallel to these immense changes in the conditions in Norwegian agriculture, we also see an outspoken development regarding the attitude of the consumers and citizens. The urban public is no longer content in viewing agriculture as a privately owned source of food production (Lieblein et al. 2000). Especially the last decade, society has shown a growing demand for the ecological, ethical and social dimensions of the agricultural production and use of rural resources (Wilson and Morran 1990). Individual farmers are now beginning to relate to this challenge. We see the development of activities and productions that can cater for emerging focus on identity needs in the “Dream Society” (Jensen 1999), linked to experience of nature, therapy, education, organic agriculture, food culture and the conservation of natural and cultural landscapes. In the region of Nord Trondelag in Norway cooperation between local schools and farms is developed in all of the municipalities (Jolly et al. 2003).

This change does, however, presuppose a reconditioning of the farmers’ competence and identity from being oriented towards traditional agricultural products, to a stronger focus on “identity products”, on the landscaping of farming and on documenting and selling the production processes – both in private and public markets. These changes challenge the traditional production-oriented paradigm in Norwegian agriculture, because they generate a need for a broader competency among farmers and extension workers (Lieblein et al. 2000), as well as for teachers in the agricultural upper schools. Earlier, the farmer could simply deliver his/her products to wholesale companies. Today, the new situation often forces the farmer himself/herself to become a sales person when a higher price for the “identity products” is demanded. Further, the farmer often has to relate to the public, whether it is kindergarten

[3] The education is named “Praktisk-pedagogisk utdanning” (“Practical-pedagogical education”) and presupposes a Bachelor or Master degree in agriculture (animal husbandry, plant production, management of natural resources etc.).

children, school children, pupils with learning or social disabilities, persons suffering for substance abuse or psychiatric patients.

The Question of Farmer's Competencies

For the problem formulation in this article, two aspects of farmer's new competencies is important: firstly the need for developing the skill of acting according to a situation characterised by change and uncertainty, and secondly the need for the farmer to extend his/her competency to include the professional interacting with groups or individuals who participate on the farm, with the farmer.

Farm management is a matter of making the totality on the farm run in a satisfactory manner. This requires a manifold of knowledge and competencies, from knowledge about the various activities and productions, short term and long term economic planning, to knowledge about the surrounding world, marked possibilities etc (Østergaard 1997). As farming is an activity in constant change due to climatic conditions, marked situation, unforeseen events etc, a key competency is the skill of adapting to the current situation (Nitsch 1990 and 1994). This is a lasting process of decision-making that is integrated in the farmer's daily work activities (Nitsch 1990). In order to cope with the changing situations on the farm, the farmer is in a continual dialogue with the surroundings. This dialogue is characterized by the need for new knowledge *and* the skill of interpreting and adapting this knowledge to the farm situation. This *adaptive rationality* is an act of interpretation that is guided by the farmer's experience and competence on the one hand and his/her goals and visions on the other (Nitsch 1994).

The conversion from conventional to organic farm management can form a fruitful case for discussing farmers` skill of adaptation and change. Farmers` motivations for converting to organic agriculture is both influenced by societal movements and environmental initiatives and driven by the need for realizing personal ideas and visions (Østergaard 1998). For the farmer, converting the farm is a profound process involving many dimensions. One might even say that the farmer converting to organic farming undergoes a personal "shift of paradigm" (Østergaard 1997). Conversion itself implies an application of new knowledge and new ideas to the farm's site-specific conditions. In order to become indigenous to the farm, the farmer is in a process of change and is practising and developing the capability of adaptation. Further, this skill is of vital importance in a situation with rapid economic, political and social changes in agriculture. Today's agriculture is put under pressure by consumers who demand cheap food and by policy makers who are aiming at cutting the subsidies. In this situation competent organic farmers have an advantage because they have trained the skill of adaptation (Morgan and Murdoch 2000); they have practiced being in conversion and they have acquired the capability of adapting to new conditions.

Therefore, for the farmer this skill of adaptation implies much more than coping with changes due to natural variations or agronomical, political and food marked dimensions. In a situation where farmers are combining traditional production of goods with social welfare or pedagogical activities on the farm, the skill of adaptation also can be regarded having social and pedagogical aspects. By meeting and receiving school classes on the farm, by using the farm as a classroom, the farmer's adaptive skill is needed in order to facilitate the situation as a learning process. The skill of adaptation is needed for relating to different school classes according to age, gender, individual differentiations or special needs. In this manner, two kinds of adaptive skills are intertwined: the practical adaptive skills and the pedagogical adaptive skills.

These changes in farmer's competencies will necessarily lead to changes in curriculum in regard to the education of farmers. How can teachers in agriculture facilitate for pupils' learning of this skill of adaptation? And, on the next level, how can an educational program for teachers in agriculture incorporate the training of adaptation and innovation? Before discussing these questions, let us first examine the teacher's competencies.

The Question of Teacher's Competencies

The competencies of a teacher are manifold. Five different kinds of competencies are defined in the Norwegian guidelines for teacher education (National Curriculum Guidelines 2003):

- S*ubject-oriented competence*. This competence is based on the content of the profession for which the pupils are educated. A teacher in plant production has to have basic knowledge about this profession and its different sub areas, for example applied biology.
- *Didactical competence* implies the skill of facilitating pupils learning processes – planning, accomplishment and assessment of teaching. This is a core competence for the teacher, used every day.
- *Social competence* implies the skill of co-acting, cooperating and communicating with as well pupils – individually or as a group – as parents and colleagues.
- *Ethical competence* implies the capability of reflecting on moral and ethical aspects of the profession and how these issues pervade the daily decisions a teacher has to make.
- *Innovation and development competence* implies the skill of renewing and developing ones own knowledge and pedagogical activity as a teacher by taking part in innovative school initiatives.

For our teacher students, the first of these competencies relates to the actual teaching in agriculture, whereas the other four competencies may be regarded as equally important for all kinds of teaching activities. The subject-oriented competence is related to different professions within agriculture, not only encompassing the *knowledge* aspect of agriculture (knowledge about grain production, animal husbandry, forestry, fishing, etc.) and applied life sciences (knowledge about biology, chemistry etc.). It also includes the *skills* involved in agricultural professions and the *attitudes* connected to and underlying the teaching of these subjects and their purposes in society. Teachers` competencies are generally expressed through the four last competency categories. However, the specific subjects in the curriculum also influence these competencies. For example, the social competency is based on knowledge about common social values. Teachers in agriculture need profound knowledge about the importance of social values for good agronomy. Farmers use some basic values – as independence, proficiency and management responsibility –when deciding what is right or wrong, agronomical sound or not (Vedeld and Krogh 2003). It is obvious that the competent teacher in agronomy treats and teaches the agronomical knowledge as "embedded" in these values. Similarly, the ethical competency of the teacher in agriculture is influenced by society's demand for animal well fare and ethical sound production practices in agriculture. For the experienced teacher in agriculture, these two aspects of ethical competence are intertwined.

The skill of innovation and development is already stated as one of five major competencies a teacher should have and which the teacher education should educate for. This means that teacher students must receive practice in learning innovation and how to participate in developmental processes related to actual school situations. As we have argued, training of this skill is of special importance in today's agriculture. The next question is therefore: How do we actually facilitate for the training of the skill of innovation and adaptation in the teacher education program?

A Phenomenological Perspective on Teacher Education

A phenomenological perspective on educating teachers in agriculture is relevant for two reasons: Firstly it opens up for a broad, perceptible access to the social and natural world, thus being a complement to the more cognitive based science education, and secondly, it very explicitly emphasises the training of skills. One of the objectives of our teacher education is to develop basic skills of learning facilitation through a deeper understanding of the interaction between man, nature and society. In a phenomenological perspective, a person's connectedness to nature is much more than a subject's relation to objects (stones, plants, animals) and processes (physical, chemical, biological) in nature. Rather, this relation can be described as a complex web of a person's acting and interacting in nature and in social and cultural contexts (Krogh 1995, Strangstadstuen and Østergaard 2001).

With a starting point in phenomenology as a branch of philosophy, we have over the last years developed phenomenology as a theoretical foundation for our teacher education by transforming the mere philosophical dimensions into practical-pedagogical guidelines for teaching. In this approach, we stress the perspective and participating dimensions of teacher education as much as the cognitive training: Phenomenology provides a shift of focus from *understanding* the world to *perceiving and acting* in relation to the world (Østergaard 2003). According to the French phenomenologist Maurice Merleau-Ponty, our relation to nature is primary a doing, not a knowing relation. Merleau-Ponty argues that our consciousness and our ability to think is based on our already being and acting in the world:

> "… consciousness is in the first place not a matter of ´I think´ but of ´I can´" (Merleau-Ponty 1945/1962: 137).

In the academic world, we are often confronted with the attitude that the theoretical knowledge we gain automatically can be transformed into action whenever we wish. According to Merleau-Ponty´s interpretation of phenomenology, it is just the other way around: Our already being in the world and our developed acting skills form the basis for developing thinking skills. This focus in phenomenology emphasises our experience and our experiential acting in the world. Lived experience "overflows the boundaries of any one concept, any one person, or any one society. As such, it brings us to a dialectical view of life which emphasizes the interplay rather than the identity of things" (Jackson 1989: 2). In this sense, phenomenology is a tool for understanding and reflecting upon experience. It is an attempt to describe human consciousness in its lived immediacy, before it is subject to theoretical elaboration or conceptual systematizing. Phenomenology is not aiming at explaining phenomena by reducing them to facts, determinants, hidden principles or cognitive patterns (Jackson 1996). Phenomenology is a methodology for illuminating life as people themselves see it.

This phenomenological perspective is in accordance with the theories of John Dewey on learning and experience. According to Dewey, the task of the teacher is to provide for the pupil a vital and personal experience by focusing on…

> "… what there is in the child's present that is usable with reference to it. (…) He is concerned, not with the subject-matter as such, but with the subject-matter as a related factor in a total and growing experience" (Dewey 1961: 105).

Experience is a core concept bridging the gap between phenomenology and learning. The pupils bring their individual experiences into the classroom; the teacher on the other hand must take this experience in account in order to reach and understand the pupils` life worlds. Dewey argued that knowledge is derived from *embodied* intelligence, and not from an abstract reason having an existence independent of the senses and affections of the lived body (Dahlin 2001). For the teacher, understanding this embodied intelligence implies taking lived experience as a point of departure in teaching.

Dahlin (2001) criticises a particular trend in educational research and practice that focus on the mere cognitive dimensions of learning. The basic feature of this trend is a one-sided focus on conceptual cognition and concept formation. He argues that mainstream theories of science education should be complemented with phenomenological perspectives. This trend can also be found within the teacher education programs, even though agricultural education always have had a strong basis in applied natural and social sciences. A goal of the education at the Agricultural University of Norway has traditionally been to apply theoretical knowledge in extension, locally based research and rural development. In this sense, phenomenology forms an opposite pole to the cognitive academic trend, and at the same time a further development of a teacher education based on practical application of theoretical knowledge.

In Norway, active use of nature is not only connected to agricultural production, but also through for example shorter or longer hiking in the mountains or forests. This specific way of using nature can be regarded as a common cultural trait and the cultural meaning is acquired through walking (Teigland 2000). In addition, creating and rebuilding their own identity is a main attention of youths in the "Dream Society".

The last decade, "horse girls" have secured the number of pupils in many Scandinavian agricultural schools and thus have saved these schools from being shut down. Tiller and Tiller (2002) have done a qualitative study of letters where the girls in a Swedish agricultural school describe their learning situation. Many of the girls experience that the practical horse lessons inspire their theoretical learning. Two of them are cited below:

> "Monday morning. The clock alarm wakes me up. "Oh, no, do I have to rise? Then I experience that it isn't so hard. First lesson: Horse and stable. It is good to be in the stable and talk off the weekend. Just being in the stable and talking with the horses is a pleasure… You can clean your head to manage to concentrate on the rest of the day."
>
> "Of course there are subjects that are quite dull and hard to learn, but I feel that learning has become more "cool". Even the English lessons have become more interesting. I feel more responsibility for my own learning; that I learn for my own sake and not only for getting good grades. The combination of theory and practise is excellent. Some times we even have theoretical lessons down in the stable. Then learning becomes living and interesting" (our translation) (Tiller and Tiller 2002: 113-124).

Tiller emphasises that none of the letters express negative critique of the school or any of the teachers, even though the letters where guaranteed to be exclusively for the researchers. Interviews and end additional evaluation gave the same impression. The pupils show gratitude for having the possibility to attend to the school. Both explicitly and implicitly the pupils express the importance of the combination of practical and theoretical learning.

The girls` interest in and care for the horses is consciously taken as a point of departure for teaching agriculture and life sciences in many of the Scandinavian agricultural schools. In connection with our Teacher Education Programme at Agriculture University of Norway, we have visited several "horse classes" in different parts of Norway. Our experience is that a teaching focus on girl/horse relation and horse interest seems to motivate learning about "dull" themes as anatomy, fodder production, biological processes etc. Skilled care taking for the girls` beloved horses presupposes competence in illness diagnosis and how ways and kinds of foddering influence the well being of horses in different situations.

Learning Innovation and Development

A good learning situation is a setting where the student can practice several of skills simultaneously. Before going into these skills more in detail, let us start with an example: Every autumn, a student teaching period is arranged in a cabin up in the mountains, above the tree line. Our students are encouraged to go into the natural surroundings and develop "learning biotopes" connected to subjects in life sciences or agriculture.[4] The aim of this exercise is threefold: Firstly; to find and define a teaching-sequence on basis of a chosen "learning biotope" in the vicinity of the cabin. Secondly; to teach the other students and teachers from this "learning biotope" for 5 to 10 minutes. And thirdly; to reflect on the relation between the use of the chosen biotope and the goals of the teaching sequence by asking. One of the student-groups chose an old stone cottage as a "learning biotope":

> Such stone cottages were a traditional way of building houses in this area due to the lack of trees, but with sufficient stone material. First, we were taught about the walls and their function, both concerning insulation and as a foundation for the roof, which had to hold the additional weight of one and a half meter of snow in winter. Then we were told to study carefully the thick logs which supported the roof: Where did we think these logs come from, considering that we were situated fare above the tree line? Eventually, one of our students, who himself teaches forestry, told us about the characteristics and origin of "malmfuru" logs (logs of pine heartwood) which had to be brought up from the nearest valley. The building of stone cottages was in this way put into a historical, local and cultural context. Both the physical and biological resources, as well as the human resources were involved in this "learning biotope", thus giving it a dimension bridging several subjects in life science and professional activities. (Strangstadstuen and Østergaard 2001).

This kind of exercise encourages the students to use the whole range of skills which they have been trained in: the skills of observation, reflection, communication and participation (figure 1). Being innovative is in this context connected to being a teacher and creating an environment for learning. Thus, the four skills that are to be described further, we relate to the *act of teaching*:

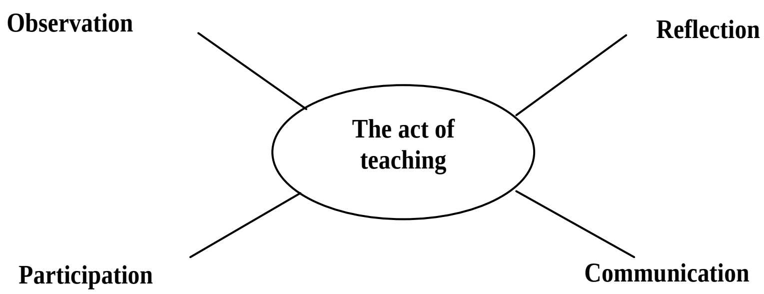

Figure 1: Basic skills related to the teacher's act of teaching: the skills of observation, reflection, communication and participation

The skill of observation is profound because it provides the basis for learning and reflection. Traditionally the virtue of observation has been emphasised in life sciences: By the careful observation of phenomena in nature, the very secrets of nature were revealed. Similarly, the careful observation of the skilled agricultural practitioner has been an important pedagogical foundation in agricultural training and education. For the teacher we here again find the dual perspective: It is necessary that the skill of

[4] In biology, a *biotope* is a place defined by a characteristic composition of plants and animals. Translated from Latin, a biotope is a place (*topos*) for living organisms (*bio*). A *learning biotype* can thereafter be defined as a place where the characteristic ecosystem composition is used for teaching and learning (Strangstadstuen and Østergaard 2001).

observation is trained also in relation to the pupil. Observing phenomena in nature and agriculture is in our training program complemented with exercises involving pupils. Through interviews and conversations with pupils, students are practicing the skill of observation. Such conversations form the basis for understanding the pupils` life world, but also improving ones own teaching.

The skill of reflection is closely related to the observation capabilities. One might even say that reflection starts with thoroughly observing *one's own prerequisites for learning*. The individual and group based reflection is a driving force for renewal and change – on the personal as well as on the organisational level. In our education, several exercises aim at connecting theory with experience. The task of pedagogical literature the students have to read during education is to reflect their own experiences as a teacher and learner. By reading theory, concepts and words are put on emotions and attitudes that maybe have been hidden from childhood. By putting words to own experiences, and by communicating feelings and emotions from teacher practice periods in relation to pedagogical theory, the experiences can be shared in the larger group.

The many skills of communication is therefore of great importance in the teacher education. Many of our new students share the opinion that this is the main skill to be trained during the education. Through exercises in writing, verbal communication, story telling and ICT, this skill is being practiced. We especially emphasise communication between the students themselves through daily written and oral communication. Due to a shift of focus from teaching to learning, the teacher needs to emphasise methods for mutual communication with the pupils more than one-way dissemination of knowledge. In this perspective, reflection is a mode of communication, just as communication is a mode of observing and reflecting upon the "inner" personal landscape.

The skill of participation is trained through the students' guided practical teaching periods in the schools. During the education, they receive between 12 and 14 weeks of guided practice in teaching situations. From a phenomenological point of view the skill of participation is perhaps the most important one. The participatory teacher is a person who is deeply involved in the learning situation and who is committed to the school and the pupils. The teacher is not only facilitating for the pupils` learning; the teacher is herself/himself a part of an ongoing learning process. Further, the participatory teacher is also relating his/her teaching to current issues in society and the rural community. In a situation with rapid societal and rural changes, the training for participation is of vital importance for education of teachers in agriculture.

These four skills are of course not trained separately; they are all intertwined, they are all found in the actual act of teaching. By using real situations, as shown in the example above, we are aiming at a case-based mode of teaching (Strangstadstuen and Østergaard 2001). Practicing these skills enables the student consciously to meet the world as a teacher. In a world of change and uncertainty, the students learn how to become agents of innovation.

Conclusions

Our teacher education program started in 1999, which means that we now have more than four years of experience with using this phenomenological approach to learning and teacher. Our experiences, which also are indicated through the students evaluations, can be summarized in the following manner: The students experience a phenomenological perspective on learning as very relevant and practical, due to the fact that it starts with the reality itself and not with theories, models or abstract ideas on how to teach. And because of the explicit emphasis on the training of skills, the students feel that they are met individually, with their own personal qualifications: During the education, they have developed useful tools in their profession as teachers. However, many of the students, especially those with an academic background, are sometimes provoked by the emphasis on the senses and the training of observation skills. This non-cognitive approach to learning and teaching is unaccustomed to students who are used to reading and thinking in order to learn something. During the education many students experience a shift of focus in their view on learning, from a main emphasis on *imparting* the knowledge, to an emphasis on *cognitive and perceptive skills* as incorporated in their teaching skills. This feedback from the students is interesting because it shows how a certain attitude towards learning is implicit in their previous scientific and academic education. Our challenge is to facilitate for the students to reflect upon their own view on learning and teaching.

Evidently, modern teacher education in agriculture is faced with new challenges due to the growing awareness of and focus on natural environment, agriculture and use of nature. New challenges are met with new ideas about how to teach, which role of the teacher should have and how the pupils` learning can be improved. The emergence of the multidimensional agriculture in Norway and Europe is a fact due to immense political and environmental processes of conversion. This process must be accomplished by a teacher education emphasising the training and education of multiple skills. Traditionally, agricultural schools have contributed to development and innovation in rural districts in Norway. This role is of vital importance in today's` situation in agriculture. As the case is also for the education at the university level (Lieblein et al. 2000), the agricultural schools need to provide dynamic learning environments for the pupils that provide not only knowledge, but also skills of communication, creative problem solving and innovative thinking. This is why teacher education in agriculture itself has to be innovative and this is why the educators themselves have to practice the skills of innovation.

The situation in Norwegian and European agriculture and society will most likely be radically changed within the next decade. In order to prepare for this transition, the students themselves must continue the lifelong learning process that started during the education in order to become agents of innovation.

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Management of multidimensional farming - the perspective of farm enterprises as heterogeneous self-organising systems[1]

Egon Noe*

Abstract

The whole modernisation process has led to a tremendous increase in productivity, but also to a lot of unintentional effects on the environment, landscape, and the possibility of livelihoods in the rural areas. The call for sustainability and multifunctionality constitutes a tremendous challenge to the farm management, to handle this whole range of voluntary and/or forced consideration of the agenda of multifunctional agriculture. In this paper this challenge is analysed and discussed from the perspective of the farm enterprise, explored as a self-organising system/network. Including a historical perspective the barriers for the development of multidimensional management are analysed by the concepts of knowledge, complexity, network relation and meaning. It is concluded that multidimensional farming is a challenge, not only to farm management, but also to a co-evolving development of the surrounding actor-networks. Development of multidimensional farming takes three co-evolving processes: - a reconstruction of the values and ideas around which the farms enterprises are organised, - a new way of reduction of complexity, shifting from reductionism to systemic knowledge, and: - a development of network relationships that facilitate network building of multidimensional farming.

Introduction

The history of modernisation of agriculture is the story of exclusive attention to technological efficiency in food production, and in recent decades there has been a strong specialisation into monocultural farms. Changing conditions in terms of technical features and market are normally seen as the major rationale and driving force of this specialisation. However, the growing amount of knowledge and how this knowledge is produced and circulated may be an even stronger factor of explanation for this development and thereby a key to understanding the challenges and obstacles to the development of farming which takes into consideration ecological, social and political factors, hereafter abbreviated as "multidimensional farming".

A century ago, all farms were multidimensional in their way of organising, not for romantic reasons or because of certain values, but because of the rationality of multidimensionality seen from a biological and social as well as from an economic point of view. The majority of people were farmers and the farm was the horizon of their lives. The whole modernisation process has been a clash with the rationality of multidimensionality, as a first step to increase food production to a fast growing population and, as a second step, to increase productivity to release labour to the growing industry. As we know, this focus has led to a tremendous increase in productivity, but also to a lot of unintentional effects on the environment, landscape, and the possibility of livelihoods in the rural areas. In the seventies it raised the debate on sustainability, mainly focusing on the environmental aspect, and in the last decade more focus

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has been put not only on the negative side effect of farming, but also on the necessary, positive effects that we want farming to have in the rural areas.

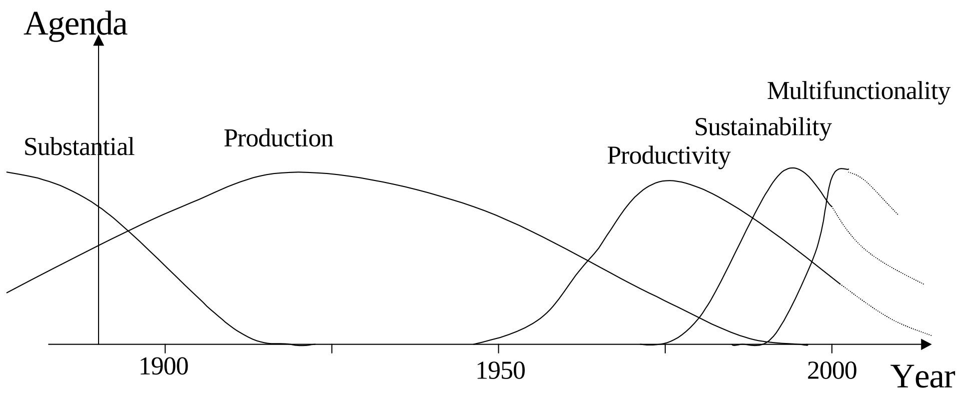

Figure 1: The changes, goals and agendas of agriculture in Denmark

The call for sustainability and multifunctionality constitutes a tremendous challenge to the farm management of profitable farm enterprises, to handle this whole range of voluntary and/or forced consideration of the agenda of multifunctional agriculture. Although one could easily argue that taking a comprehensive view on the different aspects on farm-environment relationship the development of multidimensional farming is much to prefer to a development that focuses on one aspect only, namely the increase of productivity, there is a hegemony of the development of one-dimensional, organised farming. A way to understand the barriers for the development of multidimensional management is to include a historical perspective on the development of one-dimensional management within the theoretical framework presented above, and from here to discuss the challenges to the management of multidimensional farming.

The key question is: how can the farmer/farm enterprise mobilise and reproduce the necessary knowledge and skills (e.g. in terms of labour and consultants) into the management process of the multidimensional agriculture without losing the internal coherence and strategy of the enterprise, and without loosing all the power of efficiency in food production obtained?

In the following, I will analyse this challenge through the glasses of a theoretical framework of farm enterprise as a self-organising system (Noe and Alrøe 2003 and 2004). The model is based on a combination of some of the core ideas from Latour, Law and Callon's Actor-Network theory (ANT) and Luhmann's theory of social systems.

A farm enterprise explored as a self-organising system/network

The self-organization framework is elaborated and discussed in two papers by Noe and Alrøe (2003 and 2004), and will only be briefly elaborated here to establish a necessary platform from which to discuss the implication of multidimensional farming to the skills knowledge and labour involved in such farming processes. This framework builds on Peircean semiotics and on a combination of ANT and Luhmann's systems theory.

If we approach a farm as an actor-network, there are a lot of dynamic objects[2] that are translated and enrolled as actors/actants into the objective of farming. Those are the cows, various kinds of machines and technology, the fields, sunshine, rain, computers, various kinds of plants, labour, family labour, experience, skills and knowledge, values, goals, etc. depending on the heterogeneous strategy of the enterprise.

To add to this complexity, the heterogeneous network of entities enrolled is not limited to the physical site of the farm. A lot of what we could call external dynamic objects are enrolled and mobilised as actors into the farming processes: seeds, semen, advisors, capital, magazines, weather forecasts, fodder, food chains, colleagues, knowledge, labour, subsidies, etc. The kind of entities and actors that are enrolled or not enrolled into the network, and how they are enrolled, is characteristic of the enterprise, e.g. whether the commercial consultants or the consultants of the farmers' unions are enrolled and to what kind of performances they are enrolled (see figure 2).

One may easily realize how important it is for the economical results of the farming processes that all of these interactions in the actor-network are balanced in accordance with the strategy of the actor-network, no matter whether it is based on a high or a low input strategy. Ewert and Browns's (2003) case description of the quality of labour in the reconstruction of wine-production from low-quality to high-quality wine is a good illustration of the importance of this coherence. Farm enterprises producing grapes for low-quality wine, cannot easily reorganise its network strategy to produce grapes for high-quality wine together with the other changes of the network strategy. It takes training of the workers and reconstruction of how these workers are mobilised into the actor-network from low-salary workers to skilful workers of the farm enterprise.

It is important to notice that the dynamic objects enrolled as actors in the actor-network of the farm enterprise can be actor-networks or artefacts dependent on other actor-networks, e.g. in the shape of consultant offices, dairy companies, wholesalers, etc. organising their own heterogeneous complexity, or artefacts produced and reproduced by other actor-networks like tractors and computer programmes. There will, therefore, be a tension in the interactions between the actor-networks. The mobilisation and implementation interpretation processes will always be connected with a negotiation process.

A particular farmer's expectations to a certain consultant may differ very much from the consultant's ideas of her own role as an advisor. The same applies to technology, software, and knowledge. An artefact like a computer programme to optimise pest control is produced from a certain set of ideas of how farming is organised. The company tries to mobilise the farmers to use the programme that they produce, through advertisements, salesmen, policy, etc., and the farmer tries, if he is persuaded to buy, to translate the programme into the management processes of the farm enterprise, which may differ very much form the expectations of the company.

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[2] We use here the notion "dynamic object" in a Peircean sense, as a theoretical understanding of an object with all its different possibilities and attributes independent of an observer or interpreter, vs. the immediate object, which belongs to the environment of an observer. Translated to ANT the dynamic object is equal to the entity of an object and the immediate object is equal to the object mobilised into an actor network as an actant. In Luhmann's terminology the difference between the dynamic object and the immediate object is meaning of the object belonging to the encompassing world and the selections of meaning belonging to the environment of the system. We here apply Luhmann's notion of meaning in a more generalised form referring to all semiotic relations where interactions include an interpretation, while Luhmann restricts his theory to account for communicative (social) systems and psychical systems. Luhmann's notion of system environment is here regarded as the horizon of the system, and the encompassing world is regarded as the idea of the world as it is, independent of a particular observer.

ANT is a strong framework to understand and visualise the heterogeneity and complexity of a farm enterprise, and to stress the importance of coherence in the network–strategy. A farm enterprise can be explained as the coherence of how the dynamic objects (artefact, objects, product companies, people, etc) are involved in the network strategy. Not only in terms of the technical coherence as Barbier and Lémery (2000:385) stress, but as the coherence of the entire socio-technical network including sense-making and social interaction. However, ANT has a very weak theoretical expression of how this cohesion is produced and reproduced. The encompassing world of the actor-networks continuously produces a surplus of possibilities and options, and coherency must be ascribe to network internal operations, and thereby to a process of self-reference and self-organisation (see figure 2).

Luhmann offers a comprehensive theory on self-organising of social systems (Luhmann, 1995). Where ANT focuses on the heterogeneous openness of relations between the entities of the social, biological, and technical domains of the world, Luhmann takes the opposite position in his theory of social systems and focuses on the operational closure necessary for any system to operate itself.

Food production may be organised in numerous ways according to different goals and purposes, e.g. organic or conventional production. The farm enterprise as a heterogeneous social system must select a meaning in the surplus of possibilities offered by each object that is mobilised into the system/network, in order to be operational. The network or system needs to make or select its own meaning to make a situation of coherence possible, and thereby deselect a whole range of possibilities. According to Luhmann, the production and reproduction of such system meaning must be an internal process of the social system, in this case the farm enterprise. The encompassing world will always offer a surplus of meaning, e.g. of all the ways in which a computer can possibly be mobilised into the farming processes only a few can be actualised in a coherent strategy.

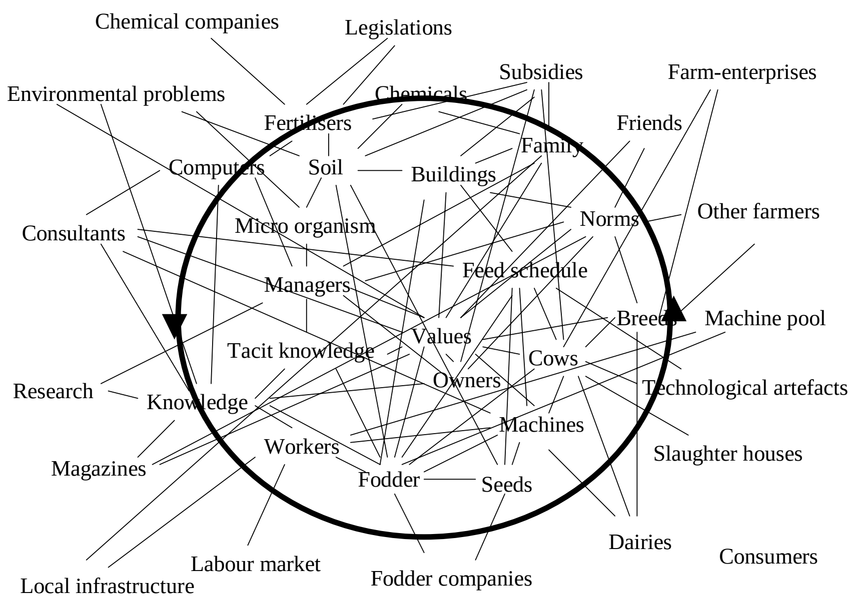

Figure 2: A simplistic illustration of a farm as a network of internal and external relations. In ANT there is no hierarchy of interaction. Knowledge, machines, livestock and chemical products are all at the same level of interaction in the network. This makes the model both very simple and very complex, simultaneously, because it means that no part of the farm can be studied as a matter of only biology, technology, economy or sociology. The circle illustrates the necessary process of self-reference and self-organisation to make the mobilisation and coherence of the farming network possible.

Using Luhmann's theory this way, the notion of selection of meaning is extended to account all semiotic relations generally, where an interpretation is possible, and not communicative relations only. The self-organisation of such heterogeneous social systems, as autopoietic, is then a process of increasing of nonredundant complexity[3]. Every selection of object and of meaning (possibilities) linked (or created by the autopoietic system) to these objects, which are enrolled as actors and intermediates into the actor-network, adds to the complexity of the network/system. And again, this selection/creation of meaning must be a system-internal and self-referential operation, by which the system draws its own operational boundaries. Selection of objects and meaning adds to the system-complexity in terms of what the system can observe in its system environment and in terms of what the system can enrol in its strategy. This implicates that coherence of a farm-enterprises cannot be explored only by studying the objects enrolled into the systems, but that the coherence needs to be studied from the perspective of the system/network – the network-strategy to coherence. The farming styles studies can be used as examples of how these operational boundaries can be studied. Ploeg (1994), Noe (1999), and Chiffoleau (2003) have committed some excellent studies of how different strategies form different clusters of interrelationships. In these studies, farming systems are typologized with respect to the meaning around which they are organised.

Another characteristic of an autopoietic system is that it has its own internal system rationality or schema at its disposal. Autopoietic systems are operationally closed systems, which means operationally self-sufficient and self-generation systems without input form the outside. This means that the system must produce its own input for operation (Luhmann 1995). E.g. the needle does not produce the feelings of pain whereas the person, who feels the pain, does. The nerve cells are only transmitting impulses, and it is in the mind that this disturbance is translated into pain. So, it is the internal schema of the system and not the specific quality of the perturbation that defines how a system reacts to a certain perturbation.

The notion of self-reference thereby leads to a general understanding of observation, namely, that it is the internal complexity of the system that is limiting the capability of the system to observe itself and the capability to observe the encompassing world.

Neither Luhmann nor ANT provides us with a notion of a farm-enterprise as a unity within the heterogeneous nature of a farm enterprise. Here, I would like to draw a parallel to the existentialist physiologist Victor Frankl's (1993) idea of the unity of a human being[4]. Frankl claims that the unity cannot be found in a reduction in multitudes of perspectives, but in the overlaying guidance of meaning. Based on his experience in the concentration caps during World War II Frankl (1984) developed a (logo) theory and therapy that emphasizes the role of "meaning" for survival. Only people who could continuously find and reproduce a meaning of life had a chance to survive. Furthermore, meaning must refer to something in the encompassing world. Self-realisation as a goal cannot substitute this reference to the encompassing world; the more a man strives for self-realisation as the end goal the farer away form self-realisation he moves. Only by referring to meaning in the encompassing world, self-realisation is possible as a by-product spin-off. Selection of meaning becomes a pre-rational condition for any rational operation, just as it is not possible to believe in God as a rational choice, just because we know that it is good for one's psychological well-being to do so. If the belief is an instrumental choice it will not work as a meaning. Frankl (1984) uses a chess metaphor to describe this contextuality of meaning. If you ask a chess player what the best move in the world would be, he will tell you that it depends on the actual position and the person against whom you are playing. A parallel can be drawn to heterogeneous

[3] Maruyama uses the term nonredundant complexity for systems-complexity that cannot be reduced to simpler patterns, see e.g. Maruyama (1995: 225-229).

[4] Luhmann refuses the idea of a human being as a unity from an epistemological standpoint, saying that there is no position from where such a unity can be observed (Thyssen, 1997)

social systems. Just as meaning is essential to the unity and survival of a human being, I claim, that meaning is essential to understand the unity and internal coherence of a self-organising social system. Without meaning in Frankl's sense, the selections of objects and meaning in Luhmann's sense will be arbitrary and the systems will fall apart.

The challenges to the management of multidimensional farming

In the following I will base the analysis of the challenges to the management of multidimensional farming on the logical shift in management from subsistence /traditional farming, to one-dimensional organised farming (see table 1).

Table 1

	"Traditional farming"	**One-dimensionally organised farming**	**Multidimensionally organised farming**
Knowledge	Endogenous	A-contextual scientific	Contextual (systemic learning)
Handling of complexity	Historical based practice	Reduction of goals and power of calculation	Differentiation of task and increase of internal organisatory complexity
Network relations	Autonomy and local	Few specialised – global Independent	Many specialised – global and local
Meaning	Local embedded norms and culture	Self-interest and maximum food production	Co-evolution and co-operation with the society
Values and goals	Survival of the family Subsistence economy	Maximum food production Profit of enterprise	Increase network quality Plurality of incomes by co-operations

Knowledge and learning

Traditional farming was primarily organised around local indigenous knowledge developed through a long-term practice and interwoven in stories, norms, rituals, etc. (see e.g. Ploeg and Long (eds.) 1994). In a sense, an effective and stable way of organising the management processes as long as the surrounding, social-technical environment is rather stable, and the farming system is interwoven in a larger network of dependent relations with the society in terms of economy, knowledge, supply etc. But when an external or internal wish of a rapid change of goals and reorganising of management processes occurs, such a local, embedded practice shows a lot of inertia and is difficult to change. Norms and rituals become out of context and were seen as major obstacles to modernisation.

The modernisation process of agriculture in the direction of one-dimensional farming is a change of the idea of ideal knowledge (to base the organising of the farming processes) from local contextual knowledge to global acontextual scientific knowledge. And here we can observe a coevolving and symmetrical process in the way in which agricultural knowledge has been produced and the way in which farming is organised (Norgaard 1994). The ideal scientific research is to focus on one or two factors and to keep all other possible factors stable to isolate the significant effect of input on the output result. The strong and, for the increase of productivity, very successful rationale of one-dimensional farming is the power of reduction and control, combined with a narrowing of goals, but when it comes to multiple goals, the paradigm of reduction shows its shortcomings for handling this explosion in linear complexity of multidimensional farming. The increasing computer power has not solved the problems, so far (McCown 2001). These computer programmes either become very narrow in their perspective or based on very naive assumptions of the effects and relations.

To apply the knowledge generated within the paradigm of reductionism the farmers needed to keep the context as simple as possible, keeping all other variables constant. To illustrate this, the majority of cows in Denmark in the mid 70s were being kept on stable around the year, presumably because of an idea of being in control, of making conditions that match the fodder experiments, although it was detrimental to the welfare of the cows and a more expensive way of feeding them. The main reason for science not producing results from grazing was that it was impossible to make these fodder experiments in a scientifically acceptable way.

Management of multidimensional farming has to cope with multiple goals and aspects in the systems environment. Here I will argue that we need to change our understanding of ideal knowledge from a-contextual, scientific knowledge to a contextual, systemic knowledge. Systemic knowledge is here defined in a in a very broad sense, as the system's expectation of what "happens if" both to the internal network of the system and to the systems environment. Systemic knowledge can be represented within the system in many ways in terms of beliefs, myths, stories, tacit knowledge, intuition, formalised rules and models - what the system knows about itself and its systems environment. There are at least four ways in which a self-referential and self-organising system can develop on and improve its knowledge about the complexity of the farming system and of how the farming system responds to the multiple goals.

1. As a learning process (Bawden 1991) through reflexive processes between outcome expected (involving values and knowledge) and outcome observed
2. Translation of scientific ("a-contextual") knowledge, which means knowledge produced with another context into the context of the farm enterprise
3. Systemic research paradigms that try to focus more on the systems context, in which the interaction studied are embedded, than to isolate the interaction from their embeddedness (Alrøe and Kristensen 2002). Farming systems research is an example of these approaches (see e.g. Conway 1991; Mogensen and Kristensen 1999)
4. Co-learning by identification of similar farming practices (Ploeg 1994) or cooperative learning processes through social or institutional organisations (Barbier and Lémery 2000).

Learning processes may involve more or all of these approaches simultaneously, but with Barbier and Lémery (2000:348) it is important to stress that there is "no learning without change". Systems knowledge is about how the system views its environment, and thereby how it organises itself. Then, knowledge is not necessarily an additive game building more bits to the construction, but may be a game of reconstruction and re-conceptualisation as well, depending on the mindscapes of the people involved in the learning processes (Maruyama 1985).

Ways of handling systems complexity

Referring to Luhmann, the complexity of the systems environment (that the system can cope with) is dependent on the internal complexity of the system. Although we may not understand it as a simple zero-sum game, there will be some kind of trade-off between specialisation and generalisation. The more elements included in the systems environment the less possibility for these elements to be observed and handled by the system in a sophisticated way, unless the systems complexity is increased.

Traditionally, farming was organised around a certain cultural practice, and a range of cultural repertoires developed from generation to generation (Ploeg 1993). Farming organised around a cultural practice contains a great complexity of knowledge based on cultural experience and failures, but like crop rotation, etc., most operations are given, and only few operations are open for decision-making.

The project of modernisation was to depart from practice and tradition to 'rational choice' decision-making. To pursue this strategy, another way to handle and increase systems complexity was needed: reducing the number of elements of systems environment relevant for the system and increasing sophistications of systems by a network of linear calculations applied in a persuasion of strategic rationality. The key elements of this strategy was first of to focus on one goal of maximising only, and secondly, to reduce the complexity of production by reducing the numbers of products and by isolating each product for partial optimisation, keeping all other factors constant. E.g., decision-making in the stable and in the field has become widely independent of each other, which can be seen, for one thing, in the way in which the Danish agricultural research as well as the advisory service has been organised.

The call for multidimensionality therefore necessitates a dramatic increase in internal complexity of the system to observe and handle the entire different dimension, i.e., a farm-enterprise needs to have a notion and knowledge on nature quality to take up nature quality as a goal in the decision-making. There are different ways to increase system complexity. One is to mobilise complexity that is organised by other systems/networks e.g. to apply a developed practice, which is known or presumed to take different considerations into account, as is the case with organic farming.

Another strategy is to increase the capacity to cope with organisational complexity, e.g. by reflexive learning, training and education as described above, by coordinated division of competences, or by mobilising more resources into the actor-network, e.g. advisors and decisions support systems (Noe & Halberg 2002).

Whatever strategies are applied to increase systems complexity, there is a need for an increasing effort to secure internal coherency of the actor-network strategy. This sense-making convergence[5] processes becomes more and more important with increasing complexity and as a communicative process within the actor-network between humans and organisations enrolled in the network strategy.

Network relations - cooperation with the encompassing actors

From the ANT we know that multidimensional farming involves interaction with many different actors representing the different dimensions. The strategy behind the paradigm of the one-dimensional farming is to reduce the entire dimensions of the project to the dimension of a market, to commoditise all the functions, as the strategy of OECD (OECD 2001).

Development of multidimensional farming is not only an internal process of the farm, but a process of co-evolution (Norgaard 1994) between the different actors and actor networks/systems. Just as traditional farming was interwoven in a complex, local network of interaction, multidimensional farming needs to be interwoven in a network of both local and global actors, e.g. in terms of labour, knowledge, advisors, interest organisations (see e.g. Vanloqueren 2003).

In the paradigm of one-dimensional farming approaches the surrounding actors (the market) are regarded as independent of each partial decision. In the paradigm of multidimensional farming, development necessarily has to be understood as a process of co-evolution, and each decision has possible impact on the surrounding actors and visa versa. In this dynamic perspective, agricultural sciences play a very important role in changing/not changing the scientific paradigm from reductionism to systemic contextual knowledge.

[5] A notion borrowed from Barbier and Lémery 2000:385.

Conclusion and perspectives

Multidimensionally organised farming is a shift in meaning and organising values – a shift in paradigm. In traditional farming, meaning was not an individual task, but was embedded in local norms and cultures. The individual person was not free to choose whether he wanted to be a farmer or not.

The shift to one-dimensional farming was closely connected with an ideological break with norms and culture by an individualisation of interest. The goals of maximizing food production had become the meaning of farming in relation to the society, separated from other interests and meaning that had previously been connoted with agriculture. In a situation of overproduction and regulation of food production, enterprises organised around the meaning of maximizing food production ended up in serious identical vacuums, an existential crises, as we could observe from the farmers' very strong reactions against the environmental debate in the 80s in many countries. The meaning linked to farming has been even further narrowed down to the self-referential meaning of profit.

The meaning was linked to the development of one-dimensional farming as was maximum food production. Multidimensional farming can be seen as a search for a new meaning of farm enterprise in relation to the surrounding society in terms of the many possibilities for actualisation of meaning linked to the surrounding society. Profit becomes thus not a goal on its own but a spin-off of the actualisation of meaning in relation to the surrounding world. Like Frankl's (1984) example with sex and love: a good orgasm is a by-product of forgetting yourself and focusing on the other person.

Multidimensional farming is a challenge, not only to farm management, but also to a co-evolving development of the surrounding actor-networks. The challenge is how to reframe the problem of increase of nonredundant complexity, and to co-evolve a network of multidimensional farming. I argue that development of multidimensional farming takes three co-evolving processes:

- a reconstruction of the values and ideas around which the farm enterprises are organised,
- a new way of reduction of complexity, shifting from reductionism to systemic knowledge,
- a development of network relationships that facilitate network building of multidimensional management,
- and research plays an important role in these processes of co-evolution.

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Innovation and Development: Intensification / Disintensification Paradigms – Reflections from the French Experience

Gilles Allaire* **and Jean Boiffin****

Introduction[1]

Intensification and the resulting specialisation of farms and regions are characteristics of the history of agricultural modernisation. It is an economic dynamic that results from private decisions made by farmers in order to respond to market incentives, in a context where the main agricultural markets were growing and stabilised. But it is also a dynamic fostered by the production and diffusion of knowledge and technologies through the diffusion of intensive models. These models are social constructions. The process of intensification starts off with the diffusion and implementation of generic technologies provided by industry upstream, and of scientific and technical knowledge produced by public research, para-governmental and professional R&D services and suppliers. The process was maintained by the productivity gains thus generated and sustained by collective action and public policies. In France, the period of modernisation that started in the 1960s, was characterised by an increase in the budget dedicated to research in agronomy, by a development of professional networks, and more generally, of technical consulting services provided to farmers. A sequential division of labour progressively emerged in the system of production and diffusion of technical knowledge. Thus, calling into question the intensification of agriculture comes down to calling into question this model of Research & Development.

No doubt today we can observe farmers' innovations corresponding with a downturn in the quantitative objective of maximizing the production per unit, actions which can be considered as disintensification processes. Generally, such an innovation is not an isolated action regarding a single factor, but implies associated issues. So, disintensification as intensification are concerning the production system as a whole. Disintensification appears as an alternative way to orient technological choices and to construct coherent production systems, at least at the level of one individual production unit.. New policies are designed so as to favour such an evolution of farming practices, expecting qualitative benefits from it, in particular with regard to ecological environment. The aim of this communication is to question the emergence of a paradigm of disintensification, as a consistent logic of innovation and as a collective development process.

Intensification can be considered as the result not only of economic mechanisms, but also of a logic of innovation that has guided private and public investments, at least during the so-called «productivist»

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1 This communication presents reflections based on the confrontation of socio-economic and agronomic researches carried out by the authors, respectively on farmers' skills, professional organisation, and technical and economical information systems (G. Allaire), and on cropping systems (mainly in a context of arable crop) (J. Boiffin), in a period of time from early 70's to late 90's. Both authors have an extensive experience of partnership with R&D and extension organisations in France. Because we have adopted a synthetic point of view in this temporary version of our communication, no bibliographical references are listed in the text. Previous papers of both authors, which are listed at the end of this document, contain references regarding the topics of the present paper.

era of agricultural growth. In light of this evolution, we put forward the hypothesis that a «disintensification» should also be based on a logic of innovation. Disintensification therefore necessitates instruments of economic policy that modify or counterbalance the mechanisms of specialisation, and a reversal of the innovation logic. We address logics of innovation related to intensification or to disintensification, by opposing both paradigms and the periods of time in which they emerge. Thus, we highlight the questions raised by the construction of a logic of disintensification. Indeed, a logic of innovation that takes into account multidimensional criteria requires other types of connections between research and development and between supply and demand channels.

This reversal of logic calls into question the role of private, collective[2] and public[3] actors, as well as the organisation of R&D systems. We do not aim, in this article, to address all these issues, but we wish to provide elements of reflection for the analysis of R&D systems through three complementary insights: that concerning the technico-economic logic, that concerning the logics of innovation and finally that concerning the networks of actors. The three first sections analyse the paradigm of intensification and the third following examine the conditions of emergence of an alternative paradigm.

1. Intensification: a technical and economic logic

The more intensive agriculture is, the more units of physical factors are used per operational unit of land or of breeding (field, animal) and higher the physical output are (physical yield). As a macro process (intensification regarded at the level of a production chain or at the national or European levels), the intensification is a complex social process. To start the analysis of that process, we first define "*intensification*" as a management principle (or a convention of productivity) *oriented by the objective to increase yield by operational unit.* We call *paradigm of intensification* dynamics, including intensive technologies, consistent logic of innovation and R&D actors system, oriented by this principle.

Intensification can be expressed by economic ratios which indicate the importance of physical capital (or of other production factors than land) in the production process. Intensification generates productivity gains by exploiting 'economies of scale'. Economies of scale are indirect consequences of the substitution of labour by capital, considering that this substitution permits efficient specialisation in the use of both land and labour. This analysis can be extended to the level of territory or of an economic system as a whole: the gains related to intensification are realised through processes of specialisation and sectoring of markets and functions..

The productivity gains related to intensification do not result from the replacement of (any) labour by just any capital. They are the result of the substitution of labour by what can be called a *technical capital*, which has several crucial properties. The «intensive» models are not only characterised by economic ratios, but also and essentially by knowledge and technologies[4] that can be defined as «generic» in a double sense. First of all, they lead to the production of standard mass products. Whereas, in the old past, local markets were exhibiting a wide range of qualities and commercial networks were organized by the merchants, the modern intensive agriculture inscribed itself in a perspective of homogenisation of the production. That led to an 'industrial' conception of the product, defined by minimal standards such as bacteriological standards for the milk, alcohol content for wine ,

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2 By collective actors we refer for example to farmers unions and several other professional structures which, together, constitute professional networks.

3 Public research for example.

4 Or «models of production» as the actors of development call them.

specific weight for grain, etc. It is this type of generic product which, directly or indirectly, is the object of market organisation public policies (CAP). Secondly, they rest on *generic techniques* (industrial chemistry, mechanisation, automation, varietal selection, chemical protection of plants….) and on *generic technical knowledge* (experience plans to compare technical variants and to select those which unlock productivity). This knowledge is based on the generalised use of the experimental method that requires the breaking-up into factors of the processes of production, and which is related to the concept of limiting factor. Standardisation of products reduces market costs and generic techniques make possible to enlarge operational production unit, to standardize prescriptions and reduce technical communication costs. The 'artificialisation' of agronomy (modification and homogenisation of local conditions) completes and reinforces the logic of intensification. These evolutions generate systemic productivity gains.

Intensification directly concerns elementary practical technical systems ('workshop') or operational units which technology and activity resources are identified for. It is at this level that the principle of intensification operates, for example through the choice of crop variety and technical inputs. Technical innovation, at that level, rests on the breaking-up of the production into technical factors (research and correction of the limiting factors), in relation with generic technologies and problem solving procedures. The 'farm' is the economic entity that provides the means of production (land, capital, labour) to the unit and possibly, concurrently, to other units. It is at this level that the phenomenon of specialisation operates. The market permits the acquisition of the generic technologies and the selling of the production. At the market level, a farmer realises the benefit of specialisation by having access to inputs and commercialisation networks. Thus, the farms specialisation goes hand in hand with territories specialisation, which, again, does not mean that it is an automatic process: it is possible through the specialisation of the professional networks and of the industrial fabric of agro-food firms.

The dynamics of specialisation is conditioned by all sorts of 'rigidities' (fixed factors) and 'indivisibilities' which give rise to counter tendencies at the different levels. We distinguish three levels: the operational unit, the farm, the production basin. At unit level (workshop), technical rigidities are linked with materials capacities and skills scope. At farm level, organisational rigidities are related to the human and social capital endowments. At the territory level, rigidities appear in professional and market networks. Processes of intensification and specialisation operate through the transformation of these technical and organisational structures. Considering 'rigidities' is considering costs of flexibility. By mitigating these costs, the diffusion of generic resources releases these rigidities linked with resources heterogeneity.

Intensification is also related to an institutional context. The development of the intensification paradigm depends, on one hand, on the evolution of the family patrimonial strategies, on a minimum level of technical and accounting education, and as historians have shown, on the opening up of the farming communities. It depends, on the other hand, on public policies : not only the market organisation policies (which secure the anticipations of the economic actors) but also on the socio-structural agricultural policy (promoting the mobility of factors of production) and more generally on development policies which consist, in particular, in providing support to research and to the diffusion of knowledge as well as to professional education and training.

All in all, intensification, as a global process, is the result of a social logic, related to the values of «progress» or «modernity». Thus, many actors have been involved in the process of intensification. And if the desintensification process was to occur, it would also involve many actors.

2. Intensification: a logic of innovation

Provided there is no uncertainty concerning products definition, market outlets and performance criterions, intensification is a winning logic of industrial development: any technical progress such as described above, is guaranteed to lead to an increase of income at the farm level. It is a logic of innovation in a double sense: firstly it is a self reinforcing logic as soon as it is supported by the overall economic development (but there is no general economic law in favour of intensification…); and secondly, because it provides a path of professional development.

The intensification principle is a way of looking at things: breaking-up into activities, and then into technical factors. One cognitive issue regarding the logic of innovation is how the two sources of production knowledge are integrated, the first one being the experience of the professionals and the second one, the technical and scientific experiments. As we have seen, the intensification principle, through specialisation dynamics, is an integrative model. However, the spreading out of generic technologies and the diffusion of the intensification logic result from diffusion of both new materials and knowledge, which can only be diffused in a receptive and even proactive (i.e. generated by the farmers initiatives) environment. In this view, farmers are not only assumed to rationally react to intensification incentives, but also to be receptive and active to absorb and construct technical knowledge. Among the other processes rendering this proactive receptivity, there are processes of professionalization:

- The diffusion of basic technical and analytical accounting skills (according to normalisation of the professional capacity),
- The professional organisation and the diffusion of know-how (constitution and functioning of local professional groups and professional networks).

In this perspective, the role of professional skills oriented by the intensification logic must be highlighted. The process of productivist innovation in agriculture («the 1960s model », in France) has been based on the development of farmers' individual and collective skills which has enabled farms, not only to adopt innovative techniques, but also, for a good part, to design and develop them. From this point of view, the intensive models were jointly constructed from downstream industrial development, from research in agronomy and from the experience of operators in the fields or stables.

3. Intensification: A system of Research and Development

The innovation logic corresponding to intensification has been supported by an efficient system of Research and Development with a strong public research component and an equally strong professional component. The organisation of development rests on allocation of roles between public, para-governmental and professional institutions (co-operatives, R&D institutes or others). This mechanism is frequently described as corresponding to the stereotype of the «linear model of innovation», that is a « Research/ Research and Development/ Development» chain where «products» that are increasingly close to the technique or process used in real scale, are designed from the findings of research. But contrary to what the term «linear» suggests, this model is not unidirectional. Even in the context of intensification, it brings into play a double flow of information. The professional groups and networks, through which the intensive models are diffused, take part in their construction, if only by gathering technical information (reference networks). On the other hand, one can say that intensification gives a linear characteristic to the system inasmuch as it polarises the functioning of each segment, which gives coherence to the system as a whole: beyond rivalries between organisations, everyone «aims at the same target», that is towards an increase in physical productivity and the substitution of labour by capital.

The downstream-upstream segmentation of the process of innovation is not the only, nor even the main, type of segmentation to be considered. The agricultural Research & Development system is also segmented per production-transformation chain, discipline (partitioning between agronomy, phytopharmacology, animal production science, economy, nutrition…), institutions (public research, technical institutes, Chambers of Agriculture, specialised professional networks). Here again, this does not endanger the coherence of the overall functioning as long as the latter is polarised by intensification, which itself is closely related to the specialisation of activities.

This mechanism comprises two important interfaces, at the level of which are set up determinant processes which are either leading to innovation or hindering it.

- Between Research and R&D: Filtering and selective use of the research findings in order to evaluate or conceive new techniques or methods;
- Between R&D and development: adoption or rejection of inventions, construction of models of specialised production (or « models of farm development »).

Another major characteristic of the agricultural Research and Development system related to intensification is the predominance of empiricism. It can be schematised as one great mutual trial-and-error process where a multi-local and pluri-annual experimentation aimed to comparatively evaluate the new technical variants (see the mechanisms governing the registration in the official catalogue of the marketable seed varieties) is combined with the «real-scale» test that the integration of innovation into farms constitutes, and the results of which are information that are widely exchanged. When the intensification is designed and developed mainly empirically, public research can, in certain sectors, content itself with a role that consists more in supporting than in really creating the technical innovation: it is then solicited as a methodological aid for the evaluation of new techniques, or for the detection of limiting factors of productivity, rather than to invent new techniques and methods: this is the role of agro-suppliers.

4. Disintensification: a technical and economic logic?

Intensification having been referred to the increase of physical output, disintensification could be defined through the opposite objective. Intensification being considered as intrinsically related to a technical specialisation at unit, farm and territory levels, it is tempting to relate disintensification to a reversal of this logic of technical specialisation. This reversal must be envisaged at the three levels we have mentioned. The question is then to determine the processes of disintensification, to analyse their technico-economic coherence and to identify the skills and competences on which they depend.

If the dominant economic logic is intensification, the objective of reducing an activity output cannot reach economic efficiency if it is not associated with qualitative changes in the nature of resources and outputs. There are two possibilities for changing the efficiency conditions (and the efficiency convention): (i) to decrease the inputs costs more than the production value, through new combinations of factors, in particular by using more qualified internal workforce or external services; (ii) to valorise outputs qualities linked with less intensive techniques of production. Disintensification objective and processes come from the requalification (or reconception) of the objectives and resources at the different levels of the farm and of its environment.

Departing from the logic of intensification comes down to implementing more systemic logics. The principle of technical decomposition associates an input to a separable function (chemical cover to avoid pest attacks). On the contrary, if the option of input reduction is first taken (whatever the cause is), the related function has to be reconsidered and, generally, this reconsideration concerns different levels of organisation. For instance, if the use of pesticides is to be reduced, the corresponding function (in this case, ensuring the health of plants) must be reassigned to all the other technical interventions. This technical function is then distributed throughout the crop system as a whole. This is why the term «integrated management» is used in this case. In general terms we can say that disintensification brings into play integrating capacities. This is equivalent to saying that the degrees of freedom or the margins to innovate lie more at the level of the production system as a whole than at the level of such and such a technical segment.

Two logics of integration are still possible. On one hand, a more integrated management at the workshop level seems to imply more cognitive labour and more abstract knowledge but also more specialized in a domain. On the other hand, if disintensification process comes from the objective of valorisation, this objective goes down to the operational level involving specific knowledge. Because disintensification objectives are related to some qualitative objectives, which can refer to a plurality of efficiency criterions, we cannot offer a simple definition of the principle of disintensification. What can be said on such a principle is that the distribution of the functions on a higher level of organisation questions the principle of separability of specialized functions. Indeed, reasoning on a more complex level requires taking into account contextual specificities of this level, than it implies reasoning about the treatment of the plot within the framework of the whole cultivation system, the farming system in the exploitation, or the exploitation in the territory. Taking in account global issues requires taking into account the specificities of the farm organisation and competences, and the local specific opportunities and constraints. While the intensification was a logic of "genericisation" and specialisation of the resources, the reversal of this paradigm of innovation rests on the expression of the diversity at different levels.

Generally, from the technical point of view, the need for a systemic and multifunctional innovation emerges. Innovations can then no longer be evaluated in a simple manner: taken individually, hardy varieties are disqualified; it is through their combination with other techniques that their interest is enhanced. Innovations dedicated to non-productive functions must also be introduced (for example, water purification, waste storage, etc). From the economic point of view, in general, the activities of agricultural production can no longer be only considered as the production of basic food products of standard quality. The practices and places of production are likely to endow the final product with additional value. The collective integrating capacities are not exclusively technical. They are also economic and are defined in particular by the capacity to seize the opportunities related to the demand for quality of agriculture.

More generally still, new objects of innovation are emerging. It is the case, in particular, with regards to territorial management. A great number of environmental functions can only be managed through the collective management of territories that are larger than the farm itself, and which do not correspond to the administrative or holdings boundaries, and which imply a wide range of stakeholders. With regard to this type of problem, technologies, trouble-shooting tools and above all the mechanisms of co-ordination are far from perfected and a wide range of new references needs to be established. Innovation must then be less empirical, and more closely related to scientific knowledge and research. The use of "insurance-related" techniques (such as a systematic pesticidal treatment) can only be reduced by keeping up with and gaining a more comprehensive knowledge of the functioning of agro-eco-systems.

In the case of phytosanitaries, for example, the development of integrated protection requires progress in epidemiology and in physiology of ill plants. The management of environmental functions is not based on the same reference systems as the management of the functions of crop production. In this case, the traditional experimentation process («all things being equal») is impossible. It cannot, for example, be applied to the management of catchment basins. The trial-and-error approach by the practitioner himself is quasi impossible: the nitrate, nitrous oxide, the carbon sequestrated on soil or oxidised by carbon dioxide, are not only invisible but are also difficult to measure. It is therefore necessary to use intermediary indicators. Trouble-shooting or assessment tools and prescriptions must be based on the modelisation of the phenomena that is validated by in situ observations rather than through classical experimental approach. And these tools themselves must be integrated in actors' negotiations and plans, which is a complex process as it implies the integration of various objectives in the knowledge systems.

5. New context, new logics and new actors of innovation

Whether the intensification comes to a halt or continues, when the objectives of innovation shift towards quality and «multifunctionality» related to public goods the linear representation of innovation is no longer tenable. This shift in innovation regimes is related to the fact that the demand has become more proactive. This is expressed in particular in changes in consumption patterns, and a tendency by consumers to give more importance to aspects of safety and aesthetics.

The breaking out of the linear model of innovation occurs at research level and at farm level, which in both cases implies the involvement of many more partners than in the past. On the one hand, research becomes both more diversified and the setting up of finalised research programmes is increasingly complex. On the other, the orientation of development is as much based on the understanding of what happens qualitatively with regards to consumption and territories, as with what happens on the production side. This leads one to consider innovation as a process that goes through several networks.

This evolution of the processes of innovation - which implies a greater number of actors and therefore heterogeneous knowledge – can be seen through the conceptions that the representatives of the farming profession have of progress. Without abandoning the intensive models of production chains, professionals mentioned «diversification» as early as the 1980s. And in 1989, the minutes of the General Assembly of the ANDA[5] mentioned the «end of the development models ». Today, certain territorialised mechanisms of transfer of technology bear witness to this evolution (GIS [6] in the Alpes du Nord region or AGROTRANSFERT in the Picardie region).

The knowledge that is necessary for innovation (and that is generated by the processes of innovation) comes from several fronts: science, of course, but also production, markets and users. It is generated by what may be called innovation networks.

In studies on innovation, the linear models of innovation driven by technology and that of innovation pulled by demand have been replaced by models that combine both aspects, but which have also rejected the idea of sequential flows of information. Nowadays, the processes of innovation are seen as complex, non-linear and with two-way exchanges. More fundamentally, innovation in firms is today considered as a network driven process. And this is all the more true when innovation concerns the management of a whole chain, to solve environmental questions for example and more generally to solve systemic issues. This also applies in the farming and agro-food world.

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[5] National Association for Agricultural Development.

[6] Groupement d'Intérêt Scientifique (≈ Group for the development of scientific interest).

A network of innovation can be defined as a network of agents and structures that have specific functions in the process of generation, transformation, evaluation of knowledge, and where are developed integrating capacities making it possible to create new services (produce new qualities or provide solutions to collective or public issues such as environmental questions). The farming world has been able to generate many professional networks, a certain number of which may be qualified as specialised networks of innovation. In todays context, one of the key questions is that of their opening up to the non-farming world: Faced with the issues we have just mentioned, the actors of innovation represent social categories other than just the farming and agro-food categories, and occupations that do not exclusively concern production, transformation and distribution. They can be institutions, in particular territorial collectivities, but also associations of users (users of rural space, of recreational resources, forest, rivers…) and of citizens who feel concerned about issues related to public health or the environment (associations of consumers, environmentalists…).

Any reorientation of the process of innovation, and disintensification in particular, must be examined by taking into account this new context. Disintensification cannot be implemented by reversing the functioning of earlier networks, or even by replacing them with networks that are new but built on a similar model. It can only become a true logic of innovation if it is part of this movement of diversification, of opening up, and all in all of network re-creation.

6. What systems of research and development are necessary for disintensification?

Assuming that disintensification proves viable as a technico-economic logic, it cannot be implemented as a logic of innovation in a framework that is shaped for and by intensification. A certain number of changes are required.

A first critical point concerns skills and competencies: In the face of the technical and economic challenges of disintensification, the current system not only «does not know how to», but cannot decide who must be in charge of the technical co-ordination when the issues affect several categories of actors and emerge simultaneously at different scales. In other words, the question raised is that of the existence of integrating capacities and of where they can be found, particularly when issues are related to space and environmental management.

The second critical point is the structuring of the global system: firstly it is necessary to determine the specific roles and functions of the different institutions and organisations constituting the R&D system and to adapt them to the objects of innovation involved by disintensification: systems of culture, systems of production, functional spatial entities in terms of hydrology, ecology, territories… But the most challenging problem is that of interfaces. When the system as a whole is no longer polarised in a simple way nor driven by the common force of intensification, there is a risk that these interfaces will become insurmountable barriers. Among other scenarios, the hypothesis of a complete atomisation of the development resulting from a regional decentralisation (or privatisation) of its financing, cannot be excluded. The pro-active reconstitution of a more dynamic and less discontinuous interface between public Research and Research &Development is of the utmost importance in order to deal with certain problems which the current system is not equipped to solve. These interfaces must play a role that is almost the reverse of the role they play at present: they must generate mutual requests of collaboration, common projects and new instruments rather than filter and limit the role and authority of each group of actors. This vision is not the result of an idealistic principle of shared labour; it results from the reconstruction of research and development objects which is related to the emergence of new entities of action and decision-making, and new networks of innovation. The integrated phytosanitary protection, or integrated management of catchment basins, remain to be invented. And their invention in the short or medium term will only be possible if the «integrators» - i.e. farmers on the one hand, and the actors of territorial management on the other - closely interact with research; because it is this integration itself which is, at least partly, an object of innovation and research. If this does not occur, disintensification might remain purely virtual or based on more or less ideological conjectures based for example, upon on acts of faith in the virtue of hedges, grass, the biology of soil, and of nature in general.

Calling into question the structuring of the research & development system, *leads to a third critical point: that of the modes of governance and of the regulation of agriculture and society relationship*. Disintensification in itself, does not guarantee that the social legitimacy of agricultural activities will increase or be regained. We cannot exclude the possibility that certain paths to disintensification might lead to an increase in the opposition to public aid, while other paths might justify it. If, whatever its orientation, a logic of innovation remained under the exclusive control of agriculture professionals, it is doubtful that it would ever inspire trust from other social actors. In other words, the concept of disintensification does not make it possible, in itself, to trigger an evolution of the agricultural research and development system that would contribute to the development of a sustainable agriculture.

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Potentials of the agricultural adviser: The specialist, the reflective specialist and the reflective listener

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Abstract

The objective of this paper is to describe three different potentials of the local agricultural adviser: The specialist, the reflective specialist and the reflective listener. The descriptions are based on a theory of two levels of learning grounded in the thoughts of and Chris Argyris and a theory of reflection as a way to create inner coherence grounded in the thoughts of George Herbert Mead. Furthermore the descriptions are based on several years experience as a private veterinary consultant and on data from a Ph.D. project on 'communication and advising'. In order to support changes in management procedures, advising must include reflection and both learning perspectives. In this sense, advising may specifically be connected to the individual farmer's standpoint and become relevant and easier for him to act on. The paper forms a basis for transdisciplinary understanding that can provide the advisers with grounds in favour of not limiting themselves to fact-based responses to current farming systems, but rather helps themselves and farmers think through on their decision-making frameworks and paradigms.

1. Introduction

In Denmark, the tradition to offer advisory services to dairy cattle farmers by local advisers has been long-standing. Formal health advisory services for dairy cattle farmers and local veterinary practitioners were introduced in 1995 and a voluntary 'health advisory agreement' between the veterinary practitioner and the farmer was established. By January 2003, 3520 of 7000 Danish milk producers have signed the agreement. Several technical tools to support the local advisers have been developed to collect, analyse and present quantitative data including data on, e.g., diseases, housing condition and production. Advisers and farmers, or farmers alone, use such data and tools in 90% of Danish dairy herds, especially as transcripts with specific key figures on health and production parameters. Pointing out such specific key figures have proven to be useful in solving some problems (Markusfeld, 1993) but even precise recommendations to solutions commonly lead to disappointing results in terms of advising. This disappointment can partly be attributed to premises for change of management that are beyond the technical language of the adviser where the complexity of the farmer's personality is more or less neglected. If value-laden issues, as for example animal welfare, are on the agenda such disappointments may become very distinct.

If the local agricultural adviser is prone to focus solely on cost-benefit analysis, well-defined variables and a technical approach in the advisory process, the farmer may carry out some minor adjustments and thereby demonstrate what by Argyris and Schön (Argyris, 1980; Argyris and Schön, 1974) is termed single-loop learning where the farmer's meaning behind the act remain unchanged. If, however, the local agricultural adviser succeeds through dialogue in involving the farmer's

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personality, action and outcome could become significant different, because for example, animal welfare is viewed in another way. Such type of learning is by Argyris and Schön (ibid.) called double-loop learning and in this article is linked to sustainable development. Reflection is due to G. H. Mead (1934) a decisive skill in such deep learning processes.

The objective of this paper is to describe three different potentials of the local agricultural adviser: The specialist, the reflective specialist and the reflective listener. The potentials are separated by the skill to fit into the context reflection, single-loop learning and double-loop learning respectively. Though the potentials are presented as types, advising is a process where the adviser constantly uses different potentials and moves beyond the edge of the typification. The descriptions are based on several years of experience as a private veterinary consultant and on data from a Ph.D. project on 'communication and advising'.

2. Theoretical background

2.1. Single-loop learning and double-loop learning

Single-loop learning is connected to learning where personal structures of meaning and values remain unchallenged and unchanged. Such learning is connected to adaptive changes in routine behaviour, like a thermostat that is set to turn on the heat if the room temperature drops below 20 degrees C. In single-loop learning focus is coming from outside ourselves, based on objectivity and with a true state of things as given by nature and the like for all of us. Farmers' management can be included with assumptions that it follows the same organizing principle and the same logic as the production system on which the farmer acts i.e. in some patterns cause-effect related. The conventional conception of agricultural advisory service is very much connected to such an understanding of the farmer's daily routines. Quantifiable data connected to the production system will in single-loop learning be in focus, not the act and the way of communicating, and the adviser usually proposes solutions that help reaching the system stability, based on, as setting of the temperature, thresholds of specific problems and data analysis. For day-to-day learning and actions 'here and now' (Willert, 2002) and within the variables and framework given, single-loop learning can be productive and lead to further competence. However, the perception of value-laden issues as animal welfare remains the same. What the farmer is doing is influenced by his values and inner structures of meaning which generates 'theories in use' (Argyris, 1980; Argyris and Schön, 1974) to which the farmer has been accustomed. One of the characteristics in single-loop learning is that theories in use are not revealed and as a consequence people tend to express themselves different compared to what they feel and think. What is actually said is by Argyris and Schön (ibid.) called 'espoused theories'. To protect the theories in use and to sustain control and absence of conflict people in single-loop learning tend to follow four governing thoughts and feelings: 1) define personal goals and to achieve them; 2) maximize winning and minimize loss for you as a person; 3) attempt not to generate negative feelings and 4) try not to make things too complicated. Based on oral facts, consensus of an action plan might apparently be reached, but due to the inconsistency between the governing thoughts and feelings and what is communicated (the espoused theories), the following action might be half-hearted, superficial or even absent. Certain matters may be achieved by single-loop learning, but, in spite of further qualified technical knowledge, the following action still remains adaptive and not differently rooted in the farmer (Fig. 1).

In *double-loop learning* on the other hand, it is accepted as a premise that we construct our own perception of a world outside ourselves. That objects appear for us in a certain manner does not mean that it is how they are in reality and in the reality of others. The experience of reality and what we act upon will not only be determined by logic, but also be formed and transformed through reflection and dialogue. Double-loop learning is a mutual and personal process where meanings and values are actively exposed and challenged. To support double-loop learning, it is necessary to: 1) maximize valid information as the primary variable by being honest and open-hearted; 2) maximize free and informed choice by making it legitimate to be personal and 3) maximize the internal commitment to decisions made (Argyris, 1980; Argyris and Schön, 1974). By double-loop learning it will be easier to get beyond repetitive and routine behaviour and to act significantly different because the individual feels intrinsically committed to act and will be satisfied by doing things differently, and not, as in the case of single-loop learning, because the act is rewarded by outer objectives (Argyris and Schön, 1974). This intrinsic commitment is potentially carrying sustainable management routines. Those variables can be paraphrased to trust, honesty and openness towards oneself, the other and the process initiated.

2.2. Personal phases and reflection

George Herbert Mead (1934) describes action and coordination of actions as depending on social interaction. As a consequence advising also becomes part of a process depending not only on the production system, but as well on personal information. Due to Mead (ibid.) the *self* is a social emergent and has a development; it is not initially there at birth, but arises in the process of social experience and activity, that is, develops in the given individual as a result of his relations to that process as a whole and to other individuals within that proces. There are, it would appear, two phases (or poles) of the self: ‘Me’ and ‘I’. Although they are distinct from each other by their very function they are inseparable. The ‘I’ and the ‘me’ can be viewed as a process phases arising during the interaction between the individual and others and where structures of meanings and patterns of actions constantly differentiate (Fig. 1). The ‘I-phase’ is in itself a program of action actually manifested. ‘I’ am acting as a person and ‘I’ am able to observe a considerable part of my activity (Willert, 1999). The ‘I’ is there as the spokesman of the self and the response on what lies in ‘me’. In a certain sense, ‘I’ am that with which we do identify ourselves and the response of the individual to the attitudes of the others (Mead, 1934). The ‘me’ is more sophisticated and different. The ‘me’ is a cognitive construction and non-action carrying the organized set of attitudes of others and the organized structures of meanings and experiences. The ‘me’ holds what is thought and felt and what is acted upon.

According to Mead (ibid.) *reflection* is the way to make fruitful contact between ‘I’ and ‘me’. Reflection is a harmonization between what ‘I’ carry and what is embedded in ‘me’ where a new feeling of coherence emerges (Fig. 1). The interaction can mainly be attributed to the mind that promotes the fruitful interplay between the cognitive construction of the personality where structures of meaning are embedded (potentially responding to double-loop learning) and the outwards turned part of personality (potentially responding to single-loop learning) (Fig. 1). The mind as such is relay station that utilizes the plasticity of the nervous system to bring into our lives the experience of coherence, continuity, creativity and change (Willert, 1999). Through reflection the mind can be seen as a possibility to fundamentally change structures of values and meanings so that the individual is able to act differently and in a new way through a new feeling of coherence**.** In single-loop learning reflection has not been underlying communication, whereas double-loop learning only takes place based on reflection and internal dialogue that will drive away automatic reasoning and automatic actions.

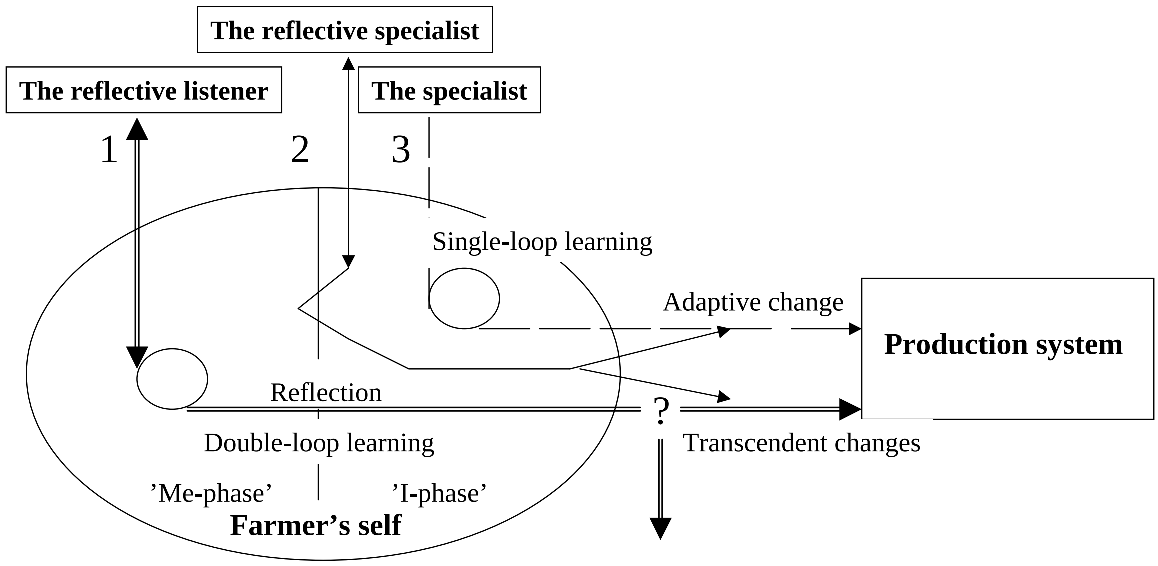

Figure 1: Interaction between different potentials of advisers, the farmer and the productions system

Figure 1 is a guide to the context of advising as comprising a 'farmer', 'advisers potentials', a 'production system', 'levels of learning' and consequential actions. Different situations, different personal skills, and different roles and relations will promote differences in the 'self' of the farmer. If the governing variables for single-loop learning underlie the communication process and meanings and values are not confronted, 'me' will remain undisturbed and the following action will result in minor or major adjustments as prescribed and maybe even as agreed upon, but heavily influenced by 'who' the farmer has always been' (arrow '3'). This path expresses extrapolation of the lawful cause-effect relationship into the human learning and action system. If, on the other hand, trust, honesty, openness and personal data are incorporated into the dialogue and supported by reflection, the learning process may result in a 'me' more or less disturbed as a consequence of double-loop learning. The subsequent action will be different and possibly transcendent (arrows '1' and '2'). The farmer will get a perspective, or a new perspective, on for example animal welfare and this perspective will guide his way of managing. The outcome of double-loop learning will be unpredictable but, with the farmer's knowledge and within the farmer's context and (new) perspective, more coherent.

3. Three potential sides of an adviser!

3.1. First potential: The specialist

The concrete problem often only exists as a construction that has no existing solution, and even after it has been long and deliberately treated by different experts, it may still suggest to each of them some different course of subsequent action. In reality one has to live with a problem it in its complexity and to accept the problem as a process includes an ongoing adjustment of personal perspective. By the specialist, the positivist understanding of practice is domineering. According to Schön (1991), the positivist understanding of practice rests on three dichotomies: 1) to see solutions as a technical procedure to be measured by its effectiveness in achieving a pre-established objective; 2) to see rigorous practice as an application to instrumental problems of research-based theories and techniques; and 3) to separate knowing from doing where action is only an implementation and test of technical decision. To the specialist, the positivist perspective is put into the foreground and knowledge from natural science as a methodology is put into play without taking into consideration knowledge about action. The farmer is disregarded and the specialist may assume action to be constituted as linear from information (the input of the adviser) to the following action. The specialist only involves his own 'I', data from the production system and the farmers 'I'. The specialist can be seen as a methodologically competent person, but not using his full potential as a human being. The disparity can be attributed to education and Argyris and Schön (Argyris, 1980; Argyris and Schön, 1974) connect the blindness to this incongruity between the way people in reality act and the expectations to how they ought to re-act to educations where you have to stick to rules and procedures. As a consequence, one might be in peril of loosing or neglecting the skill to reflectively put into play 'me' and the 'me' of the other. Thereby we limit the scope and depth of the learning that we as individuals can do and we will enter a circle of disappointments, confusions and failures (Argyris, 1980). Professional specialization can lead to a parochial narrowness of vision and due to Schön (1991) the specialist can have over learned what he knows. The way a specialist practice may promote unfolding all governing variables in single-loop learning (defining personal goals and trying to achieve them, trying to maximize winning and minimize loosing, attempting not to generate negative feelings and trying not to make things too complicated) resulting in solely a dis-hearted 'me'-dejected conversation. The ability to reflect, that by Mead (1934) is the most important skill to support the interaction between 'me' and 'I', is by the specialist either neglected or inadequately developed. The objectivity of the outer world and the positivist perspective remain the ground of understanding. The specialist is rooted in the technical rationality and complexity is to be systematized. Practice, in an understanding of creating meaning based on confusing, complex and interesting situations (Schön, 1991) is not balanced into the methodology and the technical knowledge and methodology develops at the expense of the theory through which the world is experienced.

3.2. Second potential: The reflective specialist

The formulation of a problem is far more essential than its solution, which may be merely a matter of mathematical or experimental skill. To raise new questions, new possibilities and to regard old problems from a new angle, require creative imagination and mark real progress in science (Darsø, 2001). In the practice world, we select what we will treat as the problems. We set the boundaries of our attention to it, and we impose upon it a coherence, which allows us to say what is wrong, and in what directions, the situation needs to be changed. Problem setting is a process in which, interactively, we name the problems to which we will attend and frame the context in which we will attend to them (Schön, 1991). Reflection is a crucial skill to generate such a process and the values of control, distance and objectivity take a new meaning in the reflective conversation (ibid.). The issue of concern is the change that can potentially be achieved.

> *However, solely the object does not maintain the objective relationship between individuals in question, for even the most objective relationship is also personal. The objective and personal are intertwined in one mediation (Løgstrup, 1997).*

The adviser who masters the process does not experience the lack of willingness by the farmer as the farmer's fault but as inadequacy by his own way of practicing. If there is responsiveness towards information others than technical and if the adviser allows himself to be surprised or confused by the situation that he finds risky and unique, he will get information to the reflection that enables him to create coherence between the technical rationality and the value-based rationality. In this sense, he is improving in mastering practical wisdom (Flyvbjerg, 2001).

The reflective specialist can help the farmer view things in a different perspective and to act differently. To the reflective specialist it is not only a matter of acting, but as well a matter of the relation to the farmer. In this sense advising will rely on a mutual relationship helping the farmer to reflect the right technical issues into what he perceives as a coherent feeling. The reflective specialist catches important technical variables and data in the situation, but the data are not promoted at the expense of the reflection. Such advising is a process leading through understanding, over action to new understanding. In this conversation, the reflective specialists effort to solve the reframed problem yields new discoveries, which call for new reflection-in-action. The process spirals through stages of appreciation, action, and re-appreciation. The unique and uncertain situation will come to be understood through the attempt to change it, and changed through the attempt to understand it (Schön, 1991). When a reflective specialist makes sense of a situation, he perceives to be unique; he sees it as already present in his repertoire. To see this site as that one is not to subsume the first under a familiar category or rule. It is, rather, to see the unfamiliar, unique situation as both similar to and different from the familiar one, without at first being able to say similar or different with respect to what (ibid.). This is the essence of 'taking the attitude of the other' as described by Mead (1934) and is manifested the link between the 'me' of the adviser and the 'me' of the farmer. The reflective specialist is pragmatist in the sense that he evaluates his expert knowledge on the practical consequences as a whole and on the effect, not in relation to a given general frame of reference (Flood, 1990). He captures from his 'me' a source of experience and sympathetic insight that qualifies him to trigger and link wisely. Here, double-loop learning is not in itself to strive for. But 'me' is open and listened to, but left intact. This reflective mode of advising is on a borderline between single-loop learning and double-loop learning, without the need to control and to show mutual humbleness to personal data. The personal openness is a premise to serve the technical matter and the reflective specialist uses data from both the outer world, the farmers 'me' and his own 'me'.

3.3. Third potential: The reflective listener

The reflective listener listens to the 'me' of the other through his own 'me' and 'me' is open to be disturbed. The agricultural adviser is presumably never asked for with the primary task to enter this personal ground, but what enacts in the conversation may take a twist so that new important issues emerges. Løgstrup (1991) writes that any relation to another person carries a demand to relate to the other and what is behind the words outspoken. The personal feeling of meaningfulness is not possible to describe, but can in mutual trust be interpreted forth.

> *The demand which is present in any human relationship is, however unspoken and is not to be equated with a person's expressed wish or request. It is not expressed in his or her spoken or implied expectations. Any correspondence between the spoken and the unspoken demand is purely accidental; usually they are not at all alike. The other person's interpretation of the implications of the trust offered or desired is one thing, and the demand which is implicit in that trust as, one might say, a 'fact of creation' which I must interpret is quite another thing (Løgstrup, 1997).*

As an adviser, one could choose to let the conversation remain in single-loop learning and leave 'me' undisturbed by finding solutions related to the technical rationality, as for example: 'If we make an analysis of an extension of the herd, we could find economical ways for you to employ another man'. Such single-loop learning may be governed by a need to avoid conflicts, rationality, diplomacy or the need to win or simply a routine behaviour of the adviser. Another approach for the adviser could be to help support double-loop learning, for example by saying: 'I can hear you feel sad about the future perspective, is it something we shall talk about?' In this sense the situation may take a turn in a totally different direction and thus opening what the 'me' is carrying and opening for a change in perspective. If one can be more conscious about the structures of meaning that influence the act and the decision new ways to act will appear. Double-loop learning is a possibility for behavioural change and in itself it is encircled by meaningfulness (Langer, 1986). When the reflective listener is working, ‘me’ is experienced and experienced as slightly different than before, and ‘wriggling out’ of something difficult which makes it easier to act differently (Havelock, 1969). The following action may lead to sustainable changes because the motivation for improvement feels intrinsically right and coherent. In such a situation, it could become ‘too much’ that animals were suffering, instead of ‘too many’ animals with (for example) sore legs.

3.4. Summing up the three potentials

The specialist is somewhat mindless and not in contact with the farmer. Due to the single-loop learning, he can be seduced by what the farmer is saying and his espoused theories, and due to his own technical focus he may not be able to hear what may be personal information. The dialogue is furthermore compromised by lack of reflection. As a result the subsequent action of the farmer will be adjustments to which he does not really feel personally committed. The reflective specialist does not challenge the farmer’s ‘me’ but uses information from it. Reflection is a skill that is mastered more or less by both the adviser and the farmer. The learning process is neither single-loop learning nor double-loop learning, and the resulting action will mainly be adaptive changes, but personally embedded in the farmer. The last potential is the reflective listener, who must be considered as an exception in the professional world of agricultural advising. From time to time glimpses of this side appear and both farmer and adviser feel something different happening. Mentally something ‘slots together’ and the world is viewed in another perspective.

4. Discussion

Technical skills are nearly without exception what give the agricultural adviser access to the farmer and his farm and the farmer in general send for the agricultural adviser to solve a specific problem, though a farmer’s expectations is often to get advises that are not only specific to his production system, but also specifically for himself. The scope of a meaningful dialogue is seldom deliberately an issue, but could be good to include in for example a ‘health advisory agreement’ signed by the local adviser and the farmer. What is important is ‘to make it a natural thing to talk about the personal meaning behind’. One can see the local situation as unique and influenced by information that primarily arise in the face to face contact, as pointed out by Berger and Luckmann (1966). If the information, in the hardly manageable face-to-face contact, is honestly included, the situation will, as a premise, be even more complex. Something that is different is going on, and what can be construed to control may find another meaning. To deal with this complexity, the adviser must learn to switch from automatic reasoning processes to a more conscious, reflective mode (Friedman and Lipshitz, 1992).

In Denmark, the local advisers have some real assets and potentials in making a difference due to regular contact to the farmer, the employees and due to substantial knowledge about the production system. Being aware of skills to support double-loop learning and reflection and giving these skills full and open legitimacy, may help implement both technical knowledge and to co-create behavioural change. The awareness of such skills is according to Guba and Lincoln (1989) in particular difficult to have if the positivist paradigm is a guide, possibly because what is asked for is a rejection of a basic belief system. The agricultural adviser as a specialist may be so keen to cultivate the professional ground, established during education and in the professional subculture, that the demand to relate to values and meanings is neglected or assumed to be irrelevant.

I will like to stress, that not only overdoing technical knowledge may limit the advisers' ability to make another kind of difference within the advisory field. To instigate changes in personal structures of meaning, it is necessary that the agricultural adviser possess values and ethical concern about the areas on which she/he professionally focuses. If for example the adviser does not sense a meaning in calves having good living, it will be very difficult to know how to link to the farmer’s values. The issue of importance (e.g. animal welfare) will just appear as an empty metaphor difficult to capture and put into play. Absence of values may be even more important in paralysing the process towards betterment, than overdoing the technical knowledge. Usually Danish dairy farmers are encouraged by central advisory services, research institutions and local agricultural advisers to engage in problems described by well-defined variables as for example limit values, key figures and targets set by numbers. Such limit values can be quite beneficial if meaningfulness in the value-based metaphors (as for example animal welfare), to which the variables are connected, has been established. Such meaningfulness could be taken for granted on beforehand, but it would be fair to claim that the dialogues needed to establish or change such meaningfulness are widely neglected due to modesty, non-acceptance or implicit confidence in technical means to solve all kinds of problems.

The improvement of for example animal welfare is, as part of ‘sustainability’, something arising through ‘re-design with communities’ (Röling and Waagemakers, 1998) and requires use of all three modes of the advisory skills described in this paper. Hence, in addition to the adoption of a set of separate technical approaches, the adoption of the holistic concept should be involved as well (De Buck et al., 2001). Therefore the reflective specialist and in particular the reflective listener, who carries skills to unfold such metaphors, will help development towards sustainability. The underlying demand is to reflectively deal with both technical knowledge and with the farmer’s and own values. A theory about action and a conceptual framework on some personal structures can add further dimensions to the field of advising. The difficulty with the methodology presently used to improve, animal welfare is that it creates concepts that may not be applicable in the action context, as well as it introduces conditions such as unilateral control over the technical matter and minimal interest in new universes.

‘The human learning system’ contains the sensitiveness of both single-loop learning and double-loop learning and double-loop learning does not supersede single-loop learning. But the occasional burst of activity which leads to double-loop learning helps change directions and opens up for new perspectives (Brockbank and McGill, 1998). The potentials described in this paper are sides that more or less manifest themselves. But the reflective skills and the meaningful dialogue are probably often more sensed and clearer when being outside the professional context where it emerges in smaller or bigger glimpses for example when you are together with friends.

> *If I typify my friend Henry as a member of category X (say, as an Englishman), I ipso facto interpret at least certain aspects of his conduct as resulting from this typification..... This implies, though, that these characteristics and actions of my friend Henry appertain to anyone in the category of Englishman, that is, I apprehend these aspects of his being in anonymous terms. Nevertheless, as long as my friend Henry is available in the plenitude of expressivity of the face-to-face situation, he will constantly break through my type of anonymous Englishman and manifest himself as a unique and therefore atypical individual – to wit, as my friend Henry (Berger and Luckmann, 1966).*

To learn from such glimpses, which arise in a professional or private context would beyond any doubt make the job as an adviser even more interesting and would enable the adviser to deliberately put into play multiplex perspectives that could co-create a difference.

5. Conclusion

Due to regular contact with the farmer and his employees, local agricultural advisers have some real assets and possibilities to link to the meaningfulness behind management practices related to for example animal welfare. In practice, the endeavours to work deliberately with these skills remain insufficient, and narrow the perspectives in the face-to-face contact. The insufficiency may arise due to overdoing technical knowledge, lack of knowledge on what constitutes the (farmer’s) doing, because it feels difficult or awkward, or because it is experienced as illegitimate. To be authentic about personal issues, meanings and values of oneself and the farmer may further strengthen personal and interpersonal understanding and, as a consequence, support a diversified development in agriculture taking into serious consideration ethical and aesthetical perspectives related to production.

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Participative learning for the Future: using interactive farmer-research networks in the development of new plant production systems in The Netherlands

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Abstract

The paper analyses an ongoing process in a national project on the development of sustainable arable plant production systems in The Netherlands ('Farming with a Future' or Fwf in short). In the project, farmers, researchers and advisors co-operate to realise government's environmental objectives within a short period of time. Intensive fertilisation practices are a pressing problem in Dutch agriculture, especially for nitrogen application, per hectare of agricultural land the highest in Europe. Part of the project strategy was to incorporate learning into the change process. This was strived for by making specific adjustments in the project setup for the facilitation of more effective knowledge transfer, feedback and reflection. The paper discusses how this was done and with what effect. The structure of the regional networks fostered interaction between major stakeholders, creating the basis for learning in FwF. The choice to set up diverse, multi-disciplinary platforms for data exchange has contributed to the creation of effective learning conditions. This is also the case for the synchronous execution of three research programs, and certainly holds for the on-farm trials that have been held.

Introduction

While coupling collaborative learning to processes of change seems to be accepted in agricultural projects in industrialised countries, it is difficult to asses whether this actually leads to improved project outcome. This paper analyses an ongoing process in a national project on the development of more sustainable plant production systems in arable farming in The Netherlands ('Farming with a Future' or Fwf in short). In the project, farmers, researchers and advisors strived for realisation of national environmental objectives in arable farming within a short period of time. Desired changes in farming were supported by formal research that was executed simultaneously within the project. Part of the project strategy was to incorporate learning into the change process, for which, at project inception, specific facilities in project structure were implemented. The structure included specific platforms for interaction between the various stakeholders, with most interaction between farmers, researchers and advisors occurring in networks that were especially created for the purpose.

Combining social and biophysical sciences, the authors participated actively in the project, covering among us all of its platforms. Reflecting on our experiences, we discovered that at some points unusual learning appeared to occur. As we were already aware of some unique features in the project structure, we then decided to check whether structure and learning were linked. The central question of this paper is therefore, whether the Fwf approach has lead to enhanced learning and - if it did – whether this is related to project structure. From this, we try to draw generic conclusions for other projects. In doing so,

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we like to challenge our audience to contribute to the basic methodological question of giving evidence that effective learning and capacity building is taking place in a setting like FwF, and how this contributes to the project outcome.

Context

Agriculture in The Netherlands is characterised by intensive cultivation practices. Nitrogen surplus per hectare of agricultural land (262 kg of nitrogen/ha) is the highest in Europe, being more than four times as high as the average level for the EU-15. Because of this, Dutch agriculture is an important source of nutrient emissions. In 2000, agriculture caused 40% of all acidifying emissions and two thirds of the nutrient loads to land and water resources (RIVM, 2001). While this already was an improvement as compared to the situation in the 1990s, further action still is needed in both dairy and in arable farming, which contribute significantly to ammonia volatilisation, production of greenhouse gases (nitrous oxide) and nitrate leaching.

Dutch legislation on nutrient application is based on the MINeral Accounting System (MINAS) that was introduced in 1998. The major instrument chosen is the farm gate balance, forcing farmers to account for nitrogen and phosphorus flows (inputs, output and surpluses). In 2000, manure transfer contracts were introduced for farmers producing more manure than they are allowed to apply on their own fields. At the same time, several measures were taken in order to soften the effects of the hardship of tightening nutrient legislation: manure and pig production rights were purchased by government, which also offered favourable fiscal conditions and made extra investments in research and extension. In 2001, additional research funds were supplied to assist farmers to comply with the environmental legislation

Agricultural research

Research and extension in The Netherlands in the past were organised along a classical model, following a line from fundamental to applied research into extension. After successful application for more than four decades, this model gradually became complemented by a more systems-oriented multidisciplinary approach. The first farm-scale systems-oriented research program was initiated in 1979 with the establishment of a research farm in Nagele in the new polders, involving generalists and - when necessary – specialists covering agronomic, edaphic, climatic, economic and social aspects of farming. As high costs related to this type of research did not allow for replicates, it was decided to replace this by on-farm research on so-called pilot farms (commercial farms linked to the project). The ‘Nagele’ research approach can be compared with the classical setup of Farming Systems Research and Development (FSR&D) which gained much support towards the end of the 1980’s, focusing on the farm system as a whole, involving interdisciplinary research teams and working with iterative, dynamic research programs.

Inclusion of the ‘Nagele’ pilot farms facilitated real world testing of research results and provided feedback to researchers. In return, innovations developed by pilot farmers could be used in the steering of the experimental farm research. The network thus facilitated links between farmers and researchers, allowing more effective feedback and interaction, and, hence, reflection on the way of thinking and working that existed in either group before they were linked. Over the years, the ‘Nagele’ program developed into a research approach with combined experimental and pilot farm research (see for example Vereijken *et al.*, 1994). This approach starts with the definition of a set of quantified, prioritised objectives that are used to design and develop a farm system. The system then is implemented at the experimental farm, after which it can be applied and adjusted by pilot farms, before finally being disseminated to other commercial farms. During the process, there is plenty interaction between and among researchers and farmers, involving – at some point - various stakeholders including cropping specialists, modellers, policy makers, pressure groups, advisors and communication specialists.

This approach was adopted by a group - comprising of members from strategic research, applied research and an NGO - that set up a farm for environmentally oriented systems research in dairy farming. The farm, 'De Marke', later became linked to a research project involving a group of pilot farmers called 'Cows and Opportunities'. While realisation of environmental and economic objectives dominated the discussions in the early years, two-way communication and interactive exchange of views and information gained in force over time. By doing so, researchers and farmers developed a structure that facilitates effective data exchange and discussions on agronomic and environmental objectives, economic consequences and research strategies (see e.g. Oenema et al., 2001).

'Farming with a future'

Towards the end of the 1990s, experiences in dairy farming formed the basis for a similar project in arable farming, 'Farming with a future' (Fwf), which became operational in 2000. It combines systems and experimental research, involving experimental and pilot farms. The research nutrient management, nature development and reduced input of agro-chemicals, the main focus being on the impact of nutrient emissions on quality of groundwater and surface waters. Fwf includes arable, field vegetable, tree and bulb farming, each sector being represented by an experimental farm and a number (five to fourteen) pilot farms, thus linking four groups of internal stakeholders (farmers, advisory services, research and applied research) plus project management. Project objectives are twofold: (i) to design, implement and improve sustainable plant production systems, and (ii) to communicate results to farmers and other stakeholders in the agricultural sector and society (Booij *et al.*, 2001; Neeteson *et al.*, 2001a). During inception, a range of environmental and production objectives was formulated. Objectives for the pilot farms are predominantly based upon existing nutrient policies; objectives for experimental farms are more stringent.

Theories of learning

Learning was incorporated in the project set up, as it is considered an essential means of change that can enhance both individual and collective action. We see learning as a process, occurring through interaction among stakeholders with different perceptions and knowledge (LEARN, 2003), originating from different domains, each bringing their own background and assumptions (Kouzes and Mico, 1979). The notion of learning is derived from social learning theories, which regard learning as a process of social change. As put by Webler et al (1995), social learning occurs "when citizens become involved in working out a mutually acceptable solution to a problem that affects their community and their personal lives". As to how learning develops, Kolb's experiential learning cycle was adopted, identifying four stages: (i) concrete experience, (ii) reflexive observation, (iii) abstract conceptualisation and (iv) active experimentation (Kolb, 1984). Effective learning will however only take place if individuals or groups actively engage in each stage, using their experience to reach new insight (Woodhill and Robins, 1998), thus requiring stakeholders to take responsability for discussing and exchanging experiences, formulating problems and showing willingness to discover how things work and can be improved (Ratering and Hafkamp, 2000).

Farmers do not change in isolation. A movement towards sustainable agriculture would also require a parallel movement from their networks (Nieuwenhuize, 2000). Thus, groups of farmers, and their networks, are approached in the project, while the same attitude (collective approach of groups of stakeholders, recognising the fact that learning is a social process which requires a number of subsequent steps that cannot be taken in isolation) is applied with respect to internal stakeholders. Only in this way, the development towards sustainable agriculture is realised through a process of "learning our way out" (Finger and Verlaan, 1995).

Facilitating learning

Although the importance of learning was recognised from the beginning, the way how this was to be realised was not really clear. Making use of experiences in the development of combined experimental & pilot farm research projects (starting with the 'Nagele' farm and being fully realised in the 'De Marke'/'Cows and Opportunities' combination), many steps were taken intuitively. Three factors have been of major importance. Given the pressing environmental problems, (i) it was decided to implement two research programs (systems and experimental research on experimental farms) and a research and extension program on pilot farms synchronously in stead of putting them in place after each other as often is done. Further, (ii) project structure was designed in such a way that interaction and feedback between different internal stakeholders (experimental researchers, applied researchers, advisors and farmers) was guaranteed. This was done, finally, (iii) making use of multi-stakeholder platforms. The three elements are discussed below in some more detail.

Ad (i) Recognising from the beginning that the project required a specific setting for communication between farmers, researchers and advisors, and that progress would be realised from complex change processes rather than uni-linear adoption processes, researchers that preliminary used to work in mono-disciplinary research now were to co-operate with other disciplines in a setting where research on experimental farms was executed simultaneously with systems research and guidance of pilot farms.

Ad (ii) and (iii) In regular research, interaction between the diverse internal stakeholders involved in Fwf would be extremely rare. Researchers would mostly discuss among themselves, and experimental and systems researchers would not meet on a regular basis, let alone experimental researchers and advisors or farmers. Although this is understandable, it leads to a situation where data and insights travel a long way before finally arriving at the farmers' tables, while each time a domain is being crossed interaction is becoming harder. In Fwf, the number of interfaces between both institutional as well as disciplinary domains was decreased by bringing stakeholders together in a number of integrated platforms, including regional networks where farmers results were exchanged, reflected upon and suggestions made for the next research cycle. In the communication, practical knowledge is considered as important as formal (or academic) knowledge, while classical one-way knowledge transfer from research to farmers was set aside.

Project setup

Covering five groups of internal stakeholders, active in experimental research, applied research and extension in four agricultural sectors distributed over five regions, designing project organisation for Fwf was not easy. As was discussed above, the basic work is done in seven regional networks, each consisting of 3 to 5 pilot farmers, 1-2 advisors, an experimental researcher and an applied researcher (Figure 1). The networks meet at least 8 to 10 times a year, while there is additional contact among individuals (mostly advisors and farmers or advisors and researchers). Collective members of all regional networks meet once a year in a two-day session, while researchers and advisors also meet in 8 sessions of the so-called 'project team', which also includes the management. Major characteristics of the project platforms are given in Table 2.

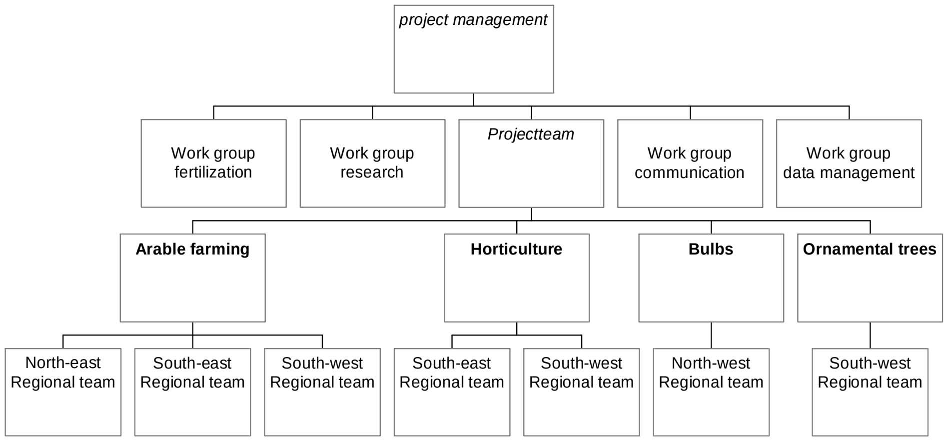

Figure 1. Structure of 'Farming with a future'.

Moments of learning

During the project, a broad variety of learning moments occurred. While it is beyond the scope of this paper to list them fully, a short overview is presented of relevant learning moments related to the first project objective (developing, applying and improving sustainable farming systems). Learning occurred in the definition of bottlenecks for the development of sustainable farming systems, the joint annual formulating and evaluation of farm plans for crop protection, nutrient and water management, etc., the bottom-up formulation of research questions, exchanges between regional networks, analysis and interpretation of data for environmental evaluation, reflecting on project strategy, giving feedback of learning points from regional level to management team, and holding sessions for monitoring and evaluation of project setup.

Table 2. Major platforms for exchange in the projects.

Platform	Objective	Meetings per year	Background of members	Major disciplines of members
Regional network	Advice farmers, discuss approach; exchange farm performance and impact on environment	8 – 10	Farmers (3-5), applied research (1), advice (1), research (1)	Agronomy, extension science
'Projectteam'	Exchange experiences between regional networks; discuss project progress in relation to objectives	8	Applied research (4), advice (10), research (5)	Agronomy, extension science
Two day conference	Discuss project progress; exchange information; improve motivation	1	Farmers (33), applied research (5), advice (10), research (5)	Agronomy, extension science
Working groups	Discuss issues of communication, registration & analysis, research and fertilisation	3 – 4	Applied research (4), advice (2), research (8)	Agronomy, extension science, soil science, modelling
Evaluation meetings for experimental farms	Evaluate results experimental farms and impact on environment; discuss adjustments to be chosen	1	Applied research (6), advice (1), research (6)	Agronomy, extension science, soil science, modelling

Results

Farmers showed large differences in the way they accepted and adopted alternative fertilisation practices. Most, but not all, farmers made considerable improvements in nutrient management over the three years the project now has run. Progress was often impressive during the first year, showing a decreasing speed thereafter. Large differences were also found with respect to crops where progress was made, as well as types of methodologies that were adopted. Most commonly applied techniques include the reduction of fertiliser application levels (getting in line with recommendations), correcting applications for mineralisation (i.e. indigenous soil fertility), and splitting fertiliser applications (not giving the entire load at once and thus being able to adjust the application rate during the season to crops requirements). Less frequently applied techniques include cultivation of ‘catch crops’ (grown after harvest of commercial crops to ‘catch’ available nutrients, in order to prevent them to be lost to the groundwater), application of slow release fertilisers (being less sensitive to leaching), changing manure application (applying treated manure with lower nitrogen levels or applying manure in spring in stead of autumn) and application of alternative sources of organic material (i.e. containing less nitrogen).

Adoption

It is difficult to assess why some practices are adopted and others are not, or why a given farmer is adopting a given technique. Clearly, farmers only adopt something they understand and feel confident that no unreasonable risks are taken, but considerable differences were found as to what risks individual farmers find acceptable. Such differences were, rather surprisingly, also found among researchers and advisors. Further, it was clear that the decision to adopt or reject an alternative depends on the outcome of a more or less systemic evaluation of the innovation. If necessary, farmers did not hesitate to ask for additional information. Advisors and researchers formulated similar requests. Such requests generally could be rewarded, partly because a team of specialists was already involved in the experimental research of the project. In a few cases, Fwf specialists assisted in passing through requests to other specialists. The fact that specialist information was so easily accessible was highly appreciated and the number of request increased by the year whereby the experience of asking questions and receiving proper answers clearly helped to create a feeling of trust between the major internal stakeholders.

Learning

Regarding the way in which enhanced learning did or did not occur, we first report some general results, after which the main features of the Fwf learning strategy are explored in two cases (one on crop protection and one on fertilisation), to see if evidence can be found that enhanced learning indeed took place and - if it did - if these features indeed were significant.

The structure of the regional networks fostered interaction between major stakeholders, creating the basis for learning in FwF. Because of the intensive interaction major stakeholders were forced into reflexive practice. In building a joint frame of reference team members encountered two types of tension which they had to overcome. Different disciplines, originating from different (institutional) backgrounds. Researchers had to explicit their views on important (technical) issues such as nitrogen leaching. Research plans were made collectively, both for research activities and for annual farm plans. Researchers had to actively step into farming praxis. It was further remarkable how project setup, with intensive and frequent interaction between researchers and advisors, generally not meeting each other very often in a setting like this, and coming from different institutions, forced them to reconsider each others role and therefore also the general view of each institution involved. This was not only useful in communication related to the project; it also led to a relaxation of frictions that existed prior to the start of the project.

An interesting side effect occurred on the level of participation in decision making. In the beginning, co-ordinating and decision making was mostly done centrally by the management team. While developing dynamics during the project, however, researchers and advisors in regional networks asked for more room to manoeuvre. The management team, focussing mostly on progress in terms of environmental objectives and general project performance, needed some time to acknowledge that a more decentralised approach could provide regional network performance. Networks were given budgets for regional activities. Regional networks also claimed more time for exchange within and between teams during meetings of the Project team.

Cases

The setting of this paper does not allow for a detailed evaluation of the potential techniques that were suggested to the farmers. It is of interest however, to mention two cases, showing how farmers evaluate alternatives in a systemic way, and how the project structure, especially the relatively large number of disciplines included in the project and the different platforms for exchange of information and/or views have played a role. In each case stakeholders became aware of gaining new insight. In Annex 1 we describe two significant cases. In the following we discuss the learning results in both cases.

In the case of the fertiliser strategy three research cycles were implemented simultaneously: research on pilot farms, and systems and experimental research on experimental farms. In the classical set up these research cycles would take place one after the other, independently, and only when conclusions were thoroughly grounded in repeated trials and tested. The insight that mineralisation appeared to be higher than expected was effectively shared by all stakeholders and lead to adjustment of fertiliser practices and research in all three programs. From the start, all stakeholders were represented in diverse platforms, at all times including representatives of different kinds of experimental research, applied systems research and the advisory service. This lead to the emergence of networks for effective data exchange.

In the case of the CropScan, FwF pilot farms successfully asked to be included in a testing program on CropScan application in leek, following an effective lobby starting in regional networks but soon including the ‘project team’ and reaching the management. It was further decided to compare this method to two alternative methods of analysis (mineral soil nitrogen and petioles). In a classical research setup this analysis would have been implemented on experimental farms. Under FwF, simultaneous field windows were designed at the pilot farms.

Discussion and conclusions

The challenge of this paper is to prove that the chosen approach, including participative learning and trying to realise a structure to facilitate better learning, has been successful. While this is not easy, a number of indications show that pilot farmers, researchers and advisors effectively could exchange data and insights, reflect and give feedback, activities that helped them to select those techniques that potentially contribute most to their objectives. This is demonstrated by the cases discussed in Annex 1, and the quotes that are presented in Annex 2. We realise that the amount of evidence included in the paper is limited, but it is beyond the scope of the paper to go into more detail.

As to the question, to what extent enhanced learning is related to the project structure, this is even more difficult to answer. With hindsight, one might say that the choice to set up diverse, multi-disciplinary platforms for data exchange has contributed to the creation of effective learning conditions. This is also the case for the synchronous execution of three research programs, and certainly holds for the on-farm trials that have been held. As was stated before, most of these decisions were taken more or less intuitively and by no means at all times with the intention to improve learning conditions per se. It does however appear that, given the acknowledgement of the seriousness of environmental problems and experience in dairy farming research prior to the start of the project, sufficient elements were available for effective project setup. This paper has tried to analyse part of this in a systematic way, focussing on project organisation and learning conditions. It can be concluded that elements of the approach are no doubt also applicable elsewhere. One might consider, for example, the synchronous execution of different research programs, assuring data exchange in multi-stakeholder platforms and, preferably, a combined management. Further, setup of mixed, integrated platforms for data exchange and discussion certainly seems to be favouring learning conditions.

A last word, finally, on our co-operation. During the writing of this paper, we have reflected not only on the process as a whole, or the role of research, but also on our intentions when we first became involved in the project. Writing this paper therefore helped us to analyse the way in which conditions for learning were shaped, and to what effect, but also to decypher the way in which our own day-to-day decisions played a role in this. Although sometimes we seemed to speak very different languages, it helped us to reflect on ways to improve conditions in activities that are to come.

Concluding, Fwf has facilitated learning and probably more learning than could be expected. This was not always done intentionally; sometimes conditions for learning were created unintentionally. Nor did creating good learning facilities always play a role in day-to-day decision making. Creating learning facilities was, however, always related to project setup, elements of which also seem applicable in other projects under different conditions.

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ANNEX 1 Examples where intensive data exchange enhanced project performance

- **Generating a fertiliser strategy considering mineralisation**

Regional networks designed fertilisation strategies for each pilot farm at the beginning of the project. Input was provided by farmers and researchers, basing themselves on results of experimental research. Network members annually discussed farmers' performance over the previous year, after which farmers made plans for the new year. These plans were evaluated in the network, whereby researchers and advisors could do suggestions to farmers, making sure that that partial solutions which would be beneficial at one point but detrimental at another could be avoided. If necessary, specialists were invited to contribute to the discussion or provide information.

General issues regarding nutrient management were discussed by a working group. Findings were reported to the projectteam and – through researchers and advisors – communicated to farmers. Results from experimental farms were presentated to the projectteam, which become the central focus of data exchange, discussion and feedback. Meetings became an effective way to be informed on research, while ideas for new strategies in nutrient management could be adopted. The fact that all non-farmer members of the regional networks were attending these meetings assured proper exchange of information to and from farmers. It was through such discussions that awareness was raised to the role of nitrogen release from mineralisation of organic material. Experimental results showed that the release exceede expectations; realisation of environmental objectives required considering release more explicitely. This was discussed in the working group and presented to the projectteam. Researchers introduced participatory on-farm research for on-farm monitoring of nitrogen release on less intensively fertilised potato plots. Results astonished farmers, advisors and researchers alike, which strengthened links between the stakeholders, but especially between farmers and researchers.

- **CropScan**

Reduction of nitrogen fertiliser application, the most common strategy to limit nitrogen losses, has important advances; it is economically potentially profitable and links well with agronomic advice. In many cases, fertiliser application is split into a starter base, followed by additional applications over the season. There are several methods to quantity the additional applications. The most commonly applied method is a destructive analysis of leaf petioles. Petioles are sent to a laboratory, which provides a fertilisation advice. Evidently, analysis and advice have to be paid for. A less commonly applied method is based on a non-destructive leaf canopy reflection measurement. This technique, referred to as CropScan, was available at the start of the project, being provided by a research institute involved in Fwf and some laboratories. CropScan requires technicians to operate the equipment and to calculate fertilisation advice. After the second year, it was decided to test the different methods for calculation of addtional applications.

At the beginning of the project, CropScan application was restricted to potato. During the project, however, application became possible for leeks. Technicians of the research institute tested CropScan outisde of the project, but pilot farmers explicitly requested CropScan testing to be extended to their crops, which was done in the next year. Communication on the extension proved to be fairly simple, as the pilot farmers request could be discussed with project management by non-farmer network members. We are convinced, therefore, that the networks involved contributed significantly to the extension.

ANNEX 2 Boxes with learning experiences from various stakeholders

(strategic) research: "Nutrient management is complex. On-farm trials showed that a considerable amount of nitrogen is released by mineralisation. Using Nitrogen windows and CropScan made farmers aware of this invisible part of nutrient management. But also for us the effect of mineralisation was an important lesson which we learned through on-farm trials."

Advisor: "Participating brings me closer to information on new developments in research. Before, it took such information long to get through to us. Research at experimental farms showed for instance how to grow cover crops under avenue trees. The experimental farm is not an exact replica of practice, but nevertheless the results give us food for thought in our discussions."

Farmer: "Exchange meetings have added value, allowing me to compare results with colleagues, and exchanging ideas and experiences. Colleagues tell their own stories, providing background information at parcel level. I am not keen to adopt new ideas straight from the experimental farm; I like to hear a colleague's view - a view from someone who tested it in practice, our practice - first. In that way I learned a lot about MLHD and the use of the CropScan."

(applied) research: "Mutual exchange between researchers and practioners proved to be very useful. Through intensive collaboration we (researchers) gained more insight into bottle necks on the farms. Through close monitoring we gained more insight in the nitrogen dynamics in the soil and there fore we can provide tailormade fertilisation advices to the farmers. In our team a very positive collaboration generated openness to one another and through mutual respect we all made steps forward."

Changing our perspectives on learning to manage change

Harold Mattner*, Roger Packham and Richard Bawden*****

"… personal and organizational transformation cannot be generated by force, by attraction, or by reason, but rather requires an aesthetic artistry and mutuality that generates challenge and free choice."

(Torbert 1991:p.40)

Abstract

This paper makes an attempt at depicting 'deep transformation' – a change in the nature of change and uses a project with subsistence farmers in Mozambique as an illustration in the type of change sort. Using a philosophical and auto-ethnographic approach the first author focuses on the dialect arising between self and culture as he pursues a career in development that addresses the problem of hunger and starvation. Tools of analysis and practice (theory and methodology) are themselves analysed. The implications of this analysis are brought to bear at the site of interaction with subsistent farmers and how this influences the nature and focus of projects is discussed. 'True' coherence between the differing worlds of the participants and the environment is sort with the guidance of a self-reflexive ethic of the value of others that is founded in the value of self. The purpose of the paper is not intended as a guide for others but an invitation for the reader to enter with the authors in the challenge of deep transformation as a means to provide for a better present and future for us all.

Approach

This paper takes a philosophical approach that allows for an "individual exploration" (Powles 1984) that is both heuristic (searching for meaning) and critical. The term critical is used in a Habermasian sense (Simons 1995:pp.125-6).

> *In Knowledge and Human Interests Habermas says that an exercise of reason is 'critical' precisely when its impact frees us and others from the interests that constrain us and others from arriving at a greater degree of liberation."*

This greater degree of liberation arrives in the process of becoming aware of the values and frameworks that direct much of what we do while often remaining illusive of our direct cognition. This approach is supported and enhanced through critical auto-ethnography. Auto-ethnography being a self-reflexive

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process that emerges from a "dialectic between the personal and the cultural" (Alsop 2002). That is, between the personal interest in individual meaning and purpose as it interacts with customary beliefs that are socially transmitted (the cultural).

Application of the Approach to a 'Career' in Development

The first time I became aware of any great difference between myself (please note all future personal pronouns refer to the first author) and the culture around me was in my teens. TV images of starving people on the African continent in the 1970s profoundly affected me. What if these people were my family and friends, what would I expect of myself and others? From that time on the answer to that question was intimately tied with my notion of humanity, and whether that label was worthy of any special meaning. At the time I thought this a 'normal' response but in retrospect it seems somewhat different to the cultural tendency to either give something to a relief program or forget about it, both being responses to the view that the problem was temporary rather than systemic.

At the time I presumed that the problem was caused by a lack of food, as I could not conceive that the world of which I was a part could allow such human deprivation without good cause. My response therefore was to help produce more food through becoming an agriculturalist. This I did by doing an agricultural degree. While at Hawkesbury Agricultural College, where as a student taking a "Hawkesbury approach" (Bawden 1992), I became aware of complications that could frustrate the production of food. But these early premonitions were not provided tangible meaning until my first overseas work in the Solomon Islands. It was during my first and second jobs firstly assisting local farm managers produce food for a boarding school and secondly supporting villagers' steepland food gardens that I experienced first hand how the relatively simple problems of food production can be frustrated by human behaviour. Yet my experience of development in the expatriate culture that surrounded me was a focus on technical ability and professionalism in doing a job with a view to getting the next job. That meant particular sensitivity to the needs and wishes of the donor and implementing agencies.

Given my initiating experience and response to the dire need of others this cultural tendency had no appeal to me. Rather I was personally focused on making a tangible difference to the lives of the local people I worked with. I presumed that there was sufficient latitude in development organizations to allow for this but my experience has not been able to substantiate this.

It was in Mozambique where a second crisis, almost as great as the first encounter with hunger and starvation, occurred. This crisis exhibited itself in the realization that the very expatriate institutions that were purportedly promoting development in theory, were in practice mediating against it. Local institutions were also intimately connected with this problem. This devastating realization almost saw me 'give up' on the problem and just go and live my own life as comfortably as I could. But the problems of hunger and starvation persist and if humanity is to have any value to me I must continue, to "make common cause" (to borrow a phrase from Susan George (George 1988:p.263) with those whose experience it is.

Focus of the Approach

Throughout much of my career I have noticed a focal problem for the expatriate culture of development has been how can we get subsistence farmers (hereafter referred to as farmers) to change? This culture appears blind to such questions as why it is that farmers don't change according to a project's prescriptions? That there could be something wrong with the prescriptions, or there may be a need for the experts or the institutions themselves to change. This was in contrast to my personal understanding that the farmers were in a difficult position and so would be the first to change if they saw something that benefited them. Sometimes their belief systems, culture or education may affect this process just as it affects expatriates. Expatriates make plenty of mistakes in the process of their learning and an equal 'space' ethically needs to be provided in the case of the farmer as well. Change for me became a focus on dialectic interaction, that has an allegiance to farmer's needs (Collinson 2001), facilitated by an ethic that reflects the 'legitimacy of others' to use a phrase from Maturana and Varela in (Bawden 1995:p.236). Such a view leaves itself open to the question of changing oneself or the views by which change itself is defined and practiced.

The question that remains is how can the focus on the farmer as 'object' of development and its blindness to the need for institutional or cultural change be challenged? In (Cooper and Packard 1997:p.vii) a similar problem is noted and the response of this group of sociologists was to move toward an equal focus on examining the 'institutions' that were defining the situation.

> *As Africanists, we were concerned that a powerful apparatus of social scientific inquiry was being turned toward Africans - their histories, their cultures, their literatures, their politics - without a comparable examination of the investigatory apparatus itself, or indeed of those institutions of the western world which impinged directly and indirectly on Africans' lives.*

This group then moved on from their institutional analysis to examine the 'development encounters' at the sites where these institutions worked (Ibid, p.viii).

> *The idea was to move from an historical, sociological, intellectual, and political analysis of the institutions that constituted the development apparatus toward a closer examination of the dynamics of interaction that occurred on the sites of development activities.*

Susan George in (George 1988:pp.256-7) makes a similar observation.

> *Normally development theorists should be trained to test their models by observing **what they do to people** [emphasis in the original], since human welfare is theoretically the goal of development.*

This paper endeavours to do this through a case study. Prior to this, however, it is intended to investigate briefly two frameworks/worldviews that can alter the formation, application and interpretation of theories and methodologies, and in turn the kind the development we do.

Some Onto-Epistemological Considerations

I grew up in a world where the nature of my being (ontology) reflected a reality outside of me that as an observer I presumed to talk about in objective terms as a one-to-one relationship between an object and my experience of it. Words also tended to be assumed to have a one-to-one meaning with experience and epistemological assumptions of how I could gain knowledge largely revolved around learning from others who already knew or were given special status as 'knowers', such as experts and teachers.

It was not surprising then that I wanted to learn as much as I could from others to resolve the problem of hunger and starvation. To learn from institutions and people I viewed as experts. However, in time my learning ran into problems as the understanding of my experiences began to run contrary to advice from others and what I had previously learnt. I had to begin learning for myself, in relationship with my environment. This change was assisted through adult learning principles such as self-directedness (Knowles 1984), Zukav's comparison of Classical and New Physics (Zukav 1979) that Uphoff applied in his practice of sociology (Uphoff 1992), and Maturana’s explanation of “(objectivity)” as one explanatory domain of coherences where validity claims in differing domains lead to many realities (Maturana 1994).

I found the explanations reflected in the difference between Classical (Newtonian) and New (Post-Newtonian) Physics helped me understand the changes occurring with my onto-epistemology. For this reason I will explain a little of these differences. Science is changed when the scientist is included in with their science. The observer was seen to make a difference to the observation according to the New Physics (the quantum physics and relativity that resulted from the publishing of Einstein’s papers on those topics in1900 and 1905). The implications of light being both a wave and a particle and the scientist’s observing as influencing the observation was a radical change compared to Classical Physics. Zukav (Zukav 1979) makes a most readable account of these differences and the implications they have. Classical Physics claimed to be based on ‘absolute truth’ (the way nature really is ‘behind the scenes’), where the knower is an observer and each element of theory has a ‘one-to-one relation’ with reality. The philosophical implications lead to impotence in the face of a Great Machine which is the universe. The epistemological assumption is that the separate parts together constitute reality. Quantum Physics however, claims only to correlate experience correctly, where the knower is a participator and the theory does not have a ‘one-to-one relation’ with reality. Philosophically this leads to the possibility that our reality is what we choose to make it and epistemologically assumes an unbroken wholeness (Zukav 1979:pp. 65-65 & 314-326).

(Williams 1988:pp.124-38) points out the differing nature of causation. Quantum Physics giving rise to causation through a mutual simultaneous shaping compared to the necessary and sufficient conditions having deterministic effects in Classical Physics. Quantum physics provided a whole new way of looking at the world and our position in it.

Rather than looking for universal laws or methodologies that could be used to direct my work or by which my work could direct other people’s work I began to be aware that theories cannot be greater than the theory maker nor a complete substitute for experience. I am speaking in the domain of ‘development’ here not natural science.

The Selective Application of Theory and Methodology

This ongoing change in my onto-epistemological understanding assisted me with a problem that I faced in my work with farmers in such countries as Australia, Solomon Islands, Mozambique, Cambodia and now for the last 10 years part-time, in my doctoral studies. That problem was, how could I use theories and methodologies that have largely been developed in a different context? Directly using them would be like using an answer for the wrong question, like expert knowledge imported to foreign domains. To transpose it is to mistake technical alacrity for competence. Yet to personalise or internalise it and use the insights as they ‘resonate’ or ‘cohere’ with the new environment leaves one open to the claim of its misuse. Yet this is what happens in our use of words and language.

I was also becoming aware that it was important not to be limited by the known. That there were times where it was important to forgo the use of theory and methodology. And seek the ‘coherances’ and ‘resonances’ of the new situation – the unexplainable. Marianne Mithun provides an example of this in relation to the foundational contribution made to American anthropology by German American Franz Boas (1858-1942). He forwent the comparison of North American languages with Greek or Latin.

> *... he recognised right away that you don't describe these languages [North American] in terms of Greek grammar or Latin grammar, you don't just look for the six cases that are supposed to be there. You sit and let it happen. You let people talk, and then you see the structures that evolve as they speak. Which means you see distinctions you would never have dreamed possible, and you see generalisations you would never have dreamed possible…*(Mithun 2003)

I began to use theory and methodology as a metaphor and myth. As a means of gaining meaning and insight that cohered with my new situation, rather than a means of directing my or anyone else's thoughts or actions. A means of providing confidence to enter the notion of learning as an 'unravelling' (Salner 2001), of opening Pandora's Box by addressing the double-loop learning described in (Argyris and Schon 1980:pp.4&134).

> *There is in this sort of episode a double feedback loop which connects the detection of error not only to strategies and assumptions for effective performance but to the very norms which define effective performance.*

Of practicing a science alluded to by Zukav that is not limited by the known. Of the experience of Pirsig's 'Quality' through his notion of 'stuckness' and 'gumption'. And finally that of Dante's *Inferno* whereby the learner as Virgil is brought to the edge of the inferno "with understanding/and art", through which he alone must pass. The learner is crowned and mitred over themselves. That is, the authority of state and church, and to that I would add university, is lost to the 'self'. This does not mean we abandon all authority, theory or methodology all the time. Rather, a new situation or experience may necessitate the letting go of what we know before new knowledge can be formed.

What Kind of Change?

Based on the premise that we cannot expect things to change by doing the same thing, a 'bad' situation (and it should be noted it may not be seen as bad within a different culture or worldview), as I took hunger and starvation to be, may provide motivation for radical change or transformation. However, change according to (Allen 2000:p.1495) may occur "in structure, appearance, or character." It is change in 'character' with its corresponding changes in structure and appearance that best fits the nature of change I have experienced. The type alluded to in our discussion to this point and the type that results in a change in the norms that define how the problem is defined. This change is different to the change I have most frequently experienced in development projects where the focus is on improving efficiency and effectiveness without sufficient questioning of the norms by which those factors are defined. I would describe these kinds of changes as changes of appearance that may also include changes in structure, but not critically sufficient to include changes in character.

But what do all these ideas look like in real life? Let me try and illustrate it in the following case study. Again due to space I have decided to focus mainly on 'transformations of character', or 'deep transformation' to borrow a term Richard Bawden has recently acquainted me with.

A Case Study –Mozambique

A brief field visit

As an introduction to the case study I would like to take you on a brief mental field trip to the village and surrounding areas of *Julius Nyerere*, the focus of project activities. This village had a population of

22,000 people (3,200 families) located about 35km from Xai-Xai (itself about 200km north of Maputo, capital of Mozambique), capital of Gaza Province. For all intents and purposes we are on an island as it is too dangerous to travel much more than about 10km in any direction from Xai-Xai, with exception to this line along the Limpopo valley where the village is located. All project staff travel by plane from Maputo and any goods trucked through risked being destroyed along the way. We are not allowed to stay in the village overnight for security reasons.

You will find that most farmers were women, as many of the men worked in the South African gold mines. Their typical day was tough, rising early and leaving around 5.30am to walk anywhere from 5-10km or more to their farm plots in the valley. On these plots they grew mainly corn and beans. The heavy clay soils of the valley floor required cultivation with traction animals or tractors, but both were in very short supply. These clay soils make it very difficult to visit the farmers in the valley any time there is rain about or when the soil is wet. After working the women would return anytime after about 1pm in the heat of the day. It was not unusual to see women carrying a load on their heads (firewood, thatch, or harvested corn) with a small child and/or a basket in one or both arms, or on their back. After returning home the school children may be sent to collect water from a distant well and the ladies started preparation of the evening meal, undertaking the strenuous work of pillaring and grinding the corn by hand. At the time Mozambique was gripped by what could best be described as general terrorism and banditry. Sometimes it was necessary for the farmers to leave the village at night to sleep in the valley below to avoid raids of destruction, looting, killing and abduction. Most farmers also had plots of land on the higher sandy plateau upon which the village was located in order to avoid those times when the valley flooded. In this sandy area cashews and peanuts were grown.

The project

The Australia: Save the Children Fund Australia (SCFA), *Food Security and Self-Reliance Project, Mozambique* ran from 1989 to 1992 (SCFA 1989). About A$1 million was spent on this AusAID funded project over three years. The first author of this paper was the Agricultural Coordinator of the project and the only SCFA expatriate residing in Mozambique. The project was part of a much larger Save the Children Federation (US) [hereafter referred to as SCF(US)] project that included health and emergency sectors. SCF(US) had a central office in Maputo that was responsible for all its projects in Mozambique. It provided the country logistics for the project while its Xai-Xai office from which the SCF(US) Project Manager and SCF(US) Health Coordinator worked, was also to provide additional support to SCFA.

In trying to move its agricultural production above 10% of its domestic grain needs (UNDP 1989) Mozambique had followed a path of state farms, and then cooperatives, and as each endeavour failed a new approach was put forward; this time it was the notion of a *casa agraria*. Literally translated as an agricultural house, it was seen to be a community-based agricultural centre that provided farm inputs, grain storage and processing facilities, technical advice, and subsistence supplies. It was proposed that this entity could be self sufficient, an unusual aim I thought, given that government was far from self-sufficient itself and yet had greater access to outside resources.

Background to the case study

This case study is not about an ‘ideal’ conceptual study that from start to finish was guided by a particular methodology. Rather it was a ‘hands on’ process to see if the personal understandings on development and worldviews that emerged from my previous experiences and theories were of wider cultural use. In this particular case a project proposal had already been completed and funded and the Project Manager of SCFA and the SC(US) Country Director for Africa were looking for someone to coordinate it.

The proposal document (SCFA 1989) as I saw it reflected the way I saw projects before working overseas. Only now I was beginning to see presumptions surrounding the notion of 'expert', the relatively 'static' and 'benign' environments, and the farmer seen as 'not knowing' and thus in need of tutelage. An additional problem I was beginning to be ware of were that project documents resulted from proposals developed to gaining funding. Here, special sensitivity is provided to the donor agency. The problem after funding is that it then becomes the document upon which implementation is based. The project proposal saw the main problems of farmers as lack of training and farm inputs. It depended upon a formal training program at the Provincial Department of Agriculture Training Centre for casa agraria staff and farmers. The use of off farm demonstration projects, a baseline survey of 100% of farmers every six months, the construction of two Casa Agrarias and supply of seeds and farm inputs, a logical framework and a budget. The purpose and justification of the project was to lift farmer grain and livestock production by 20% and the amount of produce they marketed by 20% over the project period.

In seeing the project document as a static representation of a dynamic situation I was able to suggest changes in approach. No matter how good the expert and not-so-expert analysis is in developing a project proposal, things change. Mitigating against the project document representing the situation in the field was the time that elapsed from the initial fieldwork and the limited participation of local people. Such factors become very important when operating in a very difficult environment such as Mozambique was at this time. I was prepared to accept the goals of the project, as I thought that in a country producing only 10% of its food needs that any work in this area would be of interest and benefit to farmers. However, my view of efficiency and effectiveness was not the implementation of the project plan as it stood but by embracing the goal of increasing food production through a process of interacting with the farmers in their environment according to the needs as they saw it and the expectations of the donors. My job at this stage was to align such views with the expectations of SCFA and SCF(US). The other observation I made to them was that pending the local circumstances I would most probably change the training program from a formal classroom oriented one to training program based on successful interventions in the field. My learning at university and experience in the Solomon Islands had shown the effectiveness of such an approach with farmers.

SCFA and SCF(US) were happy to employ me on this basis. AusAID provided a project structure that included a Project Coordinating Committee (PCC) Meetings every six months. This group included all participant sectors, including farmer and village representatives. The PCC meetings were an ideal means whereby changes in the project could be made according to changes on site.

I was told by the SCF(US) Country Director for Africa that they had tried to achieve something in agriculture at the project site previously but nothing was really achieved and I would be starting from scratch. SCF(US) was a large organisation at the time with an annual budget in the order of US$85million, SCFA was tiny in this regard. I was expectantly looking to learn much from them. Unfortunately it did not turn out like that. What started out as a supportive environment gradually got worse the closer I got to the project site. The two people I negotiated with from SCFA and SCF(US) both changed jobs and I found myself in Xai-Xai at the other end of the table from five SCF(US) expatriates from New York, Maputo and Xai-Xai all saying that what I was doing was wrong. I asked them what document they were using and they showed me a proposal dated one year earlier to the one that SCFA, SCF(US) and AusAID had signed off on and which provided the basis for my contract! Yet they appeared that they were not willing to change their orientation to that of the existing legal document.

What previously I had seen to be substantial support from SCF(US) became minimal and at the Xai-Xai level counter productive. I will take one point to illustrate this. SCF(US) had agreed to provide suitable office space for me in Xai-Xai. They had been provided sufficient office space for the Health and Emergency sectors by the Provincial Department of Agriculture (PDA) due to the overall project having an agricultural component. They wanted to keep this space for themselves. I suggested that we look for additional office space together and they said they were happy with what they had. As a result of this I negotiated with the PDA to renovate a building area they had outside the main building so the social club could shift to that area and allow us to use the office area they previously used. After all this work was done I was told by the Health and Emergency sector coordinators that it was not fair that we had all that space and that they should be able to take up half of the new area I had arranged. I agreed with this and then when I started to arrange to fix the toilet in the new office area, the Health Coordinator protested against it as it would reduce the interaction between the staff upstairs with the staff downstairs. I could multiply examples like this ten's of times. The purpose in bringing these issues up is that I was neither looking for nor expecting these things to happen, yet they happened and theory does not have much to say about them. Such a situation places extreme pressure and creates a head wind that a project has to counteract before anything can get done.

Contrary to the SCF(US) Country Director for Africa's view that nothing much agriculturally had been accomplished the Emergency and Health Coordinators view was that a lot had been accomplished although they could provided no evidence as far as project documentation or physical evidence other than a casa agraria of local materials that was falling apart and a group of PDA and casa agraria extension workers that were nominally working with 80 farmers and making bricks to build a new casa agraria. They were still very much attached to directing the agricultural project and I was happy for them to do this while I was establishing the project infrastructure and talking to as many people as I could about the project.

Whether I came across PDA, District Department of Agriculture (DDA), or other project staff and introduced myself as the Agricultural Coordinator for Save the Children I was often confronted with the same comments. These noted that I was from the group who built a casa agraria of local materials (The Director of PDA thought it a great novelty that Americans came half away around the world to show them how to build a casa agraria of local materials), introduced crops not recommended by PDA or DDA and introduced cattle into the village area contrary to local health regulations.

One world one truth Vs many worlds many truths

The problematic situation that arose with the Emergency and Health Coordinators came to reflect the world from which I was coming from and the world within which many projects proceed. I was happy for them to have their point of view but I could not understand why they persisted in trying to change my point of view. Especially in a domain in which they had no training and very little experience. Yet that had been the way I learnt in the past. To find someone I thought that knew more than me and do what they say. They were just two people I mused who 'knew' and therefore expected everyone else to learn from them. I have seen projects often like this, with a focus on changing the farmer. This is not unlike a Classical Physics view of the world. Such a world resonated with my conservative religious heritage of people who knew the 'truth' and therefore conversations became a one-way affair from the truth holder to those without the truth. Yet it was the last thing I wanted to appear to the 80 farmers who I was yet to meet as a group.

How could a project be transformed along the lines of a New Physics notion of the world? A world where I can share my 'truth' and you can share yours. Of creating shared worlds that cohere as each individual world is *trans*cended.

An adventure in process

The first major interaction around which the success of the project coalesced illustrates the difference between the approach used and the dominant approach of most other projects at the time. This was achieved not by implementing a pre-planned project (note that all project documents at the time of my arrival were in English – at my suggestion all major documents were translated into Portuguese – it would have been better to translate them into Changana, the local language, but we could not do everything), but rather, based on interacting with the vital daily issues in a Freireian sense of consciousness raising (Freire 1970). A process whereby people *as knowing subjects* rather than as objects or recipients, *achieve a deepening awareness both of the socio-cultural reality that shapes their lives and of their capacity to transform that reality*.

At some stage the project had to face 80 farmers who had received no substantial benefit from the previous two years of working with the project. If a project revitalisation was going to succeed, it needed to at once demonstrate that it had something to offer, that we were trustworthy partners who would listen and act on what we heard, and that we could help the farmers improve their own capacity to act on their own problems. This was achieved by accessing the experience-base and the support of the project agricultural extensionists and of the Casa Agraria President and its workers. They were all in agreement that what the farmers most needed at that time, was corn seed to plant, and that the best way of delivering this to them would be via a credit program. This correlated with my own observations and talks with farmers directly so corn seed was immediately ordered. Most had to be imported and this itself was a difficult task as much cargo was destroyed en-route due to the bandits. It was also thought that the farmers might show interest in trialling small plots of a new variety of corn, together with a plan of pest control to ensure better seedling establishment.

The first meeting with the farmers was preceded by a lunch - a show of traditional hospitality by the farmers. Instead of talking to the farmers about the new project and what it would do, we asked the farmers what their greatest need was at that time. They said that it was for corn seed as the season had two false starts that had exhausted all the farmers seed corn. When asked the best way they thought the project could help them in this regard, they also suggested a credit program with the original amount plus 50% extra seed being paid back after harvest. I would have been happy with 10% extra corn being returned on top of the amount provided but the farmers insisted that 50% was appropriate! The project was happy to take the risk of seasonal failure and not expect repayment should lack of rain result in no harvest. We did, however, need information from the farmers regarding the number and size of farms in each zone, in order to help us plan for the amount of seed that would be required. We also asked for a contact farmer that the extensionists could visit in each zone to develop the program further, particularly in relation to undertaking on-farm experiments with regard to seed varieties and pest control following germination. The extensionists had been trying to get this information for two years, and it had seemed impossible; now the farmers were willingly cooperating to provide the required information. The joy of the extensionists was palpable. It should be noted that until we were able to discover the natural working structure of the farmers in the valley our work could not develop. This was different to the structure of the same group of people in the village.

This was our first joint operation with the farmers and things just blossomed from there. It resulted in a good harvest at a time when no other grain was available in the district. People in Xai-Xai knew where to go to get grain, and word got out such that the Mozambican Experimental Television Station in Maputo came out and made a documentary called *Sementes a Crédito* [Seed by Credit] (Mozambique Experimental Television Station 1991) without any prompting on our part. In that documentary Geramias Mondlane the Mozambican counterpart Agricultural Coordinator for the project makes three points about the project.

1. That the project did not grow through inviting more farmers to work with it … the farmers saw what the project was doing and would invite the project to work with them.
2. The difference between this project and other projects was that it had no fixed methodology of rural development. For example, this season our project is selling butter beans (*fejão manteiga*) something that no other project in the province is doing. Yet all the projects would have seen last year that the butter bean crop failed, but no other project was flexible enough to do anything about it.
3. The project does not order anything like hoes or seeds without first going to the farmers and asking them what they think about it.

As a result of this successful interaction the number of farmers participating jumped from 80 to 530, and then to 1350 within less than 18 months, all without the project undertaking any self-promotion. On their 10m square demonstration plots, farmers' yields doubled (to 2t/ha) through a combination of new varieties and different planting densities, when compared with the rest of their fields. Yet given such success, the project was just at a starting point as the basis for dealing with the larger problems limiting grain production – those being the need for irrigation, land preparation and pest control (Mattner 1990:p.12) .

The level of achievement of the project was well regarded. The Director of PDA said we had the best *case agraria* in the province and the Village President said:

> *…that they have not worked with a project that has made development look so achievable for them.* (SCFA 1991:p.5)

In Conclusion

At the beginning of my journey in development with subsistent farmers I was only too willing to follow the directions and advice of those I thought that knew better than me. This was supported by an objective world view where specialists held a privileged place closer to that reality than the self. Under such a view farmers are often seen as 'objects' to be changed, and often this can be a sole focus of a pre-planned project. But such a process can be blind to the apparatus that is making these claims about the farmer, and the reality of poor field results.

When conflict arises between personal experience and cultures interpretation of it a challenge arises that provide for the possibility to envision a different world. I found that different world symbolised in New Physics, a world where projects could be involved in a process of 'mutual simultaneous shaping' to quote (Williams 1988:pp.124-38) again. The implications for development projects, in my view, is a sensitivity to farmer-project interaction that is equal to that between the institution and the donor.

The case study in Mozambique showed the possibility for me, of achieving project aims via interacting directly with farmers needs as they see them at the time in dialectic with how the project saw them. The advantage of this is that as they are part of the creation process there is no residual problem of trying to change their mind. However, institutional change appears to be more problematic, particularly in regard to maintaining their privileged position of defining the situation.

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Facilitating participatory evaluation as a learning process

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Abstract

This article presents the experience of conducting an evaluation of participatory learning, within an action research project conducted in South Sulawesi, Indonesia. An alternative approach to evaluation was taken by focusing on learning, and creating dialogue with the community as a main strategy. We classified this project evaluation in terms of: the outcomes of the research project, but equally importantly by the learning that occurred for all groups of participants. In this connection, we discuss the basic differences between *traditional* and *constructivist* research paradigms. We conclude that strategies and methods employed in the evaluation itself are key elements to enable participants to clarify and articulate their norms and values, decide on action, and illuminate their learning and eventual empowerment and a sense of liberation.

Introduction

The dictionary meaning of the phrase "to evaluate" is to give value or to judge. Taking this viewpoint, evaluation may be defined as the act of judging or determining the value, merit or quality of something finished, ongoing or simply a proposal. The act of judging also calls for a definition of what is good or desirable and what is bad or undesirable.

Two categories of evaluation can be distinguished in agricultural development programs, the formative and summative evaluation. The differentiation between the two types of evaluation is concerned with the basic use of the value judgment (Petheram 1998). Formative evaluation is usually conducted to provide program staff with judgments useful for ongoing improvement of the program, while summative evaluation is commonly conducted after completion of the program for the benefit of the decision maker to determine whether the program had achieved its goal and whether the program should continue or not.

In this study, both formative and summative evaluations were conducted. The formative evaluation was carried out during the implementation of action as a part of a Participatory Action Research (PAR) process. The PAR methodology results in on-going learning throughout its implementation, and therefore the evaluation process played an integral part in the development of the study. Evaluation was built into all the stages of the research process and it determined the action orientation at each stage. It was aimed at improving and developing existing activities, and to establish whether those activities were reaching their goals or not. The summative evaluation was conducted towards the end of the research project's life and it aimed at reviewing what participants thought and valued about the process and outcomes of this research project, and to move towards a self-sustaining development process in the study area.

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The present research project was undertaken in Tombolo village South Sulawesi, Indonesia over a two-year period. PAR was employed as an overall strategy to investigate Tombolo village, and to support villagers and development workers in their *learning how to learn* in order to improve their own situation. The PAR first identified the problems and needs of the farmers, and then developed strategies with them to meet these needs. They learned and executed social research techniques and they took actions and interpreted the results of the actions based on what they had learnt. In their food production efforts, fodder security through the year was found to be the major constraint to cattle production. This was improved through integrating forage into their farming systems. Though this represented a 'new' technology' for these villagers, introduction of the forages was adapted by them to local issues and needs. Details of the approach taken in this project and some of the outcomes have been described already in Habibie et al (2002a, b). This paper includes an outline of how reflection in the PAR cycle was undertaken by the different groups of actors during the course of the project.

The most common approach to evaluation used by Government Livestock Services in Indonesia was "measuring" things only to fulfill the need for accountability, and external evaluators would carry out the evaluation. The clients of the programs (farmers) were not generally involved in developing indicators for the evaluation. In this study, instead of using a conventional questionnaire method to evaluate the participatory learning process and to give value to its achievements, villagers in collaboration with the PAR team and development workers, developed some working strategies for evaluation that emphasised dialogue. Here, an evaluation based on a constructivist paradigm was undertaken, consistent with the principles of community participation. The community self-evaluation strategy that was carried out built upon the inherent critical and reflective capacities of the participants who were involved in this study. The researchers and stakeholders defined the topics to be examined in order to transfer knowledge relevant for future actions.

As a research project about social change, in the evaluation of this study, we were not searching for the desirable and undesirable things, but rather some reflections from the participants about the lessons thy had learnt during the research process. The focus here was looking at what happened with respect to the activities carried out by the stakeholders, why participants thought these things happened, uncovering the factors that contributed to both the success and the constraints of the research project, the strategies employed, and what this research meant to stakeholders in terms of their everyday lives. It also included the reflections of the facilitators on the learning process.

Theoretical perspectives and Approach adopted in Evaluation

There has been a gradual shift from a notion of evaluation based on the conventional approach involving measurement, judgment and description by 'an expert' to a concept of a participative approach in which the people who engage in the research process participate in the creation of knowledge through review (Guba and Lincoln, 1989; Brunner and Guzman, 1989, Patton, 1989; Ernest, 1993, Narayan, 1995, Mayer 1996 and Wadsworth, 1997). Guba and Lincoln (1989) in their *fourth generation* evaluation introduced the constructivist approach to evaluation. From their perspective, evaluation is a process of construction and reconstruction of realities. It comes closest to giving full consideration to stakeholder concerns. Here, the evaluator should not only be responsive to the needs, issues and concerns of different stakeholders, but also acknowledge that the perspectives held by stakeholders themselves represent different values, assumptions and assessments of what is happening in the project. In other words, it is about bringing to the surface and negotiating the multiple realities held by different stakeholders. In this context, findings are not 'facts' in some ultimate sense but are, instead created through an interactive process that includes the researcher-evaluator as well as the many stakeholders whose realities are put at risk by the evaluation, these need to be continuously articulated and renegotiated throughout the life of the project (Guba and Lincoln, 1989). Similar to Guba and Lincoln (1989), Greenwood and Levin (1998) put it that in the evaluation process, the recipients of the programs need to be actively involved in the process of interpreting evaluation results. This means that the evaluators collaborate with the stakeholders in gathering the data as well as making sense of the findings.

There are several reasons for the claimed low usability of evaluation reports for practitioners. One of the important reasons is that the traditional belief of evaluation emphasises the scoring of events using the principles of statistics and scientific method, and is often based on outside expert's perspectives, whereas a constructivist belief would focus on the real voice of the real people who are the intended beneficiaries of the project. Also, the conclusions arrived at by an evaluator with a tendency to only measure single measurable details may be too simplified, and may overlook the 'soft' issues that are difficult to measure - an aspect on which a constructivist view would place much greater emphasis. Guba and Lincoln (1989) illustrate these differences between traditional and constructivist beliefs, and a summary is shown in Table 1.

Table 1. The Contrasting conventional and constructivist belief systems on evaluation (from Guba and Lncoln 1989)

Traditional belief	Constructivist belief
Ontology: *A realist ontology* assert that there exists a single reality that is independent of any observer's interest in it and which operates according to immutable natural laws, many of which take cause-effect form. Truth is defined as that set of statements that is isomorphic to reality	*A relativist ontology* assert that there exist multiple socially constructed realities ungoverned by any natural law, causal or otherwise. Truth is defined as the best informed (amount and quality of information) and most sophisticated (power with which the information is understood and used) construction on which there is consensus (although there may be several construction extant that simultaneously meet that criterion)
Epistemology *A dualist objectivist epistemology* asserts that it is possible (indeed, mandatory) for an observer to exteriorize the phenomenon studied, remaining detached and distant from it (often called 'subject –object dualism), and excluding any value considerations from influencing it.	*A monistic, subjectivist epistemology* asserts that an inquirer and the inquired are interlocked in such a way that the findings of an investigation are the literal creation of the inquiry process. Note that this posture effectively destroys the classical ontology- epistemology distinction
Methodology *An interventionist methodology* strips context of its contaminating (confounding) influences (variables) so that inquiry can converge on truth and explain nature as it really is and really works, leading to the capability to predict and control.	A hermeneutic methodology involves a continuing dialectic of iteration, analysis, critique, reiteration, reanalysis,, and so on, leading to the emergence of a joint (among all the inquirers and respondents among etic and emic views) constructions of a case.

As a natural aspect of the action research process, evaluation occurred during this research process as a way of understanding and managing the relationship between theory and practice, between researchers and researched. This relationship builds by using dialogue as an important tool, and it is seen as interactive and linguistic relationship, characterized by joint action, joint involvement and shared responsibility. Everyone who participates in the process is jointly involved in discovering the reality, as well as the creation of a new reality (Van Beinum, 1998). Performing the evaluation process, the learning group commits to meet regularly to discuss the progress and the issues that they face. It was also assumed that the evaluation itself would occur through informal conversations among the community and the different groups of stakeholders.

The Evaluation Process

The PAR concepts in this particular research project originated as a means to help some smallholder farmers assess and solve their production-related problems. The evaluation process therefore occurred through the AR cycle, in which the participants were encouraged to reflect on their action. The process of reflection, evaluation and action is presented in Figure 1.

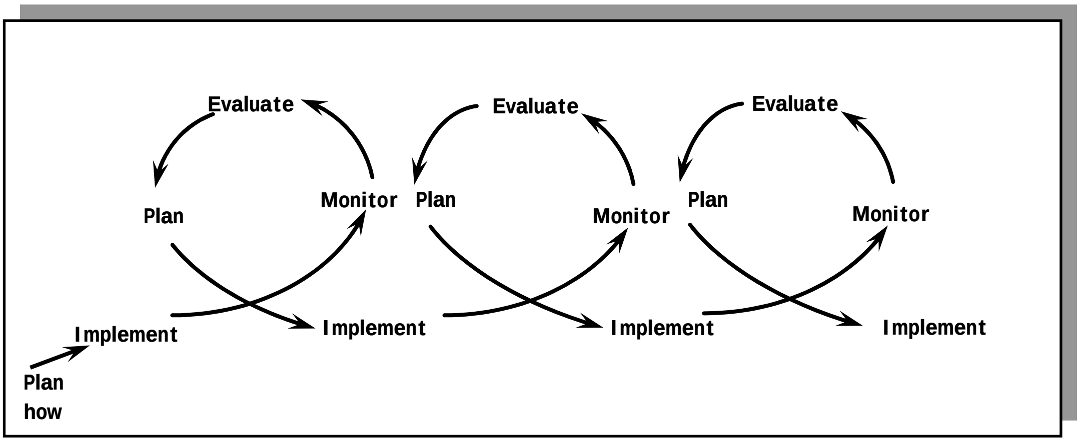

Figure 1. The action research cycle as an on-going evaluation process.

There were four groups of participants recognized. The first was the learning group of farmers (as co-researchers); the second was farmers who were peripherally involved (through group discussion); the third was the development workers (government livestock and extension officers); and the fourth was the AR team.

The formative evaluation during the different phases of fieldwork

The action-reflection cycle guided the participants and research team. Actions were planned and constantly evaluated. The break-up of action phases in this study into three monthly intervals was found to be appropriate by the participants in generating fruitful actions, which provided information for the next step. Participants had a chance to collect the information from their experiences, make meaning and learn from it. It led to the production of new knowledge that could be used as a basis for appropriate future action. Actions were implemented based on the reality of available knowledge, and were conceived as trials to be validated through practice, and accepted or rejected based on the experience of the outcomes of the practice. In this way the participants progressed and learnt at the same time, and learning was constantly applied to the process. The goals of evaluation at this stage of the research process were to:

1. Develop an understanding of livestock farm practices and the work of livestock development in the study area
2. Gain an overview of the important issues as perceived by the farmers and development workers who were involved in the management of this relevant farming system
3. Determine which problems required further investigation
4. Look for possible solutions based on local knowledge and circumstances.

Scarcity of fodder was found by farmers to be an important problem from the first PAR cycle. In the next phase, several activities were undertaken by the participants in order to improve livestock production and the work of livestock development (Habibie et al 2002b).

The summative evaluation of the research project

This evaluation was carried out 18 months after participants had been introduced to the concept of the learning approach of PAR. Evaluation here was aimed at encouraging a change of the extension approach used by livestock and extension services staff, as well as seeking to end the project for the AR team by evaluating outcomes. The evaluation in this context was a process of finding out and making sense of the experience of participants with the PAR in which they had been engaged. The questions were: Has the situation improved? Did the participants' action play a part in this improvement? Did participants learn and gain knowledge through this study? Which were the strong and weak points in the methods employed? The steps that guided the evaluation process were:

- Reflecting on discrepancies noted by participants
- Seeking follow-up answers to questions where appropriate
- Thinking through responses
- Reaching conclusions about what participants and others thought about aspects of the study, and what they valued and preferred
- Considering future action, and
- Acting on these where appropriate

Here, evaluation was not just focused on determining future action, but it also focused on giving a voice to the farmers who were usually silent. Dialogue (Bohm, 1990; Issacs, 1993) was used as a way of channeling farmers' voices into action in order to improve their condition. This strategy emphasised what the participants 'valued' in this research project

The summative evaluation methods

The summative evaluation took place over three months. It started with a series of in-depth interviews with the community members who were directly involved in the research project, which in this case included members of the learning group, as well as community members who were seen by the AR team as being able to benefit from an increased understanding of this research project, including ordinary farmers (male and female), and development workers (extension officers and livestock services officers). The process ended with a group meeting with the PAR team. For the convenience of participants and in order to encourage them to express their opinion and feelings, a dialogue was created with them, starting with simple conversations and informal discussions. The evaluation also included observations on the forage fields, during which casual conversations were held with their owners. The participants were asked some specific questions such as 'tell me a little bit about your forage field; tell me a little bit about your cattle; what significant changes did you find during this research project? What do you think about this project now and what did you expect from this project?' and so on. Moreover, this community conversation was often grounded in empirical data and focused on perceived outcomes.

A final evaluation workshop was also held in the village with the aim of sharing learning to improve the program. Participants were encouraged to comment on the data that was presented to them. The workshop focused on gathering individual interpretations, which were then shared within groups prior to conclusions being given. There were four groups of interviewees. The first was the learning group of farmers, group A; the second was farmers who were peripherally involved, group B; the third was the development workers (government livestock and extension officers), group C; and the fourth was the AR team, group D. The initial questions asked at the evaluation are presented in Box 1. These questions often led to other questions based on the answers of respondents. These questions were guided by the work of Kemmis and McTaggart (1988) and McTaggart (1991) together with the work of Grundy (1992).

General questions to respondents (group A, B, C and D)

1. What do you think about this research project?
2. What did you get and learn from being involved with this research project? What significant lessons did you gain?
3. Why did you join this research project? What significant change did you find?
4. What do you think about the approach that we applied in this project?

In relation to forage management: (group A and B)

5. What do you think about your forage?
6. What is most important to you in managing forage?
7. What are the problems of forage? Why are there problems?
8. What do you think about planting forage?
9. Does planting forage affect to your family labour? Why?
10. Do you have any problems with planting forage? How do you handle it now?
11. Is your wife interested to look after your forage? Why?

In relation to the learning group (group A)

Participation:

12. Why did you join this group?
13. What interested you about being a part of the learning group?
14. What do you expect from participating in the learning group?

Learning process in the group:

15. What have you learnt so far through the experience of being a part of the learning group?
16. What do you think about the way we have been learning as a group? For example the way we solve problems etc?

In relation to extension workers and trainers (group C)

17. As a professional, what did you learn from being involved in this research project?
18. What do you think about PAR that guided the process of the research project activities? Were you aware of PAR?

In relation to AR team (group D)

19. Has the process gone as we planned?
20. Have we achieved desired goals?
21. What are some significant constraints in conducting PAR?

Box 1: List of questions posed to participants at the time of evaluation

The data analysis and transfer process

The information that was gathered from interviews and from the workshop was analysed through content analysis. An evaluation worksheet was used to help to identify important components of the research activities. Some of the questions raised by the PAR team in this circumstance were: What makes the information collected more than documentation of subjective conversation? How can this information from conversation have benefit for decision-making, and planning process in terms of livestock development work? We believed that this approach is difficult to evaluate, because it concerns a learning process in which activities and outputs cannot always be determined beforehand, and may change over time in unexpected ways (Defoer, et al, 1998). The information collected from the participants particularly reflected on (a) the activities that participants undertook, and (b) the lessons learnt from participating in those activities.

As part of the evaluation process, participants were required to give a justification of their practice to others. This enabled them to show how the evidence they had gathered and the critical reflection they had made had helped to create a developed, tested and critically examined rationale for what they were doing. Accordingly, in the workshop, participants were asked to re-examine this process, and as a part of this they drew on paper the relationship of forage production to their household, thereby identifying the linkages between forage and other aspects of the farming systems.

It was found that there were differences between genders regarding perceptions of the impact of forage. For example, women described that planting forage near the homestead benefited them because their children had more time to help them in doing housework, such as collecting water or firewood. Some male farmers saw that time saved by having a forage field could be used for rest and productive activity. Both fathers and sons appreciated the saving in their time, which resulted from moving from grazing animals to a cut and carry system. Gender differences were also seen when ranking indicators. Male farmers focused more on the productive and technical aspects, such as fattening animals, and which leaves animals preferred to eat, whereas the women were more concerned with the social aspects, such as having more firewood, and the labour reduction for children. The development workers gave more emphasis to the relation of forage production to the techno-science perspective, such as increasing the fertility of soil and preventing soil erosion.

Several indicators highlighted by development workers as important in relation to animal health, the aesthetic environment and the prevention of soil erosion, were not mentioned by farmers. What is interesting to note is that, although farmers were able to identify indicators, they had difficulty in differentiating between each indicator as to whether they had a direct impact or an indirect impact. For them all the indicators had the same value, which was to improve their cattle production in order to enhance their income.

Growing forage was a new concept for most farmers in this village. However, the idea had expanded gradually among the farmers. We observed from this study that it was better to start with a small group of enthusiastic farmers so we could visit them regularly in order to gain insights about their experiences of planting forage, as well as to provide technical information about forage management practice. Some farmers expanded their forage fields and started growing one or two additional varieties of forage in addition to the ones introduced through the project. This indicated that farmers learned from their experiences of planting forage, and gained insights to understand the advantages of forage to cattle production as well as for the soil fertility. As observed from this study, farmers tended to grow several varieties of forage rather than only one variety; for example 27 from 34 respondents grew more than one variety of forage on their land. Farmers chose the varieties of forage to grow based on their purposes and availability of land. From these experiences, development workers learned that offering farmers a broad variety of forages allowed them to select the variety that was appropriate to their local circumstances.

Reflections of the learning approach

Most of the participants considered that this research project was useful and felt that their expectations had been met. Their view was that this research project had benefits for them in terms of learning something new, sharing information, improving skills and meeting their needs. A large majority of farmers said that there had been improvement in the way they learned. All of the members of the learning group found that this learning approach was useful, although at the beginning they had felt that there was "too much theory and talking". They also found that their learning behaviour had changed to become more active, and that they were willing to contribute more to discussion.

Most of the respondents found that the relationships between them had been improved through collaboration: meeting regularly, meeting informally and meeting based on needs. The entire learning group found that the relationship between farmers and development workers had improved, but some also commented that the relationship needed to be improve further in the future towards more informal meetings.

The interviews revealed that participating in this project had influenced the development workers' approach to farmers for the better. They claimed they were becoming more aware of the importance of farmers' knowledge and circumstances, and they also saw themselves as becoming good listeners. Similarly, farmers had improved their practice and attitude to learning. Forming the learning group had helped achieve this end. The *learning group* model for agricultural extension was still a new model to the study area, and there were several implications and issues that needed to be discussed before this model could be developed further. Some of these issues relate to facilitator skill, to the institutional support needed for adoption of the model, and to farmers' commitment to working as a group, particularly their willingness and ability to commit their time to meet regularly. Most of the respondents were aware that the project was guided by the PAR cycle. Among the farmers, the learning group members were more aware of the PAR process compared to others farmers.

Around 45 % of farmers in Group B mentioned that they knew about the PAR process because they were invited to the group discussion, and all the time the researchers talked about it. Some of the farmers mentioned that they had been told about PAR from the beginning of this research project. All of the development workers who were involved in this study mentioned that they knew about the PAR cycle, because they had been told about the time frame of the PAR process and they had been involved in the PAR process. Virtually all the AR team, development workers and the learning group of farmers felt that the PAR framework was appropriate, even though the majority had no prior experience with a PAR project. The important point found by the participants was that PAR was an appropriate framework for enhancing the quality of developing appropriate technology with farmers.

Some wider outcomes of the project

In this study the research team encouraged farmers to grow Napier grass in the unused land such as under *Kapuk* trees and near their homestead. Farmers found that the Napier grass could be grown well in hard soil, which had previously never been used for planting any crops or forage. On account of its high yields, Napier grass was particularly well suited for 'cut and carry' systems of animal production, such as for the smallholder beef production that were being encouraged through this study. The progress created by the learning group during this project increased the numbers of farmers planting forage. Many farmers from adjoining villages asked farmers in the learning group for seeds and cuttings of forages, and also to teach them the management of planted forage, particularly Napier grass. As mentioned in the workshop, most farmers from the village were interested in the activities of the project and at some time attended the meetings that were organised by the learning group without being invited.

As a result of the success in planting forage, the village received more attention from the District Government and from the Agricultural Department and thus gained more development resources. For example, the learning group was invited to help facilitate a workshop organised by the livestock development program at the district level; One of the members of the learning group was invited to be a representative from the district at the livestock farmers conference at provincial level, and to present his experiences about the success of planting forage, and to tell other farmers about the role of the learning group in supporting this end.

The incorporating of planting forage into the farming systems, particularly in uncultivated land, attracted the head of the district (*Bupati*) and the chairman of the district council to visit the village. When introduced to the context of the study by the first author, the head of the district became really enthusiastic and he promised to provide funding to train the people in forage management, to support the cow-fattening group to build collective stalls, and to provide soft loans to expand the numbers in the cattle- fattening group.

The establishment of the cattle-fattening group was a by-product of this study, but it also provided powerful evidence of the farmers' empowerment. By being involved in the fattening group, some farmers have developed leadership skills through their role as a chairperson of the group. Group members also improved their personal autonomy and ability to increase their livestock production. The farmers also democratized the process of selecting a group chairperson; previously the village leader selected this role. This is a profound strategic transformation as nowadays they select their group chairperson by consensus according to the criteria of: Commitment to the success of the group; ability in speaking, writing, and reading; and ability in organising the other farmers.

During the course of this study there were three cattle fattening groups established, each with ten farmers. Previously raising livestock had only been a part time activity, however now the farmers develop the idea of raising cattle in a semi-intensive system, and the learning group made it easier for them to access information, services and support from outside the village. The learning group also helped farmers to develop their self reliance by sharing information and knowledge in relation to their cattle production, and to extend their group concerns to other commodities such as cotton.

Conclusions

The participatory evaluation employed in this study was built into the framework of thinking that is a necessary aspect of action research. In contrast to the common practice of an external evaluator undertaking a project evaluation, it has been shown here that all participants in the research process can be engaged at crucial points in the evaluation, consciously and as an on-going activity. This enables the participants to remain aware of the benefits of the facilitated learning model, the concurrent developmental changes in their situation and the important role of the learning group in the whole process.

Dialogue (Bohm, 1990; Issacs, 1993) has been the core of this evaluation process. Dialogue was the means to help the participants focus their attention on reviewing what the project had meant to them through sharing the meaning achieved through democratic conversation. Values and assumptions were freely discussed. Personal experiences were used to demonstrate opinions. The broad opinions of participants were explored in order to establish a common understanding about the benefits of the research project. Through dialogue they examined their knowledge (understanding, skills and values) and interpretive categories (the way they interpret themselves and their action in the social and material world). In accordance with the concept of dialogue in this circumstance, the participants learnt to witness their collective thinking and to unfold meaning together, to become aware of how their thinking and the shared meaning created by them was impacting on them to get the results that they desired. In this process new actions emerged as a by-product of the dialogue. Bohm (1990) suggests that the original meaning of dialogue was a stream of meaning flowing among us and through and between us - a flow of meaning in the whole group, out of which will emerge some new understanding, something creative. He suggests that dialogue is associated with representative democracy, where each individual takes turn to speak and be fully engaged as a part of the collective effort.

Several strategies were adopted to achieve the quality of dialogue in the group situations, to ensure the trustworthiness of data gathered, and to make adequate demonstration of the participant perspectives to further ensure the authenticity of the study. Through this evaluation process participants observed that the learning approach that was employed in this study enabled them to improve their capability to work collaboratively to improve their situation. In this context, the working partnership between farmers and development workers that was developed became a learning partnership, and was seen to be a necessary condition for further improving livestock production.

Although the primary researcher had more knowledge and power as a leader, she tried to use this power sensibly to ensure that the process went on participatively, and that all the members had equal responsibilities during the research project. A democratised climate was created, always trying to balance the authority and responsibility of the members of the research team, while also developing collaboratively the relationships between the research team, the farmers, and the development workers. Therefore, this researcher took the role of the 'outsider within' (Kemmis & McTaggart, 2000) and worked side by side with others to enrich her understanding *from the inside out*, while coordinating others *from the outside in*. This understanding enabled the research team to join with the participants to improve their situation as well as to achieve their own goals. This was a challenge to the researcher's status, in that others by habit assumed that she knew everything.

Cousins and Earl (1992) argue that participant evaluation from PAR and other forms of action research is limited to a normative and ideological research orientation, rather than being an evaluation itself. It is our view that the working strategies and methods employed in the evaluation itself are the key elements, enabling it to be responsive to stakeholders concerns. Through appropriate working strategies, knowledge and experience are generated for collective use. Our experience with this facilitation of dialogue within a learning community suggests that it needs to start by presenting data to the participants, and then continue by encouraging a critical examination of this data. Throughout our dialogue, participants made explicit the values and assumptions they held in relation to this data. We agree with Brunner and Guzman (1989) who defined evaluation as an educational process through which social groups produced action-oriented knowledge about their reality, clarify and articulate their norms and values and reach a consensus about further action. Such action, learning and empowerment of participants are obvious outcomes of being engaged in PAR, and further illumination of these to participants through the evaluation process, as Roberts and Jennings (2002) concluded, could also be liberating.

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Partnership as a Special Case of Participation: an Experience of Cooperation Among Farmers, Researchers and Extensionists in Brazil

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Abstract

Restriction of participation to small groups and the absence of strategies for scaling up is identified by several authors as one of the biggest problems of participatory approaches. Dissatisfaction with these limitation led to the recognition of the need for partnerships with agricultural organisations. The aim of this article is to discuss the problems and opportunities of partnership among farmers, researchers and extensionists and their organisations to promote rural development. Partnership is introduced as a specific form of participation, in which organisations are involved. Its impacts go beyond the micro social level to include the meso and the macro levels. However, in the transition from participation at the microsocial level of action to meso and macrosocial levels we can observe an increase in the problems between different actors, in which cooperation is made difficult by the power relations, competition and indirect communication through intermediaries. A participatory experience in the Brazilian state of Pará is analysed: a research project in a partnership between a research organisation and a farmers' organisation in the Transamazonian region. An assessment of the causes of conflicts among the partners revealed that the most important questions of power were related to the distribution of financial resources and the competition for prestige among farmers. A major problem, however, was the lack of clarity over the type of partnership, which may take different forms ranging from distant to close. In this case, the partnership was too close. Distance increases the zones of uncertainty, diminishes dependence and hence reduces the power element in the relationship. On the other hand, antagonisms are especially strong in a close link between parties in which one cannot relinquish. Thus, the type of partnership in this experience was an inadequate form of achieving cooperation among the subsystems of the Agricultural Knowledge System.

Keywords: Participation; Partnership; Smallholder farming; Agricultural research; Rural extension.

Introduction

Restriction of participation to small groups and the absence of strategies for scaling up is identified by several authors as one of the biggest problems of participatory approaches among which are Participatory Rural Appraisal and Participatory Technology Development (Bliek & Veldhuizen 1993:F4; Okali et al. 1994:107; Veldhuizen et al. 1997:281; Kitz 1998:192). Dissatisfaction with the limitations of the participatory approaches led to the recognition of the need for partnerships with agricultural organisations. Thus, participation is not effected only between individuals or small informal groups at the microsocial level, it also extends to meso and macro-social levels among research and extension institutions apart from other organised actors.

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In the last years the concept of partnership has developed to an important pillar of the rhetoric of development and is also used frequently in traditional research and extension. However, it is understood as more than a loose network of contacts among different actors in a rural context, among them the "real" clients, the farmers (EMBRAPA 1998:19).

The aim of this article is therefore to contribute to the better understanding of the problems of partnerships between research, rural extension and its clients in Brazil and to facilitate the cooperation of the actors in the rural areas. Thereby contributing to the development of the concept of partnership, thus avoiding the substitution of the relatively unclear concept of participation by the even more nebulous concept of partnership.

In this article partnership is understood as a special form of participation, in which organisations are involved, and thus it goes beyond the microsocial to the meso and macro social levels.

Participation at the meso and macro social levels predominantly occurs through mediators (intermediary persons), normally representatives (see Glasl 1997:62-64). Researchers, extensionists and farmers meet as representatives of non-formal organisations (farmers' interest groups), formal organisations (associations, trade unions, regional movements), local government bodies, and state institutions (agricultural research institutes, universities, extension services). Moreover, they bring along varied interests (private, their own links with other groups, etc.), even when these may lead to role conflicts. In the transition from participation at the microsocial level of action to meso and macrosocial levels we can observe an increase in the problems between different actors, in which cooperation is made difficult by the power relations, competition and indirect communication through intermediaries.

The ideas discussed in this article are the result of a larger study based on the experiences of farming systems research and extension in a partnership involving researchers, farmers and their organisations from 1994 to 2000, and as external supervisor of the Lumiar Project[1] of the National Institute for Colonisation and Agrarian Reform (INCRA) from 1997 to 2000, both in the state of Pará.[2] The decisive themes of this study, conflicts, power and organisation, are discussed with reference to Simmel (1995) in order to understand the nature of conflict and its different forms and according to the approach of the ”French School” of sociology of organisations led by Crozier & Friedberg (1993). These latter authors start from the formation of "concrete action systems", which allows them the analysis of collective constructions which do not necessarily coincide with that of formal organisations. They can be organisations with relatively weak possibilities for sanctions, public extension services as well as farmers' associations, municipal development councils or partnerships. The existence of a concrete action system (structured human ensemble; Bernoux 1985:138) is not natural; it develops from concrete problems and actions of the involved members. Power is understood as a relation between actors (at the level of action) and not as a structural phenomenon (e.g. domination), an attribute of certain persons (e.g. an authority with capacity to command) or as a "*combination* of coertion and legitimation" (political power; Chazel 1995:214, 228, 241). Crozier & Friedberg (1993:30, 68) introduced the phenomenon of freedom of the actors in the analysis of organisations which gives another perspective of social action, going beyond the Taylorian view of a passive person. Within the organisation groups may be formed which have opportunities for common action (trumps) and interaction capacities, some considered strategic, others apathetic, depending on its influence on organisational life. The fundamental mechanism of structuring of power relations and of collective action can be understood as a game,

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1 Lumiar Project (1997-2000) was administered by INCRA, the Brazilian agency for agrarian reform, in order to offer a free public rural extension service to the farmers of the INCRA settlement projects. Peasants' organisations could choose, which extension service they wanted to subcontract. Before Lumiar, public rural extension was only possible through the state's organisations of rural extension.

2 Schmitz (2002); titel (translation): Partnership among farmers, researchers, extensionists and their organisations: reflections on the agricultural knowledge system in the State of Pará, Brazil.

making cooperation possible, uniting freedom and joint-action. Power is localised in these free spaces, uncertainty zones, in which one of the adversaries makes use of the opportunity of refusing what the other demands of him, to a greater or lesser extent. Rarely does someone whose future behaviour is totally predictible (that is transparent) manage to succeed. While each actor wants to reduce the complexity, that is the unpredictibility of the other, at the same time he is worried about increasing the complexity of his own behaviour towards the others (Crozier & Friedberg 1993:40-41).

The methodology of the study mixed elements of ethnography and action research. As I had the dual role of observer and actor, even though only as an associated researcher of LAET with scant involvement in organisational decision-making, several measures, such as 'peer debriefing' and triangulation[3], were taken in order to reduce the element of bias caused by the predominance of the view of the researcher. (Lamnek 1995; Albaladejo & Casabianca 1997; Flick 1999; André 2000). This meant, among other things, consulting others for their perceptions and interpretations, e.g. through the analysis of documents written by my colleagues.[4]

Partnership between the researchers and the users

The partnership was a pretext for disseminating proposals and results for a wider public, if the scope of the activity were ample enough (e.g. part of the 40,000 agricultural families in the Transamazonian region). This was the thinking which led the two organisations, the Movement for the Survival of Transamazonia (MPST) and the Transamazonian Agro-Ecological Laboratory (LAET), to participatory cooperation in 1993.

The MPST was formally founded in 1991 as a reaction to the reduction of the presence of the state in this region of official colonisation. Two years later it counted on the participation of 25 associations, 4 cooperatives, 8 rural workers unions (STRs)[5] and unions of teachers and health agents, when it sought greater involvement of the research through the Federal University of Pará (UFPA) in order to work on the problems of the region with approximately 40,000 farming families. The objectives were the implementation of a programme of technical assistance to the movement for the drafting of financial projects aimed at the development of the region and the training of experts to manage the projects. The LAET was created in 1993 in response to this request. LAET declared as its objective to contribute to the development of sustainable family farming and the better management of natural resources. The work was based on a permanent partnership between organised farmers ("unionists farmers") and the team of interdisciplinary researchers following the farming systems research and extension approach, which includes a joint definition of the lines of action in a participatory and interactive process (Castellanet et al. 1996:141; Henchen 2002:72-78).[6]

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[3] Peer debriefing is the consultation and regular discussion with persons not directly involved in the research in order do identify other points of view and to verify work hypotheses and analyse results. Triangulation is a combination of different methods to investigate a phenomenon (Flick 1999:249-252). Moreover, documents of the organisations under study were also analysed.

[4] Christian Castellanet played an important role in the formation and coordination of LAET from 1995 to 1997; Mário José Henchen was a researcher of LAET, but he had a long period of cooperation with the social movement of the region; Gutemberg Armando Diniz Guerra had a more independent position as member of an other associated group of the same programme in an other region of Pará; Jean Hébette was until 1995 head of the whole regional programme and the first LAET Coordinator.

[5] In Brazil, the members of "rural workers unions" (Sindicatos dos Trabalhadores Rurais - STR) are rural workers and peasants (the last are the great majority in the region under discussion).

[6] There are many studies on the results of this cooperation. Castellanet & Jordan (2002) list 25 publications that refer to the issue.

The ideas of this partnership were based, among other things, on Merrill-Sands & Kaimowitz (1990; quoted by Okali et al. 1994:84) who list seven conditions for an effective partnership with clients. These include: create opportunities for interaction; seek agreement on tasks; cultivate mutual respect; have common goals; promote understanding of interdependence; perceive the other as partners not as competitors; and the personal benefits should outweigh the costs. As cooperation evolved, we identified other factors. "However, cooperation can occur in a more conflicting manner due to the divergent interests which can be partly antagonistic or that exceed the capacity of the actors to manage them, because of their complexity. Lack of skill in recognising the divergences and in dealing with conflicts can lead to a breakdown in cooperation and failure to achieve objectives" (Schmitz et al. 2000:52).

Conflicts

Although cooperation between the partners in farming systems research and extension and the users deepened in the first years, from the start we perceived some critical issues. Representatives of MPST expressed the view that for many of the peasants the role of LAET was not very explicit and that the researchers interfered too much in internal affairs of the farmers' organisation. MPST therefore saw the need to maintain a greater distance between both organisations. It was perceived that there were two undercurrents within the MPST: one interested in strengthening the partnership and in cooperating in joint projects, and another concerned about the loss of political leadership being left in the hands of a group of foreigners[7] with their own specific interests. On the other hand the researchers believed that the peasants at the grass roots level were not sufficiently involved in the process of decision-making of MPST.

As the climate in the relationship between MPST and LAET cooled down, the MPST, during one of the rounds of negotiation about the continuation of the agreement, took the opportunity to propose an integration of LAET as a technical service within the structure of the MPST, under its coordination, in which case LAET would lose some of its autonomy. This subordination was rejected by the members of LAET. A subsequent agreement did not last more than a year. The drawing up of a new project for the financing of a common programme had reached an advanced state before the MPST surprised its partner, at the end of 1998, by declaring that it no longer wished to sign the request. This conflict ended up in a dispute over the resources to be requested. The MPST insisted in an equal division of the budget between the movement and the research group.[8] Nevertheless, this cooperation continued for some time in this cold atmosphere, until it ended in 2000, when the project was rejected by the funding agency and also due to another conflict over a natural resources management project.

In the following sections, I shall discuss the two forms of the conflict - the struggle for power and competition - which in my view were the most important determinants for the dismantling of this partnership.

Power Struggle

The struggle for power is a conflict between two adversaries (diade) which can occur within an organisation, between organisations and between individuals. Possible results are victory, exhaustion or accord (Simmel 1995:138-153).

[7] LAET was a French-Brazilian cooperation project and was initially coordinated by foreigners.

[8] Up to this moment, LAET had administered the majority of the resources designated for the common programme.

The dominant role of LAET was especially reflected in its control over the financial, material and human resources and their distribution, such as vehicles, computers, physical space, and the contracting of collaborators, and in the definition of research themes. The researchers often confronted the unionists with fait accompli or involved them much later and in an insufficient way in the decision-making process, such as the drafting of the financial projects. The MPST claimed that it did not receive adequate infra-structure, while the partner managed to better equip itself through the common programme.[9] A permanent source of conflict was the request for contracting professionals for MPST and the remuneration of unionists for project work with resources of the project. The MPST wanted more control over the resources, but did not make much progress in this regard up to the time of the rupture. A community project in natural resource management in which the partners had posited much expectation contributed to the final breakup of the partnership. While the municipal Natural Resources Committee of the level of the municipality, which invited LAET to advise it, wanted some committee members to be remunerated, LAET tried to contract collaboraters from within the communities in an attempt to gave value to the technical functioning of the project, as these would be more directly involved in the project activities. The unionists became more irritated when another organisation, in contrast to MPST, would directly manage the resources for their project activities. The unionist prove that the partnership had failed in the negotiations.

Competition

Competition is a direct or indirect dispute between competitors in order to win over a third (triade). Victory or advantage over the adversary are possitive results; however, these are worthwhile only in so far as the party with the advantage also gains the favour of the third. Limitation or, in a few situations, impediment of competition, are possible (Simmel 1995:84-105).

A key point of competition among partners was who is recognised by the public as the leader of the peasants. The representatives of the peasants' organisations were mainly interested in reinforcing their organisation. Thus they hoped for a cautious behaviour on the side of the researchers who were called to advise them. These, on the other hand, must have defined their role in a definitive way.

A complicated aspect of the partnership was the question of political activities. The MPST maintained the monopoly on the question as LAET was new in the region. In the course of time, the researchers developed their own political activities which culminated in winning the elections for the head of the UFPA campus at Altamira. A group of lecturers belonging to the Workers' Party (PT) and LAET won the election with the support and coordination of MPST, against another group supported by the urban social movement and by another faction of PT. The MPST was divided on this question, with the coordination in favour of the LAET group, later facing severe criticisms, and the divergence between the different segments of PT being an important factor. Nevertheless, this occurrence was a confirmation for the MPST critics that LAET had become a rival on the question of control of the social movement. From this moment the MPST tried to initiate some activities without the involvement of LAET, partly supported by other research and development organisations, and to reduce LAET participation in the ongoing projects (Castellanet & Jordan 2002:70-71). In this case it was political engagement which created the problems.

Struggles for hegemony could be observed also on the part of the research group. The researchers of LAET were distrustful in relation to other research with farmers of the region not negotiated through them. A study, which transformed the researchers into objects of research led to a strong reaction against

[9] The situation of MPST (today: Movement for Transamazonian and Xingu Development - MDTX) in terms of material and human resources improved substantially after the separation.

the interference of other organisations supported by the MPST. Openly critical and derogatory remarks about this study provoked a conflict (Guerra 1999:461-463).

One special point of sensitivity in the relation between researchers and the unionists was the representation of the peasants (the grass roots), of which the social movement wants to maintain control. Direct contacts between researchers and the grass roots level, without mediation through the MPST, were interpreted as competition for control of the grass roots or its organisations. The mention of the expression "base" (grass roots level) three times in the proposal by LAET for the continuation of the partnership[10] irritated the unionists. Official visits of peasants with an evaluation team, without MPST involvement, were understood as an affront.

Discussion

Issues and stakes of the conflict

The conflicts which led to the final breakup of the partnership between MPST and LAET were perceived differently by the actors involved. Each of the actors interviewed presented different explanations, influenced by his own interests and perceptions. Important reasons for some were deemed irrelevant by others. The survey[11] revealed 16 perceived conflict issues that fit into four problem areas: power struggle (involving both the partners and the insiders); competition between the partners; subjective factors (personal) and dissatisfaction with the results (Schmitz 2002:202-203). On the other hand, Guerra & Castellanet (2001:148-149) identified different strategies as a cause and affirmed that "... the existence of extremely different fields of interest and power, equally divergent conceptions of development and of the role of the researchers complicated the development of a balanced alliance where each one benefitted from the other, without threat."[12] In order to arrive at a negotiated equilibrium in this relationship, they propose "... the rigorous identification of well-defined common fields of interest, and by contrast, reserved fields, where each partner understands how to preserve his supremacy and suggests clearly to the other to minimise his interference" (Guerra & Castellanet 2001,148-149).

We did not attempt to explain the conflict by only one cause. According to Glasl (1997:90-93) we understand that a series of factors and confrontations contributed to the final result. Whether a potential conflict results in open confrontation also depends on the attitude and behaviour of the individuals. What is decisive is the perception of at least one of the parties.[13] An assessment of the conflict issues (Schmitz 2002:203) reveals that questions of power related to the distribution of financial resources and the competition for prestige among the farmers were the most important causal factors.

The issues of the conflicts shifted over time. They were: the elections for the head of UFPA campus, credit projects, contents of the research work, remuneration of sindicalists, contact with the grass roots farmers). However, what was at stake did not change very much. These were relatively stable: questions of power related to financial ressources and the transformation of research and development work into political representation (MPST) or scientific recognition (LAET).

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10 Document: Proposta preliminar de novo convênio MPST-LAET 1997-1999. Altamira: LAET, 1997. 4p.

11 Interviews with various actors of the different groups involved in the process of building the partnership were carried out. Moreover, I had direct experience at some moments with the conflicts, and was present at some meetings which addressed these issues.

12 The nature of the partnership between MPST and LAET and the expression alliance are discussed below.

13 Social conflict is an interaction between actors in which at least one actor experiences imcompatibilities of thought, representation, perception, feeling or wish with the other, so that an impediment occurs in the other's action (Glasl 1997:14-15).

Thus subjective behaviour reinforced the conflicting tendencies. Compared with this, satisfaction with the results of cooperation and different objectives and strategies had a less important role. Generally, the difficulties are not linked to problems of communication or comprehension among "different social worlds" (Guerra & Castellanet 2001:148; Schmitz 2002:203).

In order to ensure their power positions the partners maintained uncertainty zones which involved, e.g., on the MPST side, their political strategies, possible alliances and their position relative to the partner (the organisation was divided in two internal groups, one of them in favour of the partnership, the other against). On the LAET side were negotiations for development projects, level of engagement and commitment of the researchers and their position relative to the partner (there existed three different opinions on how to relate to the partner - subordination, equality or intervention in his intern affairs) (Castellanet & Jordan 2002:146; Guerra & Castellanet 2001:131-132).

Trust

When we started cooperation with the peasants in order to accomplish an action research on mechanisation in partnership between LAET and MPST, we were convinced that transparency and trust would be important elements of the partnership (Schmitz et al. 1996:232). However, some time later, studies on this partnership concluded that it was not possible to develop "a balanced alliance ... The culture of non-transparency, the divorce between rhetoric and practice ... would impede the development of a common strategy ..." The dissimulation and manipulation of information by the farmers' organisations were identified as limiting factors (Castellanet & Jordan 2002:153, 192; Guerra & Castellanet 2001:146-148).

However, due to the relations of power and the zones of uncertainty (Crozier & Friedberg 1993:40-41) maintained by the actors there can only be a limited form of trust. Based on experiences acquired through the action research and this partnership, we came to conclude that trust is not necessary for a successful partnership (or, in general, cooperation). So theoretical and empirical considerations would suggest, that neither trust nor transparency are the bases for the relationship between the actors in an organisation or between different organisations. One can distinguish between direct cooperation with individual farmers and interest groups, that is, at the microsocial level; and cooperation among organisations and actors in the political arena, that is, at the meso and macrosocial levels. Trust is more restricted to the microsocial level, in which strategies and power games have a minor role. The limit between the two situations can be the level of association. Above the microsocial level, the tatical and strategic considerations gain more importance. However, cooperation is achieved in spite of the different interests of the actors involved, and the existence of common goals and perspectives in the long term, often identified through delayed and somewhat conflicting discussions, is not necessary (Crozier & Friedberg 1993:57; Schmitz 2002:247).

The form of partnership

Partnership can be constructed in different ways: near or distant. LAET committed itself to the target group through the creation of a permanent research team, headquartered in the region, "to establish a true relationship of partnership and trust", different from other researchers who were present only at specific moments, leaving the local experts to do the surveys (Castellanet et al. 1996:145). A central idea was the "privileged partnership" between the two organisations.[14] The partnership agreement was drafted

[14] Concerning the nature of the LAET/MPST partnership Hébette (1996:51) had no doubt. "It was not that they associated to undertake some precise activities, such as specific research, an agricultural mechanisation project, or the setting up of a cooperative. It was to work jointly on a development process of peasant agriculture ..." which would take "... a period of five years... to be set up...".

immediately after having started cooperation with LAET and delivered to the directors of MPST, so that they would suggest only modifications in the description of the objectives of MPST, taking this document more as a formality on the part of the researchers. The relationship between LAET and MPST was characterised as a narrow and permanent partnership or as an alliance understood as a very close form of cooperation (Castellanet et al. 1996:139-144; Guerra & Castellanet 2001:131, 148; Castellanet & Jordan 2002:54; Hébette 1996:55).[15]

Glasl (1997:244) distinguishes different types of relationships: alliance, coalition and symbiosis. In general, the expression alliance means a union against a common enemy which ends when the adversary (or another objective) ceases to exist (Simmel 1995:111; Glasl 1997:244). "Coalitions are formed in order to pursue objectives in common through a process of integration and exchange in the long term. The parties in a coalition expect an increase in the benefits for all the participants involved in a cooperation, without the need for giving up their autonomy." In the case of symbiosis the persons or groups look for "... support of each other because they expect compensation for specific demands ... The relationships between partners in such unions are characterised by strong links which strongly undermine personal autonomy" (Glasl 1997:244-245). The closest form of partnership would then be the symbiosis. The partnership between LAET and MPST can thus be characterised as a coalition with tendencies towards a symbiosis.

The strict relationship which LAET intended to create in a precipitative way and the fixation of written concrete rules of the partnership awakened many expectations, leading to various problems.[16] "From the start, the movement manifested its reticence and refused the term 'partnership'; defended autonomy or even hegemony supposedly threatened" (Hébette 1996:50). There were constant manifestations against LAET's interference. Several times a greater distance was demanded. For the members of MPST this form of partnership created the feeling that LAET would act exclusively in its service as its research organisation. In view of this sense of belonging the researchers were seen in the initial phase as possible allies of the movement's political project (Henchen, 2002:86). Thus, there arose possibilities for disapppoinment, especially because LAET was internally divided on the question of its relation with the MPST (subordinaton, equality or intervention), inspite of the fact that the leadership made it clear that officially LAET would only support the policy of development, but not any party politics (Castellanet & Jordan 2002:66).

Conclusions

The case presented here shows the presence of aspects of power in the day to day operations of organisations. They must be considered at all levels of the Agricultural Knowledge System[17], without illusions about the possibility of consensual negotiations of the different interests and objectives. Many serious people, technically well qualified, are not prepared for these power games and, consequently, fail or waste much energy wishing to improve the "moral" of other stakeholders in order to end the power

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[15] The alliance goes beyond the partnership to include the right to criticise as in the case of the comrades in the struggle (Hébette 1996:55).

[16] LAET recognised that "this contract was a proposal of the research team, perhaps without the MPST seeing all the implications of this partnership clearly and which would concretely mean alliance between researchers and farmers" (Castellanet et al. 1996:144). The "definition of *privileged partner* caused some misunderstanding. On LAET's side, it did not seem clear .... After all, whom did one classify as the privileged party?" (Henchen 2002:86).

[17] The Agricultural Knowledge System is composed, according to Nagel (1979:147), of three subsystems, research as the generator, extension as the transmitter and the farmer as the one who integrates innovative knowledge in the process of production. Between the subsystems there exists an efficient communication flow in both directions (for an updated discussion see Schmitz 2002:63).

games and to establish greater transparency and predictability. However, based on previous explanations, it is necessary to free oneself from a purely negative and repressive vision of power, which predominates in several scientific disciplines and also in everyday as well as in organisational life, simultaneously making it difficult for critical analysis and for use. There does not exist social action without power (Crozier & Friedberg 1993:17-18). Thus, the ideas about partnership presented intially must be reviewed.

The proposal of defining "exclusive fields of interest" between partners can be referred to, in the case of power struggle, as a strategy for avoiding interference (intervention) in the internal affairs of the partner. This could also mean, on organisational level, to reduce the interaction between the members of each organisation and to concentrate on the communication processes and decision-making exclusively on leadership level. But this option, apart from not being very realistic, would also affect the possibility of widening relations and cooperation, and it would restrict the initiatives to the leadership. Attempts to reduce or impede competition and to impose respect in hegemonic areas only partially worked. Nevertheless, rules for attaining negotiated equilibrium in the partnership can be successful only if they are respected by all the members of the organisations. However, the indefinition of the role of the LAET researchers in relation to the MPST impeded an agreement over fields of interests.

Similarly, the definition of rules cannot eliminate power manifestations in relationships and in conflicts of interest. Power relationships and conflicts are normal phenomena with which the researcher and extensionist must learn to cope. The main problems of the partnership were not related to communication or a lack of comprehension among different social worlds (farmers, researchers and extensionists), but to mediation between different interests (Schmitz 2002:247).

Could the rupture between LAET and MPST, which was prejudicial for the development of the region, have been avoided or did it only serve to confirm a generalised tendency? Can the partnership approach between research, extension and farmers' organisations be interpreted as a failure?

The experiences of the Transamazonia provide some insights. An assessment of the causes of the conflict (Schmitz 2002:213) revealed that there were various motives - the most important were questions of power related to the distribution of financial resources and the competition for prestige among farmers. A major problem, however, was the lack of clarity over the form of partnership.

In the case of LAET and MPST, the partnership that LAET was seeking was too close: on the one hand it nurtured expectations of the unionists farmers of having at their disposal an exclusive service provider; on the other hand, it led to conflicts, when LAET began to behave as an independent NGO, an autonomous force, gaining clout in the region and on the academic campus, instead of remembering that it was the farmers who had given impetus to the foundation of LAET, through the MPST, which had built up a name and legitimacy as an actor in the region (Henchen 2002:13, 86).

The two aspirations - proximity and independence - cannot be simultaneously achieved in this situation between coalition and symbiosis. There are two contradictory messages, reminiscent of a *double bind*.[18] LAET committed itself too intensively and could no longer interpret the messages of the partner in the original sense which, for example, was often a political manoevre. Once locked into this process, a real conflict dynamic evolved, which manifested itself from the start in tensions among the partners and whose later manifestations could not be connected to each stage of escalation (Schmitz 2002:242).

[18] Double binds often occur with individuals in an intense relationship, where it is vital to their interests to distinguish exactly what type of message is beeing communicated, in order to react in an adequate manner. A double bind often occurs when the opponent sends out two types of messages, each one denying the other, and the individual finds himself locked in this situation. The individual is incapable of distinguishing these messages and of deciding to which message he should respond. He cannot make meta-communicative affirmations, neither can he simply opt out of the situation (Bateson, 1983:278-279).

A greater distance between partners would have been better in this case. Distance increases the zones of uncertainty, diminishes dependence and hence reduces the power element in the relationship. The limited knowledge about the other means economy which makes possible the concentration of energies for the real work (see Bateson 1983:192-193). Distance allows one to recognise interlinkages and context. On the other hand, antagonisms are especially strong in a close link between parties in which one cannot relinquish (Simmel 1995:56-64). Proximity can provoke confrontation. Thus, the partnership in the LAET way was an inadequate form of achieving cooperation among the subsystems of the Agricultural Knowledge System.

In comparison with the experience of the partnership between LAET and MPST, the partnership developed with peasants' organisations within the framework of the Lumiar Project (subcontracted extension service) in Transamazonia can be considered as very successful in its partnership with the farmers' organisations. The Lumiar teams were committed to much less than the LAET and their role was clearly defined as rendering specific services to the client. There were several partners, however none had the "privileged" position as the MPST in relation to LAET. Unilateral decisions to avoid involvement in politics had a positive impact, such as the restriction on political party activities, imposed by the supervision. Subjective factors, in the first place empathy, also played an important role: permanent contact of the president of the extensionists' cooperative[19] and the peasants' leaders was decisive in order to maintain good relations among the partners. As cooperation is achieved within a concept of more distant partnership, but clearly defined as the relation between the advisor and the client, even the difficulties of some extensionists in interrelating with the farmers were not interpreted as prejudicial to the partnership. "Presently, the teams in Transamazonia have autonomy, within the work plan negotiated with the settlers, in defining their activities and in making proposals, a fact which raised the level of satisfaction among the extensionists and also increased creativity by focussing on the dialogue between extensionist and farmer as the locale for decision-making" (Schmitz 2001:367).

It seems then, that the attempt at subordination or the rupture of the partnership were not the only alternatives.[20] Neither subordination nor symbiosis builds a creative environment for participatory work. In the first case it is unlikely that critical dialogue with the farmers (Freire 1992) will occur, in the second case the friction is too great for potential to develop.

The researchers and the extensionists must be relatively autonomous in their relation with the farmers, attending to the demands and transforming them into proposals and activities to be achieved within the ambit of the annual work programme. They must have a certain organisational independence in relation to the representative organisations of farmers in order not to lose the distance necessary for critical dialogue, without the chance of building a true partnership, as was the case in relation to some farmers' organisations and which was criticised in the evaluation of the Lumiar Project at the national level (Marinho et al. 1999:38).[21] It is important that we remember that the extensionist must be an actor and not an instrument of extension (Neuchâtel Group 1999:12). Especially in organisations with weak sanctioning and control mechanisms, such as in research and extension, motivation of the professionals

[19] The service was carried out by a service agency, the "Cooperativa de Prestação de Serviços em Desenvolvimento Sustentável, Técnico e Social da Agricultura" (COODESTAG).

[20] Another experience in Pará, the partnership between the research organisation, the "Laboratório Sócio-Agronômico do Tocantins" (LASAT) and the farmers'organisation (FETAGRI) also continues.

[21] It was demonstrated that "... the weight of certain social movements ... seems out of proportion in the states where they accumulate the function of service agency and contractee or representative of the interests of the settlers. Such a fact can represent an inversion of logic as, contrary to contributing to participation, the social movements become the one who decides, in an authoritarian manner, the destiny of its representatives, discrediting the project as public policy" (Marinho et al. 1999;16). "... it is not working for the proposed objectives of the project, that the social movements of great penetration ... absorb and control it, diverting it from its proposal of participation, plurality, diversity and decentralisation" (Marinho et al., 1999:38).

is decisive. Without this, actors' freedom and available room to manoeuvre would have a negative effect on the quality of the service, a fact which would be difficult to correct through strict sanctions (e.g. dismissal). However, in order to guarantee this autonomy a permanent process of communication with the farmers'organisations at the municipal and regional level is essential in order to maintain the capacity to mediate between the different interests and to have a clear definition of the role of each partner in relation to the other.

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Spatial and temporal boundaries, stakeholder ownership and the power of people in Action Research and Extension processes

Jess Jennings* **and Roger Packham****

Abstract

From February, 1999 to June, 2003, an industry-funded project, known as the Profitable Pastures Project (PPP), was collaboratively managed by five stakeholder organisations representing industry, government and the research community. Together they aimed to create a project that was locally operated by farmers in pursuit of improved on-farm profitability within the New South Wales (NSW) dairy industry, Australia. PPP introduced a blend of Action Research (AR) methodology with agricultural extension across seven Regional Dairy Groups (RDGs) that effectively enhanced or newly established a variety of farmer-driven Action Learning (AL) and AR forums. Learning processes initiated by PPP were monitored at regional and state levels to glean farmer perspectives, as well as the impact of PPP upon the stakeholder institutions themselves. Meta-research linkages were explored between AR theory and practice, with analysis providing insights and implications for AR as an applied methodology. This paper explores the issues of i) spatial boundaries, ii) temporal boundaries, iii) ownership of process, and iv) achieving results with AL/AR processes. In conjunction these elements are argued to be critical for developing labour skills of all stakeholders within agriculture. They also ensure that the capacity of rural communities and their associated production systems are methodologically equipped to manage multidimensional and increasingly complex environments.

Keywords: Action Research, Action Learning, Extension Science, Spatial, Temporal.

Introduction

PPP was administered and implemented by representatives of five organisations that together formed the PPP Leadership Team (PPPLT). These included funding and in-kind providers from the national dairy industry research and development body (Dairy Australia) and its state administrative arm (Dairy Industry Development Company), the state department of agriculture (NSW Agriculture), and two universities (Charles Sturt University and the University of Western Sydney. A PhD student and the Project Coordinator conducted participant-observation of PPP, with a focus on the empirical experiences of delivering an AR method to dairy farmers and evaluating the farmers and researchers practice of it.

Amongst the PPPLT, discussions about the theoretical definition of AR and how it would best be delivered as a process for use by dairy farmers, revealed that AR was not a uniformly accepted and understood concept, and its meaning was, to say the least, ambiguous. Observation of these discussions identified that the term AR was interchangeably referred to as a *method* (a way to act) and as a *methodology* (principles to guide action). An assessment of the PPPLT's early definition of AR included the following aspects, simultaneously:

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- The discretely defined steps of the AR cycle were generally considered to constitute method, while principles of AR, such as democracy; learning by doing; single, double and triple loop learning (King 2000); social justice and equality of status amongst participants; acknowledgement of power relationships etc held connotations of methodology.
- To varying individual tastes, AR existed somewhere on a spectrum ranging from a single individual's experience to a community of practice, sometimes in a mutually exclusive fashion and at other times simultaneously. To the former AR was an intensely personal experience for achieving individual goals and developing one's own capacity, while the latter believed AR existed in the public domain to promote social justice. For some AR was a mixture of both.
- AR was narrowly expressed as a mechanical exercise of implementing the four-stage cycle of *plan-act-observe-reflect*, while others promoted AR as an organic process that could accommodate unforeseen events and facilitate changes in agenda priorities that were a natural part of any project and indeed of life itself.
- The AR cycle was believed to hold properties that ranged from a discrete process targeted to specific action, to being a continuous process that were beneficial on several levels, including to individuals, combinations of individuals within groups, an entire group of AR participants, stakeholders outside the AR group affected by externalities, as well as the institutions participating in AR.
- Doubt was expressed as to the effectiveness of AR as some questioned its theoretical basis relative to that of traditional scientific process, or felt AR was co-opting the term *research*.
- Distinctions were made between Action Research and Action Learning, with peer review and adaptability of results to other situations being unique to AR.

Evidently, the PPPLT definition of AR meant different things to different people depending on their construction of reality, experience, ideological basis (such as positivism, constructivism etc.), and the context into which AR was to be applied. From the observer's perspective, a high level of variation, inconsistency and interchangeability of the elements and definition of AR was identified as a major barrier to effectively applying AR to the NSW dairy industry.

Confounding any consensus of the PPPLT's working definition of AR even further was the plethora of terms and labels, and their overlapping and multiple usages, within AR and related agricultural extension literature. For example, a brief foray into AR literature revealed terms such as Practical Action Research, Technical Action Research, Emancipatory Action Research, Pragmatic Action Research, Industrial Action Research, Action Learning, Critical Action Research, Critical-Emancipatory Action Research, Action Science, Participatory Learning, Participatory Learning and Action Research, Social Learning, Systems Thinking, Soft Systems Thinking, Experiential Learning, Classroom Action Research, and Educational Action Research; which is to mention but a few. In terms of agricultural extension, the literature related to AR offered no relief with a similar myriad of definitions, including Farmer Participatory Research, Farmer-First, Participatory Technology Development, On-Farm Research, Systems Action Research, Farming Systems Research, Agricultural Knowledge and Information Systems, Interactive Agricultural Science and Agricultural Systems Thinking (Carberry (2001), King (2001), Kelleher et. al. (1990), Röling (1995 and 1998)).

While it seemed plausible that AR held different meanings for different people - even within the same AR group - PPP experience (both at the PPPLT level and at the farm level) indicated that AR processes were universally characterised by the opportunities and limits imposed by spatial and temporal dimensions.

Four examples from PPP experience are introduced to illuminate concepts of spatial and temporal boundaries. Example A refers to a single farmer's investigation of the use of aquaculture within her dairy effluent system. Example B consists of a regional project run by five farmers and several research institutions aimed at investigating on farm silage wastage over a six-month period. Example C relays the experience of on farm fertiliser and pasture species trials run by individual farmers over several years. Example D refers to the PPPLT's management of the project over a five year period.

i) Spatial Boundaries in Applied Action Research

A *Spatial Boundary* primarily refers to the nature and number of stakeholders involved in an AR group. The inclusion of any stakeholder brings with him/her many elements that influence AR processes, including the organisation(s) a person represents; their geographic origin, current place of residency or concern, cultural identity, gender, political beliefs, ambitions, personal history, nationality, professional skills, social standing within society/community, economic status, networking skills and networks, and, their ability to access resources.

Identifying spatial boundaries enabled AR participants to resolve competing concerns about the level at which an AR cycle was implemented. That is, decisions were made about the elements of action that were chosen to be reconciled with the AR cycle. In the PPP *Example A* that occurred on one farm, the AR cycle was addressed by an individual with minimal input from an involved research organisation; while in PPP *Example B* that occurred across five farms, the AR cycle was addressed in a collective manner with the research agent incorporated. In PPP *Example C*, several farmers collaborated within an AR framework without a research agent involved, which limited the accountability for learning to only participating farmers. In PPP *Example D*, the PPPLT's experiences of operating PPP where primarily reflected upon from a collectivised institutional perspective with few individual reflections being of relevance unless couched within the group discussion.

Throughout PPP the union of AR stakeholders was observed to have simultaneously determined the scale and scope of the action to be taken. In Example A, where a single farmer embarked on an AR project the physical scale was limited to one farm, while the Example B project was conducted across five farms that represented differing farming systems throughout an entire dairying region.

In both Examples A and B, external institutions with relevant expertise were invited onto projects to provide technical knowledge and analysis. This inclusion of institutional stakeholders increased the scope of the work to be conducted, particularly in terms of building and maintaining new relationships and the increased complexity that comes with specialist knowledge that is framed within the organisation's cultural and professional work ethic. In Example C, farmers conducted on-farm trials, such as weed control strategies without seeking external advice and the absence of additional stakeholders effectively limited the scope of the work to be done to the local level. For the PPPLT (Example D) the scale of the NSW dairy industry and scope of PPP was similarly determined by the depth of resources and intent of the five stakeholder institutions and their representatives.

Knowing the spatial boundary location of AR activity progressed farmer's implementation of their AR processes, seemingly because participants gained a critical degree of clarity about the nature of the task(s) at hand and their scope, even if the finer details were not yet obvious. Based on PPP observation, spatial boundaries were not always established in the early stages of farmer-initiated projects and in these cases the project tended to *tread-water* until the spatial boundary was recognised and accepted. As a consequence, PPP experience suggests that AR processes should actively seek to explicitly identify spatial boundaries in the early stages of a project's life, and should be made an overt part of the AR methodology, in order to reveal sooner to all involved what their AR experience was likely to entail and how each participant could contribute.

ii) Temporal Boundaries in Applied Action Research

Identifying the *Temporal Boundary* of PPP projects was significant in building group understanding of what people wanted to achieve and how they would best go about it. Many farmer-run projects began with a vaguely defined, usually assumed 2-3 year timeframe for completion, but when this was made explicit and formally discussed in conjunction with the (sometimes still emerging) spatial boundaries, most projects were scaled back and focused upon temporal targets that could be reached or at least monitored on a monthly or six-monthly basis.

Through facilitation and naturally occurring group discussion the recognition of temporal boundaries of an AR project led to clear individual and group understanding of what the project would require of them and for how long. For time-poor farmers the temporal boundary was a crucial determinant of their involvement because it elicited assessments of the extent to which new stakeholders could be brought in if desired. Observations suggested that shorter AR projects (from one day up to six months) had less chance of expanding the spatial boundaries than longer-lived projects (over six months). From a theoretical perspective this may imply a trade-off exists within AR processes, in which decreased temporal boundaries come at a cost to spatial boundaries.

The spectrum of spatial and temporal boundaries for AR is illustrated in Figure 1, with Examples A, B and C identified in appropriate quadrants. The PPPLT operated across the entire NSW dairy industry, involving constant and transient members, and their stakeholder institutions, over a five-year period. Hence the PPPLT identified its own spatial boundaries as being group driven, macro in scale and over a long temporal period.

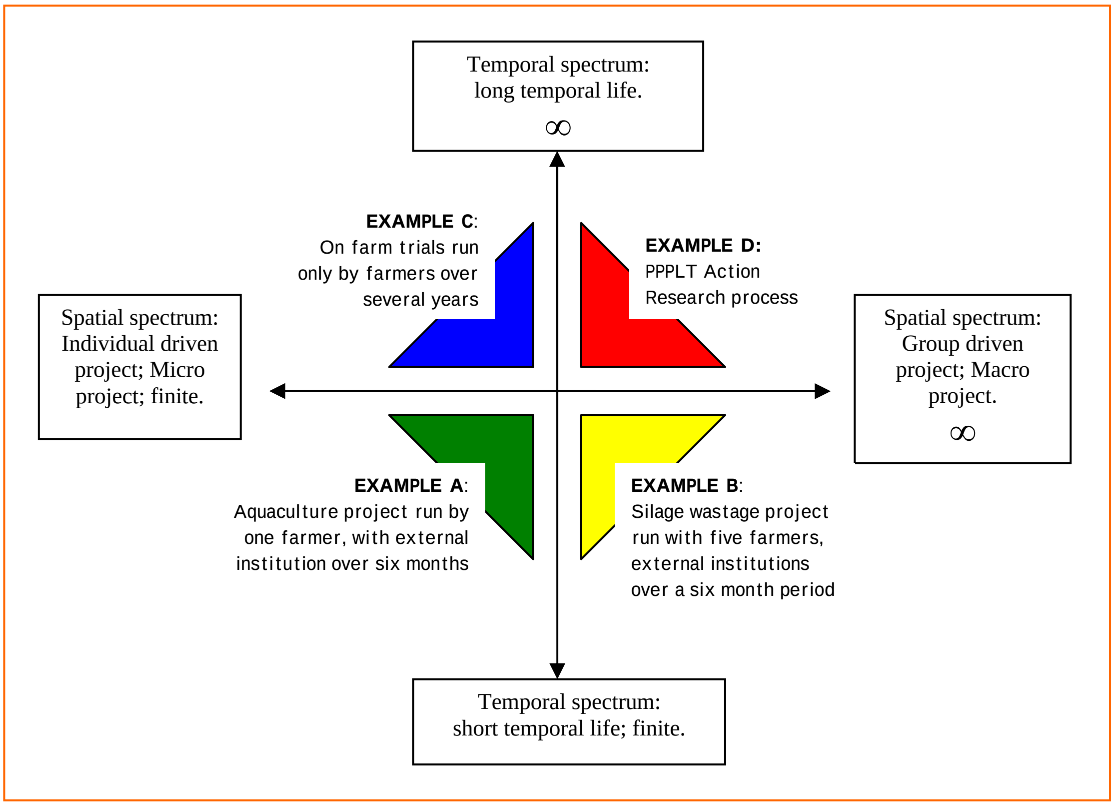

Figure 1: The Spectrum of Spatial and Temporal Boundaries in AR

iii) Stakeholder Ownership of AR Processes – Who's Reality Counts?

Within PPP, and probably many AR projects that occur with agricultural industry, the most sought after participants are often those people – farmers - who have very little experience or no awareness of AR as a professionally practiced and theoretically based approach to rural development. Most PPP dairy farmers had never heard of AR before they engaged with PPP, but getting farmers to join PPP was a critical factor for the project's success. Furthermore, stakeholders such as scientists, agronomists, private sector suppliers to agriculture etc, not only had little or no experience or knowledge of AR but many actively (often naively) rejected it as a means for developing agricultural practice.

PPP's experience of delivering ownership of PPP to farmers was associated with *Emancipatory Action Research*, in which participants are freed from "… the dictates of compulsions of tradition, precedent, habit, coercion, as well as from self-deception … [by focusing on the] …theoretical and organisational structures and social relations … [that support particular practice] " (Grundy, 1982). Thus, instilling *genuine* farmer involvement with PPP meant devolving power and resources away from the centralised PPPLT structure and down to relatively small groups of farmers and often a select few people who ran them.

Money & Power

The PPPLT, having received it's funding from the national industry provider, committed half of all PPP funds to all the RDGs. The RDGs were made aware that PPP funding was theirs, to do with whatever *they* decided (within the project constraint of dairy farm and pasture improvement). With these finances the PPPLT handed a major portion of its power within the industry to farmers – in effect the PPPLT inextricably linked its own prospects of success to the likelihood that dairy farmers would meet the challenge of utilising PPP resources effectively, efficiently, professionally and on matters of relevance to industry productivity.

From the farmer's perspective, receiving PPP funding meant they immediately became the major partner of the PPPLT, with a real voice to communicate and co-determine the PPP content and operation, both regionally and at the state level. This approach appeared unusual or odd to most farmers, completely mystifying to some, and a golden opportunity to others.

Facilitated Power

In addition to funding, the PPPLT provided strategic support through facilitation and encouraged farmers to question, and where appropriate, overcome their relatively low level of involvement in agenda determination processes for learning, research, development and extension. In practice this task was enormously complex and highly politically sensitive. Farmers were facilitated by PPP to increase their degree of control of industry agenda by creating their own projects, seemingly at the direct expense of the traditional drivers of research, including scientists, government officers, industry representatives and private consultants.

By assisting farmers through initially minor local projects in which the farmer's agenda was the genuine focus of the activity, PPP enabled farmers to go beyond their previous participation, but this was not at the expense of other traditional stakeholders. Rather, professional project managers, scientists and others remained vital to successful project outcomes, but under the PPP framework farmers invited them to join in as their expertise was required. This farmer-oriented approach constituted a re-regulation of traditional research structures in which the agenda is largely (if not wholly) determined prior to local farmer involvement.

Disseminating Power in AR

The learnings from PPP success in gaining farmer's confidence, trust and their collective commitment to take ownership and responsibility for learning and research through action include the following:

- Participants must be granted a 'reasonable' or 'fair' share of power encapsulated by an AR project, including funding and other project resources.
- The transfer of power must be genuine, not tokenistic, and clearly communicated without compromising qualifications or conditions.
- Using participants as 'tools' within projects <u>cannot</u> be considered as a form of power-sharing, particularly for key stakeholders.
- Evidence that power has been genuinely and fairly distributed within a project is the rise of more complex relationships between stakeholders, with dialogue leading to changes in agenda priorities.
- Communication channels must be constantly maintained and remain open between the body distributing its power base and the participants receiving it. The opportunity to access and be heard through effective dialogue is itself an emancipating process.
- Reaching agreement amongst all participants must be allowed to be negotiated through to some form of consensus or acceptance, with an expectation that each person has the right to express their view to all stakeholders.
- Recognition that gaining participant trust requires sensitivity to people's orientation, and that addressing potential participants on their own terms is often required. This is particularly so in terms of language, the location of meetings, adherence to local customs, awareness and acceptance of political structures, and traditional processes.

iv) Getting Results with AR, or, Having Faith in Humanity

With the issues of spatial and temporal boundaries and participant ownership explored (above), this section outlines the achievements and outcomes created by using the AR framework in PPP. These results have been analysed to distill the elements driving action that led to successful outcomes. Specifically, assessments have been made about the extent to which PPPLT input, mostly through facilitation of farmer's regional activities, was required in order to maintain project momentum, achieve rigorous intellectual and design standards, implement reflective practice, achieve project completion and generate valuable and verifiable outcomes.

The previously mentioned Example A and Example B are two projects amongst many from which PPP farmer's realised direct benefit. Observation revealed that the PPPLT typically played a major role in the beginning of most RDG projects, primarily as a facilitator to bring farmers together and clarify their agenda priorities. The PPPLT played a significant role in enabling farmers to set and accept the spatial and temporal boundaries of their self-chosen projects. Facilitation provided by the PPPLT was generally withdrawn once it was felt that farmers were in control of the unfolding process.

The PPPLT realised a critical need to step back from the action and let the stakeholders play out their roles. This was at times a difficult position for the PPPLT because it meant suspending its power to intervene in local projects. From the farmer's perspective over-involvement (by the PPPLT) was not merely unnecessary, it was potentially disruptive and counter-achieving. By maintaining a constant presence within RDG projects, and the specific work they accomplished, the PPPLT risked 'crowding out' farmers from their own learning processes through over-facilitation or conducting project work on farmer's behalf. This is particularly true of projects in which roles were clearly defined and responsibility and commitment to complete tasks was high. Similarly the constant presence of the PPPLT in RDG activities was recognised as being a possible inhibitor to action, or action that might have occurred without the PPPLT being present.

A balance was struck between the PPPLT and each RDG project, with the PPPLT generally keeping *in touch* with projects as they unfolded and ensuring open communication lines were always available. Where farmers did not grasp an issue for research, the PPPLT found itself continuously devoting attention to getting farmers motivated and willing to even turn up to meetings – in effect these farmers had not begun to garner a sense of ownership of process, nor had they begun to identify boundaries around different agenda issues.

Interestingly, the range of ways in which farmer groups put their ideas and agenda into action produced a variety of *modus operandi*. These are identified in the PPP Final Report (Dairy Australia, 2003, p47) as follows:

> "From observing PPP, various models emerged for conducting farmer-driven research activities, with a key determinant being the extent to which farmers could take time out from the daily operation of their business to engage with learning, research and innovation processes. Having decided their issue PPP farmers implemented their agenda in several ways, including:
>
> - contracting the work out to a research consultant (such as the Kikuyu research),
> - farmers themselves carried out the bulk of work in a project but in collaboration with technical experts who provided design and technical guidance as required,
> - creating linkages to other industry projects of a relevant technical nature and collaborating with them,
> - building formal institutional linkages between RDGs and research/advisory agents that service the local region, and
> - individual farmer-run research efforts that were, as a minimum, required to present their results to the wider dairying community, and PPP funding had to be approved by the local RDG (such as the investigation of aquaculture in dairy effluent management)."

The setting of spatial and temporal boundaries within AR activities effectively determined which aspects of the AR process were considered valid for achieving intrinsically desired outcomes. In Example A for instance, a single farmer interested in trialing aquaculture within her ponded dairy effluent system validated the need to document her individual reflections upon the trial; while in Example B, a silage wastage project involving five farmers focused its documentation of reflection upon the cumulative learning outcomes from the entire group experience.

The facilitation and methodological framework for PPP activities could only be relied upon to a relatively small extent to get results. PPP experience indicated that the real results come from people deciding to participate and act together, re-regulating their behaviour (consciously or not) to the above spatial and temporal boundaries and grasping opportunities for action in pursuit of situation improvement. In terms of relating this experience to AR method, it would appear that there is a point of diminishing returns for process effectiveness regarding the role of the facilitator, particularly when the facilitator is simultaneously the primary funding source.

Conclusion

The establishment and acceptance by AR group members of where a budding project was located both spatially and temporarily reduced confusion about the role of individual versus group learning processes, clarified the time frame within which action would occur, addressed the likely number of stakeholders to be involved, and in general drew out the nature of the desired task to all involved. This is a lesson about AR principles than can be applied more generally.

Although shared funding arrangements and the power that went with this was a major factor in delivering ownership of the learning and research processes to farmers, it was not the only factor. Observation of RDG reactions to PPP's entrance to the industry indicated that farmers were willing to take on a fair proportion of project responsibility and workload if they were simply treated as genuinely equal partners. This meant actively listening to farmers and making changes to *a priori* expectations of group goals when farmers indicated such desires, it also meant having continuously open channels of communication in order to capture feedback farmers might have at any stage.

This confirms the primary goal of AR as being to institute a learning process as always being a feature of such research for all participants, rather than it being a *blueprint* approach determined beforehand by self-designated *experts* who then gain most of the learning benefits; other stakeholders becoming more like tools in the process. This project has demonstrated that more complex issues can and will be tackled once the capacities, confidence and support of all stakeholders has been developed. In this project the focus was very much on farmer-driven research, but similar principles would apply to research aimed at broader groups of stakeholders, for example environmental research affecting the community at large.

Notably the PPPLT expressed itself to farmers using appropriate (local) language and respecting local protocols, that is, the PPPLT identified a need to relate to farmers on their own terms and on their own territory in order to build a sense of trust and collaboration. The consequences of more vigorous farmer participation within PPP activities took the form of farmer's more freely speaking their mind by not being afraid to publicly state potentially embarrassing or controversial comments or ask *silly* questions; increased farmer involvement in terms of time commitment, attendance to meetings, willingness to take on work responsibilities and a greater propensity to *wear* higher personal costs associated with achieving group outcomes. In one example a farmer was financially subsidised two days labour to attend a PPP workshop, although after the event the farmer refused to claim the money because of the benefits derived from participation.

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Rural Areas are Shaping the Future: Some Experiences with the Regional Action Programme in Germany

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Abstract

The starting point for this paper is the rediscovery of the concept of the multifunctionality of agriculture and rural areas as a way of adapting to economic pressures and the changing role of agriculture in society. Multifunctionality has always been a key feature of farming. Only over the last decades it has been set aside in favour of the conventional development model for agriculture in order to reduce production costs and to increase competitiveness.

The new development model that is sketched out is illustrated on the basis of the practical experiences gained so far with the *Regionen Aktiv* ('Regional Action - Rural Areas Shaping the Future') pilot programme in Germany. In this programme an integrated and holistic approach is applied to the development of agriculture and rural areas. At the same time it is tried to encourage community participation and action, and to foster local and co-operative initiatives at all levels. A rediscovery and redefinition of rural-urban linkages is a key feature of the projects that are implemented as an integral part of more comprehensive regional development concepts. A key idea is that 'new' farm-related activities are actively reconstructing and revitalizing rural economies in the model regions.

The paper aims at giving an impression on how learning processes and skill building, which are considered integral and vital components of the pilot programme, are taking place in the model regions. Learning processes are examined at the level of individual entrepreneurs and actors, the level of the model region and the programme or policy making level: Making multifunctionality a key issue of agricultural policy programmes requires a mutual learning process between policy makers, research and rural actors.

1 Introduction

1.1General considerations concerning the paradigm shift towards multifunctionality

Policies regarding the development of rural areas are more and more determined according to the principles of integration, territoriality and sustainability. The multifunctionality of agriculture is increasingly seen as being inextricably linked with the economic, ecological and social dimensions of a sustainable development of rural areas.

Multifunctionality emerges as a redefinition of identities, strategies, practices, interrelations and networks. Sometimes this redefinition rests on an historically rooted but marginalized cultural repertoire. In other situations it is based on highly 'market-oriented' responses that embody a general or partial reconceptualisation of what farming should be in the context of the new ties emerging between town and countryside. Job creation in rural areas is in this respect not so much a function of natural resources, rural amenities or infrastructure, but of local people and entrepreneurship (BRUNORI & ROSSI, 2000; VAN DER PLOEG et al. 2000, 2002).

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In the Amsterdam Treaty of 1999 a concrete form has been given to the so-called *European Model of Agriculture*. In this model explicit reference is made to the *multifunctionality* of rural areas and agriculture. HERVIEU & BERANGER (2000) emphasize that agricultural change cannot be seen without considering its contribution to the preservation of the socio-economic viability of rural areas, as well as its specific cultural and historical role: *"Multifunctionality is an integrative concept that provides a macroeconomic reality and a global coherence to externalities that are often neglected on the microeconomic level."* The 'Regional Action - Rural Areas Shaping the Future' pilot programme corresponds with these recent shifts in policy at the European level and it trial tests new, trend setting options for action in practice.

The same reorientation in the agricultural and rural economy can be observed in practice in recent years. Departing from the available empirical studies we argue that over Europe as a whole, between 60 and 70% of all farms are functioning and maintained, precisely since they are firmly grounded in 'new' farm-related activities. Starting in the mid 1980s but particularly since the early 1990s there has been a very substantial rise in such activities in most rural areas, which have to some extent compensated the loss of economic significance and employment in the primary production sector. It is telling that over the last years a range of 'atlases' was elaborated that describe these new repertoires and the associated practices (VAN DER PLOEG at al., 2000, 2002; VAN BROEKHUIZEN et al., 1997).

It has become evident - in Germany as well as throughout Europe - that multifunctionality through economic diversification opens up significant prospects for the future of agriculture and rural areas. For farming operations it means developing new sources of income in addition to traditional production, e.g. in the areas of agro-tourism, management of nature and landscape or regenerative sources of energy. Empirical studies like the IMPACT research programme[1] which has just been concluded may well point to new ways of reconciling micro-economic perspectives with environmental and societal goals at large (VAN DER PLOEG et al. 2000, 2002; KNICKEL et al. 2004a).

1.2The situation of agriculture and rural areas in Germany

The share of primary agricultural production in the gross added value of the German economy has decreased from 3.4 percent in the year 1970 to 1.2 percent in the year 1999, thus by more than half. The proportion of the labour force working in this sector dropped from 4.1 percent in the year 1991 to 2.7 percent in 1999. This corresponds with figures for European agriculture: In the six founding EU member states, the number of farms fell by 42% between 1967 and 1997, a loss of 2.7 million farms. Between 1987 and 1997 alone, the number of farms fell by 24% in the EU-12 (Eurostat) (BRYDEN, 2002). The decline in the number of agricultural holdings is matched by an even more pronounced decline in agricultural employment.

A process that has received much less attention while it gained more and more importance is the diversification of agriculture, the development of new farm-based or farming-related services such as landscape management, an increasing quality orientation and the focus on regional products and markets. Diverse patterns of income generation and the focus on regional markets have become more important again. The diversity of agriculture and food traditions can in this respect be seen as a strength. Regional-level processing and marketing, short chains and community supported agriculture provide new opportunities for green and local products in the market-place and an alternative to an increasing standardisation in mainstream production and markets (VAN DER PLOEG at al., 2000, 2002).

[1] The Socio-economic Impact of Rural Development Policies: Realities & Potentials (IMPACT). DG Research - Quality of Life Programme. Contract no. FAIR 6 CT 98-4288. For results see VAN DER PLOEG et al. (2002). A copy can be obtained in the Institute for Rural Development Research (IfLS). Cost: 20 Euro plus postage. Email: Knickel@em.uni-frankfurt.de.

Rural areas, however, are characterised by a large range of diversity, a fact to which policy-makers have not always given sufficient consideration in the past. Nature, culture and agriculture in the Allgäu region in southern Bavaria are entirely different from the conditions found in the Emsland region in north-western Germany, for example. The Uckermark-Barnim region in one of the new states in east Germany has a 22 percent unemployment rate, one of the highest in the country. By contrast, the Oberland - a typical rural area in Bavaria - only has a 6 percent rate of unemployment. With respect to the kinds of support required it is important that the particular regional situations are taken into account by local development agencies, national governments and the EU in developing policies designed to support these new activities. As elsewhere in Europe, there are no standard solutions for development in rural areas. Against this background, the Regional Action pilot programme has been implemented in order to trial test a new bottom-up policy approach.

2The Regional Action Programme

2.1Objectives and expectations

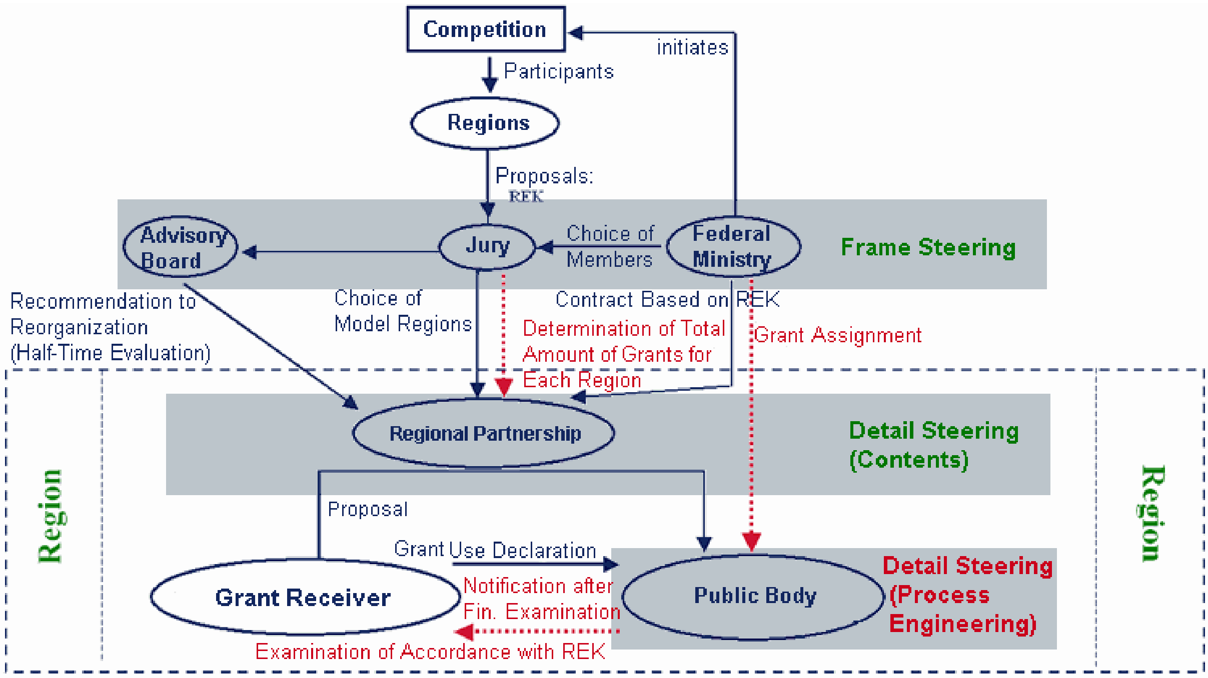
The pilot programme 'Regional Action - Rural Areas Shaping the Future' was initiated by the Federal Ministry of Consumer Protection, Food and Agriculture (BMVEL) in Germany in 2001. It follows an integrated approach to regional development acknowledging the need for rural areas to harmonise their various functions in order to be strengthened and create new sources of income. The relevant actors, institutions and stakeholders in individual regions are encouraged to develop visions for the future of their region and to devise integrated development concepts that are geared to the particular regional situation. Policy makers expect the pilot programme to provide best-practice models for sustainable rural development and for connecting rural and urban economies (BMVEL 2002).

Through the programme support is given to the realisation of these development concepts that aim at quality production and environmental protection in the agricultural sector as well as proximity between producers and consumers and economic stimuli through regional products and direct marketing. Instead of supporting individual sectors, the programme focuses on the region as a whole, aiming to make it a catalyst for innovation. The combination of economic development and social balance with intact nature and environmental protection is a major goal in all model regions participating in the Regional Action programme. The objective is to explore and develop fields of action that will eventually demonstrate the ideal of sustainable development in a clear and comprehensible manner. Interrelationships between different fields of activity are considered important, and projects are conceived in mutually supportive ways. The aim is to create synergies between different developments at farm household, communal/local and regional level.

2.2 Implementation

At the beginning of 2002 eighteen regions were chosen by a jury out of over 200 competitors on the basis of the quality of their concepts for an integrated and sustainable development of their region. The presented concepts had to be agreed upon at regional level by those actively involved including the major regional interest groups. The winning regions now receive an annual grant of up to a maximum of 1.5 million Euro. Through the grant the ministry provides a support framework actively backing up regional development activities including in particular a regional management structure and the implementation of particularly innovative core projects. Over the period 2002 to 2005 the regions, which are mirroring the vast diversity of Germany's rural areas, are supposed to develop innovative ideas and provide useful examples by putting their integrated development plans into practice (BMVEL 2002).

The co-operation structures that had to be conceptualised as a part of the regional development concepts and that, in many regions, are continuously improved, provide the basis for the implementation of the programme. It is expected that these newly-formed co-operation structures - the so-called 'regional partnerships' - will provide the foundation for longer-term joint involvement of regional actors in regional development processes (BMVEL 2002). **Figure 1** provides an overview of organisational structures in a typical model region.



Source: Annual Report of the Regional Partnership Ostfriesland (2003); REK = Regional Development Concept

Fig. 1: Overview of organisational structures

The specific organisation in the individual regions is now handled by a group that is representative of those actively involved. The main idea is to hold decision-making power within the regional partnerships themselves. A public regional body - often the district authorities or the agricultural office - has the responsibility for financial management and budget administration. A regional management team plays a key role in promoting regional networking, supporting project development and interlinking individual projects as well as in preparing decisions in relevant bodies of the regional partnerships (KNICKEL et al. 2004b).

The accompanying research for the pilot programme is carried out by the Institute for Rural Development Research (IfLS) at Goethe University Frankfurt. It aims at providing the policy level with comparative analyses and recommendations for further policy formulation and the mainstreaming of bottom-up approaches as well as at supporting regional level learning processes.[2]

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[2] For further information on the pilot programme and the accompanying research please contact Karlheinz Knickel (Email: knickel@em.uni-frankfurt.de).

3 Learning processes at different levels

3.1Learning processes at policy and programme level

The basic premise of the approach is that those actively involved regionally have a more precise knowledge of the local situation than people working for a state or federal government ministry, for example. This superior knowledge makes it possible for the regions to organise specific measures more purposefully, to co-ordinate them better and, above all, to motivate and involve relevant actors and stakeholders from within the region. As the experiences with the model regions show, the degree of identification of the population with its own region increases, just as does the motivation to take an active part in this type of grass roots democracy process. The fact that bottom-up processes can provide important impulses for dynamic development in rural areas has already been demonstrated since the early 1990s by the EU LEADER programme. The additional aspect of the Regional Action pilot programme is that this process is now explicitly implemented in favour of a reorientation towards a sustainable agriculture, a quality orientation in production, environmental concerns, and regional resources and markets.

The key to the success of this initiative and the necessary participation processes is a professional regional management team that has sufficient resources at its disposal. Communication competence, organisational skills and the ability to moderate and mediate are prerequisites. The pilot programme allows the regions to finance these 'soft' success factors. The importance of such a support structure and the role of NGOs for skills transfer has been elaborated by OLUKOSI (1996) who is dealing with the issue of participation possibilities for local groups in innovation processes. The experiences gained so far with the Regional Action pilot programme are in line with that.

Programme evaluation and the methods employed

The concept developed for programme evaluation and the methods employed are based on the idea that a dynamic development of rural regions is closely linked with the creativity of local actors and their knowledge of the opportunities and difficulties of their particular geographical location. By allowing regional actors active participation in the development process, the Regional Action programme makes such knowledge accessible. In correspondence with that, the programme involves the model regions themselves in the evaluation process by allowing them to present the effects of the programme implementation on the basis of guidelines developed as part of the accompanying research.

In respect of the specific conditions in the individual model regions, a relatively comprehensive set of criteria for the success of the initiative had to be developed. This has been done on the basis of a comparative analysis of the regional situations, their respective development models and strategies being elaborated as well as the core projects being implemented. A comparative analysis of the regional competition documents helped identify regions with similar conditions and potentials in a first step.

The qualitative methods employed during the first phase of accompanying empirical research involved participant field observation and interviews with regional key actors based again on a common guideline. RÖLING (1996) refers to the issue of integrating farmers' and researchers' knowledge, pointing out that knowledge of the social structures is crucial within the field of research in order to make the right choice of interview partners and assessing the information gained. Further information was available in form of annual reports that had to be delivered by the model regions on the basis of common guidelines and in which the process and progress of the implementation of the regional development concepts is being described (KNICKEL et al. 2004b).

RÖLING (1996) also addresses the problem of generalising local-specific information. The latter poses a challenge for the next phase of the accompanying research, which aims at moving from a more descriptive approach on to general conclusions for best-practice models. In this next phase also the problem of bias will need to be dealt with in a more effective way: Because the Regional Action programme has been conceived as a competition there still is pressure on the regions to 'perform' well. Consequently, the accompanying research has to be aware of interview partners possibly tending to provide information selectively. At the moment it is questioned even by the accompanying researchers whether a pilot programme that aims at models for sustainable development, constructive cooperation at regional level and the necessary learning processes ought to have (significant) competitive elements.

3.2 Learning processes at the level of the individual entrepreneur

Besides the learning processes at policy and programme level that have been examined so far there are also very considerable learning processes at the level of the individual entrepreneur. The conventional development model for agriculture that dictated European agricultural policy, training and advisory systems in the past 30-40 years was focussed on increases in labour productivity through scale-enlargement, specialisation and the intensification of production. As a result in many European regions we now have a highly rationalised, mono-functional agriculture, which is faced with economic, environmental and social limits, and thus increasingly at odds with society's expectations of agriculture and rural areas as well as with the interests and perspectives of an increasing segment of the agrarian community (see for example KNICKEL 1994).

The reorientation in the agricultural and rural economy which can be observed in recent years, however, may well point to new ways of reconciling micro-economic perspectives with environmental and societal goals at large. Agriculture is being redefined *by individual farm households* in terms of its much wider role in a modern society. Obviously agriculture still is the biggest land-user, and - particularly if 'new' farm-related and broader activities are taken into consideration - farming remains the heart of the rural economy.

More and more farm households supplement their incomes with other activities and sources of income. Farmers and other rural entrepreneurs are engaged in the development of new farm-based or farming-related services exploring new ways of using available farm and household resources. Activities such as agro-tourism, quality production, regional-level processing and marketing, care activities, communal services, nature and landscape management or organic farming as well as more innovative activities like wind and bio-energy production are emerging as responses to the ongoing cost/price squeeze in mainstream agricultural production. To a considerable degree these activities are characteristic of the multifunctionality of agriculture and rural areas (ABLER, 2001; VAN DER PLOEG et al. 2000, 2002).

Particularly dynamic fields of activity are in Germany organic farming, high quality production (often linked with particular regional quality labels), diversification, and nature and landscape management. Agro-tourism and direct marketing have already been popular for decades. The establishment of farmer markets has been particularly important in the past 10-15 years, particularly in southern Germany. Off-farm employment have always been important in most German regions, again particularly in southern Germany where 70-80% of all farm households are pluriactive (KNICKEL et al. 2004a).

3.3 Learning processes related to the multifunctionality of agriculture and rural areas

Agricultural enterprises in the model regions show the potential for diversification, yet further (policy) support is needed in the form of the promotion of processing and marketing facilities and of intersectoral initiatives. A strengthened regional image and thus stronger identification of consumers with their region and with regional products are crucial. The integrated regional development concepts force actors to develop joint initiatives. Thus, new co-operative structures within agriculture as well as with other sectors such as education or tourism have been achieved (KNICKEL et al. 2004 b).

The fact that 'new' farm-related or farm-based activities require new skills, labour management, support services and networking still has to be realised by relevant institutions. Very often 'new' activities have been developed by individual farm households without assistance from the agricultural support system that still is predominantly geared towards primary production and cost-efficiency. Regional level actors outside the official agricultural system such as the regional management teams and agencies of the LEADER and the Regional Action programme provide some help. It is telling that it is primarily these 'new' actors who refer to the assets of the particular region as core components of the evolution of a multifunctional agriculture and of a sustainable development of the region. The newly-gained awareness of specific regional potentials stated by regional actors can help to discover new possibilities for a multifunctional agriculture.

3.4Learning processes at the regional level: Skill building and knowledge transfer in the model regions

The organisational and technical skills required by individual farm households that are engaged in the development of 'new' activities as well as the organisational and networking skills required by the regional management teams and agencies when providing the necessary support are both products and conditions of successful development initiatives. Ideally, the support programme and the agency implementing it play the role of facilitators. Particular support ought to be given to skill building activities through adequate budgetary provisions. Regional management teams and agencies then primarily play the role of learning agents and regional level catalysts that assist in the translation of overall programme objectives into regional initiatives.

Fundamental to the pilot programme is the idea that regional actors themselves take charge of the development of their region. The support mechanism tries to encourage community participation and action, and to foster local and co-operative initiatives at all levels (geographically and between private, public and community organisations). It attempts to facilitate the creation of new alliances between the relevant groups and joint action (KNICKEL et al. 2004b).

The accompanying research documents that the model regions have already experienced a remarkable learning process relating to the establishment of organisational structures and forms of decision-making as well as creating networks for the implementation of the programme. New relationships between formerly not co-operating actors and sectors have been and continue to be formed, by way of which regional development is transported on a broader basis. The willingness of the model regions to learn becomes evident through examples of organisational restructuring. It becomes evident as well that there are still deficiencies concerning the efficiency of working structures in the model regions to be overcome in an ongoing learning process at the regional level (KNICKEL et al. 2004b). Overall, it can be stated that the Regional Action programme has already contributed to a higher regional self-responsibility, has initiated learning processes as well as raised the motivation for joint action.

At the same time, there is some criticism by regional actors considering the support by the Federal Ministry insufficient. From the point of view of the accompanying researchers the learning process also concerns the ministerial level where a totally new approach towards policy formulation and implementation is being tested. Especially for a participation-oriented approach like the Regional Action programme the promotion of knowledge transfer, skill building and networking is vital as the emphasis of the programme rests on exploring development processes carried by newly-involved actors (KNICKEL et al. 2004b).

The exchange of knowledge and experiences takes place through various 'channels', first, at programme level, and second, within the model regions. To mention some concrete examples, the website established in the context of the pilot programme (BMVEL 2001) offers actors possibilities of knowledge exchange e.g. via a so-called competence-development-network (KEN). KEN addresses issues like regional management, regional and direct marketing, networking and co-operation, moderation, evaluation and public relations. Internet-based discussion platforms on critical issues and topics on the website allow an exchange of questions and advice concerning the implementation process among actors of different model regions. Working groups on different issues formed by regional actors involved are an effective way of 'face-to-face' knowledge transfer within the regions (KNICKEL et al. 2004b). Knowledge transfer also takes place via external experts, who function as professional advisers on specific questions. Interregional 'networking seminars' are another example to be mentioned. Press and public relations help make the programme and its progress known to the public, thus also addressing potential customers for newly-established services and products.

As is pointed out in the workshop abstract, identifying critical knowledge and skills and making them accessible to actors is crucial on the way towards a sustainable development of agriculture and rural areas. Communication, organisational, moderation, mediation and networking skills are preconditions in the forming of new co-operations. As opposed to mere investment programmes, the promotional spectrum of Regional Action encompasses such 'soft' measures as well as 'hard' measures like promoting investment and infrastructures. The regional management teams of the model regions function as an important agent of networking and skill building, and at the same time need further training themselves to successfully fulfil this task (KNICKEL et al. 2004b).

4 Learning from model regions and pilot programmes

4.1 From practice to theory

In order to meet future challenges a reorientation of research activities and a corresponding development of research capacities is needed. Agricultural and rural change is a multi-level, multi-actor and multi-domain issue. The global relations between agriculture and society constitute a first level of analysis. Agricultural change can be interpreted as adjustments among farm households to overall societal changes. At the same time, it needs to be understood at the local community level as patterns of agricultural change reflect local community structures. Ultimately, change is enacted by the farmers, that base their decisions on a variety of local level factors that are not always connected to the factors at other levels. Agricultural change also is multi-actor and multi-domain: Increasingly a single land area is used for multiple purposes (agro-tourism, residential areas, leisure and sports activities, etc.) over which multiple actors from multiple domains have influence. The 'rural' is no longer a monopoly of the farmers.

Dealing with multidimensional processes poses a challenge for research. An approach that in the past has not received sufficient attention from the research side, is the systematic exploration and study of practical experiences. Model regions and pilot programmes can be understood as *windows into the future*. An example to be mentioned are the practical experiences gained in biosphere reserves (BSR)where a sustainable economy and a sustainable land use are key ideas being developed and tested. At the EU level, the *Leader* programme running since the beginning of the 1990s provides interesting experiences in terms of a more sustainable development of rural areas and in terms of the institutional forms required to support and implement such developments. The Regional Action pilot programme in

Germany is an excellent national level example. The initiative as a whole can be seen as a new future-oriented policy measure with a very high potential for policy-practice synergies.

What is lacking is a thorough and scientifically sound examination of such experiences. Obviously such research would need to be transdisciplinary, i.e. also involving stakeholders using suitable participatory approaches (focus groups, expert panels, etc.). Stakeholders are the farming sector, consumers, taxpayers, citizens with food safety, environment and animal welfare interests, the food industry as well as regional level decision-makers and administrators. A challenging question is how to combine qualitative and quantitative information systems in the sense of decision and learning tools. A sufficient degree of integration of natural sciences and socio-economic research with policy studies and participatory approaches can be regarded as essential in this respect. Integrated assessment techniques normally relate to specific spatial levels, and a key question is how different levels of analysis can be interlinked (KNICKEL & RENTING, 2000). The aim must be to really bridge different research paradigms and to embed the analyses within a process of stakeholder interactions.

4.2Actively constructing synergies

Creating cohesion between activities, not only at farm level (through the active construction of new multifunctional rural enterprises) but also between different farms or farms and other rural activities is a crucial, strategic element in rural development processes. Particularly important are the (potential) synergies between local and regional eco-systems, specific farm styles, specific goods and services, localised food-chains and relevant social carriers and movements (SACCOMANDI & VAN DER PLOEG 1995).

The centrality of synergy to rural development embodies a model of agricultural development that is fundamentally different to the modernisation paradigm. Whilst modernisation fostered an ongoing specialisation in agricultural production and envisaged a segregation of agriculture from other rural activities, it is the mutual benefits and 'win-win situations' between different activities that in the new multifunctional paradigm appear both strategic and desirable. Agriculture and rural areas may in his respect well lead the way for a more sustainable society. Aspects of this are an increasing quality orientation and a quality economy, the linkages between resource use efficiency, rural income and employment, and the close connections between agricultural land use, societal demands, the provision of public goods and the management of natural resources (KNICKEL et al. 2004a, ALLINSON 2003).

The Regional Action programme in this respect not only makes eighteen innovative concepts for the implementation of integrated rural development possible. The programme will also result in important practical experiences with respect to success factors and obstacles encountered during the realisation process. By means of the results from the model regions, important information will be gained for developing new policy support instruments.

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Continuous Business Improvement: An animal difficult to domesticate

Kate Roberts[*] and Mark Paine[**]

Abstract

Recent events such as the deregulation of the dairy industry in Australia focused attention on the importance of business management practices and the need to react to and be proactive about change from an informed position. Service providers responded to this need by providing a range of business and continuous business improvement (CBI) products and services. This paper reports on a study of two of these products and services (*Continuous Improvement and Innovation* and *Balanced Scorecard*). A literature review was conducted before field work involving four case studies. Case study research was then used to document the practices that participants used in a group based CBI program. Observations focused on how program participants applied the principles and processes of continuous improvement. Three other case studies are also introduced in this paper as part of a cross case analysis. Analysis of the case studies determined that principles of CBI relevant to advisory services were highly aligned with action research. The action research methodology therefore provided a way to implement CBI for professional development and product development possibilities for advisory services.

Keywords
Continuous Business Improvement, Action Research, Advisory Services

This paper introduces the concept of Continuous Business Improvement (CBI) as it is used in the Australian Dairy Industry and then reports on a study involving four extension programs that in someway used a continuous improvement approach to design and deliver their services.

Background

Two initiatives in the Australian dairy industry have accentuated the demand for advances in CBI. The first was the deregulation of the milk supply market in Australia. Ithas resulted in severe price reductions for many farm businesses. These price reductions place additional pressure on farmers to use every possible means to improve their business performance. The second initiative has been the national delivery of projects to support farmers coping with the changing business environment, particularly the *Dairy Business Focus* and *Decisions for Action* projects. These projects have effectively primed many farmers to adopt a more inquiring approach to their farm management with respect to goal setting, monitoring of business performance and the handling of communication and human resource issues. Rendell McGuckian in their final report on *Decisions for Action* explicitly refer to the principles of continuous improvement as being the basis for building a benchmarking philosophy in the dairy industry (1999, p.31) “Continuous improvement is about continual learning and is not about having done or not done some training on a subject”. To really understand and adopt the principles CBI requires a question to be regularly asking: “how can I do this better?” To answer this question requires a process that defines what the aim/goal is, how a practice is performed now, and how new ideas are created.

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A number of programs had been operating across Australia that in someway were using a continuous improvement approach, however no study had set out to determine the effectiveness of the approach with a view to guiding the design and evaluation of future program designs. Dairy Australia[1] therefore commissioned a research project with the objectives to:

1. Determine farmer perceptions of their need to continuously improve their business performance;
2. Develop a methodology that assists service providers to make the shift from the delivery of technical services, to services for improving farm management processes;
3. Recommend changes in the design and development of business management programs and processes for farmers.

Literature Review

A literature review was used to explore and compare the concept of CBI, as used in the business management literature, with what occurs in the Australian dairy industry. This comparison aimed to identify relevant concepts that may be adopted and modified to fit into a dairy context. Action research was examined given that the bulk of the training in CBI for this project (*UM 10837: Continuous Improvement in the Dairy Industry*) was underpinned by action research principles and practice.

The objective of CBI in this context was to improve overall business performance and to provide clear links between improving quality, customer satisfaction, market share and ultimately, profit (Povey, 1996). A range of tools fall under the banner of CBI. These are benchmarking, self-assessment, measurement, continuous improvement, and business process re-engineering (Povey, 1996). We will restrict our discussions here to benchmarking and continuous improvement.

Benchmarking is the process of comparing and measuring an organisation's operations against those of others inside or outside industry. The notion of best practice is closely associated with benchmarking. There are distinct types of benchmarking: process, performance and strategic benchmarking. Davies and Kochlar (1999) made the point that benchmarking often fails because not enough time is committed to determine if it really makes a difference to business performance. They insist that benchmarking requires a long-term focus.

CBI is an on-going cycle of obtaining feedback from the various sectors of the business such as management, customers, suppliers and using this feedback for decisions on goals and indicators of success. Continuous improvement is used as a tool to improve quality and in some cases is associated with total quality and so requires employee participation across all levels of the organisation. It is thought that this knowledge gives organisations a competitive advantage because it cannot be replicated. This is similar to the *Balanced Scorecard* approach offered by Kaplan and Norton (1996).

Action research forms the basis of some continuous improvement processes, particularly those associated with the work of Clark, Timms and Roberts (1999). Action research is collaborative research based on an egalitarian approach. It integrates the principles of adult learning and has a defined structure that examines the outcome of activity. The structure is in four parts: action, observation, reflection and change (planning). Emphasis is placed on the reflective phase to ensure that actions are thoroughly analysed before decisions about change are made.

[1] Dairy Australia is a national dairy organisation that funds research from funds derived though dairy farmer levies.

One application of continuous improvement to Australian agriculture and in particular the dairy industry, has been through the training offered by Clark and Timms (2001). They attempt to deal with continuous improvement at the practice, process and systems levels. There have been issues of uptake with all the processes used. With some, the training failed to reach expectation and with others, the information generated by the process was not used.

When practices in the dairy industry and corporate business were compared, it was found that both have a poor understanding of benchmarking, particularly process benchmarking. They differed in that corporate business was more aware of the needs of their customers than dairy farmers. The suggestion was made that if dairy farmers were more aware of their customers, they could plan ahead more effectively.

Advisors serving rural Australia have adapted the findings from international and Australian research to local requirements. The *Continuous Improvement and Innovation* (CI&I) product developed in Queensland by Clark and Timms has drawn on diverse sources to build an integrated training program appropriate for both farmers and service providers (Clark and Timms, 2000). CI&I uses a modified form of soft systems thinking to address issues of innovation and change. The focus is primarily on the innovative behaviour of people and business performance and is treated as an outcome of management performance (i.e. the ability of people to manage effectively). Clark & Timms describe innovation as, 'a process of generating ideas and concepts and developing these into a product or process that achieves change in the real world.' (op. cit., p12.). CI&I is, therefore, a product to initiate and advance innovative processes by individuals.

The continuous improvement process as defined by this study, is one that has four propositions at its core. The first is a defined, cyclical structure of action that moves logically from one step to the next. The second is, the individuals who undertake these actions, especially if they are carrying them out as a group, are bound by a set of principles. The third is that the cycles of action are repeated until the issue at hand is no longer in need of improvement. The fourth proposition is that data from the monitoring of actions are recorded so that they can be analysed and used to inform decisions (Kemmis and McTaggart, 1991; McNiff, 2002).

An investigation of CBI in the Australian Dairy Sector

A project was undertaken to investigate the development of social technologies (cf. biophysical products and services) that enabled individuals and groups to advance CBI in their dairy farm management. Four case studies of dairy advisory services were used to examine CBI in practice. Each of these case studies investigated an approach to CBI that differed in context, problem situation and scale of activity:

1. New Product Development (Vic, New CBI product),
2. Farm business management (NSW, Dairy Check),
3. Program management (Tasmania, TOP), and
4. Learning and change management (Qld, Dairying Better and Better).

These investigations identified the design criteria and specifications for a methodology that advisors can use when they are determining farmers' business management needs. A cross case analysis was used to develop a generic decision framework for a second stage of the project that specified how to integrate monitoring, use of analytical tools and the role of advisors with respect to farm management decision making. This second stage is not reported in this paper. The framework addressed both farmers and advisors' development requirements for improving current business management programs and identified possibilities for new project initiatives. The CI&I model of training (Clark and Timms, 2000) was associated with three of the four case studies. The Balanced Score card was used in the fourth case study.

Case Study 1: New Product Development

This case study investigated the development, piloting and statewide delivery of a new CBI product for farmers. The Victorian Department of Natural Resources and Environment (DNRE) development team within the Target 10 group used the CI&I materials to develop and pilot a group learning based product for farmers.

Case Study 2: Farm Business Management

DairyCHECK is a project within the Dairy Do It program operating in New South Wales. Dairy Do It is designed to provide comprehensive farm business support to cope with the challenges posed for farmers through deregulation. DairyCHECK specifically addresses the decision-making skills of the farm management team through the provision of information and new management tools.

Case Study 3: Program Management

Targeting Our Profitability (TOP) is a Tasmanian extension program that has recently set a new target to have local dairy farms improve their return on capital and achieve at least 10% (on-farm improvement of at least 2%). The project began in June 2001 and involved a combination of farming systems research work, discussion group activities and linkages with private sector consultants.

Case Study 4: Learning and Change Management

Dairying Better and Better (DBnB) (Queensland) used the CI&I training materials to design the facilitation and delivery methods for participants. The managers of DBnB are observing considerable variability between the performances of the different groups involved in the program. This case has, therefore, used the same generic process as Case Study 1 but has used a less standardised approach to applying the CI&I process to develop and implement a management support service to farmers.

Case Studies 1 and 4 enabled an assessment of the robustness of the CI&I process when used as a basis for new product development (Case Study 1) and service management (Case Study 4).

Data were drawn using a combination of existing monitoring and evaluation activities. Additional data were sourced from participants in the four case studies using:

- Interviews by telephone (DBnB, DairyCHECK, TOP);
- Face to face discussions meetings and other events (DBnB; DairyCHECK, Target 10); and
- Focussed discussion at evaluation and review meetings (DBnB, Target 10).

The remainder of our paper will discuss the case studies in more detail before summarising our conclusions from across the cases.

Case Study 1: New Product Development – Target 10 Victoria

The CI&I approach was used in this program. The outcome of the continuous improvement process was that it worked reasonably well with the farmers even though they did not necessarily know about its detail. Four different methods to introduce CBI to farmers were tried and in the end it seemed that it did not really matter which method was used. The four methods were a combination of: having or not having a specific project to work on and having the CI&I process made explicit or not. On the whole, farmers valued some of the tools that were part of the process and some thought that there was value in the cyclical nature of the process. There were a number of on-farm changes during the course of the project that resulted from use of the process.

This group benefited from the adult learning approach and some of the tools used in the delivery CI&I, such as 'specialist questioning'. The use of the cyclic process was not reported as being still used by the team members although there was a statement about the gratification of seeing at least one farmer benefit from its use. The major turning points for this group were: accepting the role of facilitator as opposed to technical expert, and working with undefined outcomes and working with the right people. In future, the CBI approach will be used in other projects such as pasture management, project management, and animal nutrition. There may also be opportunities to integrate the approach throughout the dairy program and the Department of Primary Industries (Victoria).

Facilitators in the Target 10 project, made a concentrated effort to introduce the process methodically to their farmer groups. The use the process for their work of developing a new product was not so methodical. Even so, the value of their experience, is that the implementation of a continuous improvement process could be finally examined for its usefulness and was not clouded by facilitator difficulties with the concept.

The expected outcome for the CBI program was "Dairy farmers are continuously using improvement processes to identify and act on specific opportunities which improve the enterprise, financial, people and environmental aspects of the farm business" (CBI Team, Sept. 2000). However, this was a first attempt to introduce dairy farmers to the practice continuous improvement and it was a first look at what it may take to help farmers continuously improve and innovate, but more work needs to be done.

There was a change in attitude by most facilitators when it came to research as well as extension. For example, some of the findings were that:

- "changed my perception of how many different ways you can do things; this is a valuable alternative approach to undertaking extension research and development."
- "we are doing something really original and significant internationally."
- "the action research approach allows both experienced and inexperienced advisors to participate meaningfully. It doesn't require any one individual to be highly skilled."

Monitoring and recording by extension staff has increased considerably as a result of participation in this type of research. In addition, innovative approaches to monitoring have been trialled and adopted (eg a learning log to record observations and reflections and used during, after, and between CBI group and team meetings). The research approach encourages data to be collected and reviewed on an ongoing basis. This resulted in early identification of what was working and what needed changing. This real time assessment resulted in changes to monitoring, data collection and implementation. As facilitators encountered negative reactions by the farmers. The team worked on several modifications to monitoring methods before deciding on an approach that was agreeable to all participants.

The extension team is now in a better position to design and implement an extension action research project as a result of CBI. Members of the team used this experience in designing approaches to potential new RD&E projects. Action research is new to most facilitators and it presents an opportunity to take a flexible approach to research rather than the usual fixed design of traditional experiments. This is particularly suited to technology that needs to evolve over time as new issues emerge.

Case Study 2: Farm Business Management – DairyCHECK NSW

Facilitators in DairyCHECK were at an advantage when it came to implementation because they used products they developed themselves and adapted to the CBI approach. They found these useful. With some modifications, these materials could be used in the future as a vehicle for extension staff to gain experience with the continuous improvement process.

The post workshop evaluations in DairyCHECK encouraged by the continuous improvement process was seen as a useful innovation because review and evaluations were not previously part of usual workshop activities. The facilitators passed their evaluations on to the coordinator of the program who then used them to improve the program and give the workshops a consistency.
A simplified version of the CI&I approach was used in this program. Manuals on various aspects of dairy farm management were developed that incorporated the CI&I process. These manuals covered herd, shed and labour management and farm business management.

There was support from all staff about the value of the DairyCHECK. However, ideas on how it should be used with farmers were mixed. One person felt it was good when the process remained a tool for delivery and not for farmer use with only the content (e.g. pasture management, shed management etc.) ever made explicit.

When extension officers were asked what was different about the DairyCHECK facilitation process, two stated that they did not perceive anything different from what they were already doing (one because s/he was already familiar with action learning and the other because s/he was still carrying out extension in the same way). Two others considered that it was more about facilitating learning than teaching. The remainder felt that they could now deliver a better product because it provided structure, quality materials, and data for review and focused on what was relevant.

However, in almost all cases, farmers were not explicitly told about the nature of the approach. Only one person showed the process to his farmers. Even so, the field staff using this process did not want anything changed. They found it helpful and effective.

There was consensus that the original CI&I training was "over kill". The coordinator of DairyCHECK simplified the process before releasing it for use by the field staff. All the field staff, apart from one, are reviewing their activities and projects more than they did before DairyCHECK was implemented.

Case Study 3: Program Management – Targeting Our Profitability (TOP) Tasmania

The *Balanced Scorecard (BSC)* approach was the CBI process used in this program. With regard to program management, the TOP program has gone from looking at farms to looking at farming systems. Workshops with bankers expanded the process of increasing profit to also include strategic planning and benchmarking. Outputs from the workshops led to topics for discussion groups and field days and courses in areas where skills were needed. Selecting areas in which to make a difference was done on a whole of industry basis, using evaluation information and a five-year industry survey.

The process to review management of the program is cyclical because the committee met four times a year and reacted to various reviews. Also decisions are made about where to go in terms of what workshops to deliver where. Evaluation was done internally in some cases. However there was no systematic recording of the continuous improvement aspect of TOP.

The program was successfully implemented at the program level because program managers were familiar with the strategic planning process used in the BSC approach. Program managers were committed to BSC and used it themselves. The program is well supported by senior management.

TOP has provided training opportunities for extension staff. Younger staff have embraced this strategic planning process and the chance to deliver what they regard as dynamic learning events involving a variety of projects.

The products developed by TOP were popular and well attended. However, the continuous improvement process promoted by the BSC system was not given to farmers through TOP, only the products developed as a result of the use of BSC at Departmental level.

Case Study 4: Learning and Change Management – Dairying Better and Better Queensland

This project stalled in some regions because of drought and deregulation. In the regions where the CI&I process was implemented, the findings were that the process was too complicated, theoretical, and overburdened with tools many of which were not useful and therefore, did not need to be learnt. CI&I was seen by this team as a tool to use for business improvement but not as a way to change thinking about the business or the system in which the business operated. One of the greatest advantages of the Dairying Better n Better project was the integration of its key stakeholders.

Facilitators in Dairying Better and Better were largely unconvinced by the process and, therefore, had difficult implementing it.

The CI&I process was conceptually appropriate because the principles are universally applicable to dairy farming in an increasingly demanding commercial environment. However, these principles needed to be explained more thoroughly to extension staff and those working with farming groups.

The training package was partially appropriate because it provided an ensemble of tools for farmer facilitators and extension agents. However, the number of tools and requisite knowledge to apply them appropriately, tended to deflate and discourage the time-stressed participants.

Findings Across the Case Studies

An advantage of CBI in the Target 10 Case Study was that the process promoted trust that resulted in frank and open exchange of information and thus, farmers learning from each other. Facilitators in this case study observed that farmers made small, incremental change rather than introduce major innovations to some aspects of the farm. However, it is argued in the report that they now think differently about their farms and that can be regarded as innovative. Facilitators also felt that compared to other extension activities, CBI was resource expensive, in terms of the time and personnel needed to run it.

Facilitators in DairyCHECK were at an advantage when it came to implementation because they used products they developed themselves and adapted to the CBI approach. They found these useful. With some modifications, these materials could be used in the future as a vehicle for extension staff to gain experience with the continuous improvement process.

Facilitators in Dairying Better and Better were largely unconvinced by the CI&I process and, therefore, had difficult implementing it.

The *Balanced Scorecard* approach stimulated thought about an holistic approach and TOP evidenced very sound beginnings of that holistic approach to farming.

For the future, greater effort may need to be made to work with the current practices and environment of extension staff so that they have ample opportunity to learn a new process properly before they are expected to use it with farmer groups. Through interactive and reflective discussion with peers, managers and advisers, the transition from traditional extension to a different form (in this case, continuous improvement) may be less disruptive and threatening. If the ultimate outcome is one supported by extension staff then it is more likely that it will lead to a dairy industry that is more competitive internationally.

Three themes about the emergence and influence of CBI on advisory programs were identified from the cross case analysis. These themes are discussed before making a concluding comment on the current status of CBI in Australian dairy advisory programs.

Theme 1: CBI as a philosophy

The effectiveness of CBI as an approach to changing management practice depends on the extent to which each practitioner grasps and embodies the philosophy that underpins its use. It is unrealistic to assume that the simplicity of the approach (i.e. the six steps in the CI&I training that are arranged in logical cycles of action learning) ensures widespread understanding. A concise statement of the CBI philosophy will only partially resolve this need for understanding, because the power to innovate and continuously improve is primarily understood through the *doing*. It is by taking action and following through on all the steps that people come to understand the subtle influence of the philosophy on their actions. Notwithstanding this caveat, a more concise documentation of the principles is required than those currently provided in the current CI&I manual.

Theme 2: CBI as a toolkit

A toolkit metaphor has been popular among people working with CBI. This is not surprising given the extensive listing of tools in the CI&I manual. A number of these tools were effective for enhancing performance as facilitators and as practitioners of CBI. A concern is that no facility currently exists that helps with the selection of tools; checking that they are applied correctly to the issue; or evaluating how these tools are performing in practice. There is a risk that CBI is viewed as a toolkit only without an adequate grasp of the action learning philosophy that underpins continuous improvement. The tangibility of *tools* accentuates this risk (conversely the abstractness of action learning makes it less attractive). A third element to CBI is, therefore, required to ensure philosophy and tools are combined using a capacity building framework.

Theme 3: CBI as a means of capacity building – process in practice

Facilitation of CBI requires a comprehensive understanding of the process, and competence with tools that help participants to *give it a go* in their own situation. A facilitator may possess an extensive technical knowledge of a topic that participants may want to tackle. However, the facilitator needs to frame questions and respond to requests in a way that requires active effort on the part of the participant to construct their own understanding of the issues and solutions to their problem. Alternatively, where the facilitator lacks a technical grasp of the topic, they can act as a critical friend to the participant as they independently build their plans and act on these plans. Effective facilitation of CBI means having sufficient empathy with participants such that jargon is used sparingly, and only when it contributes towards an improved conceptualisation or problem solving/decision-making capacity.

Critical questioning underpins a collective learning by groups that complements the learning of individuals arising from effective recording methods. This questioning cannot occur in poorly constructed groups. We therefore recommend the use of a systematic farmer selection procedure to establish groups with a high likelihood of succeeding in CBI. The development of questioning skills needs to be a focus for all group members - with a special emphasis being placed on the cultivation of strategic thinking skills.

Conclusion and the Future of CBI in extension

Across the four case studies there was evidence that a culture of continuous improvement was initiated through the programs. CBI is starting to establish itself as a relevant process for managing change in the dairy industry. It is important to note that this cultural change is rudimentary and will require ongoing support to become routine practice among current extension staff and farmers. At this stage, knowledge and experience of continuous improvement is not extending beyond those who are interested and convinced by it. Continuous improvement is not gathering its own momentum in the dairy industry. The fact that it has not gathered its own momentum may be due to:

- Recurring difficulties with the content of the CI&I training and its application;
- Difficulty with finding a normal place for a continuous improvement process within the working environment of extension staff;
- Advisors are challenged by this sort of approach because it has a direct impact on their relationship with their farmers as well as their preferred method of information exchange; and
- A reluctance by the farming community to accept the concept of continuous improvement as it has been presented to them.

The influence of CBI on new extension programs appears to have several possible applications:

1. ***Use with farmers in development and delivery of syndicate***
   One of the new development areas in the current Target 10 brief, are dairy community syndicates (learning groups). It is recommended that the key attributes of the CBI program, as reported earlier in this document, be used in the development of the syndicate program. CBI will be instrumental in addressing the next generation of problems from the technical solution approach. It will help form different partnerships with farmers, where there are multiple sources of information.

2. Use with farmers in the delivery of current Target 10 productivity programs

There are a number of ways CBI could improve the outcomes of the Target 10 productivity programs. Requiring least development, and possibly having the least impact is to simply add a component as a front end and back end to these programs. With further development CBI could be used as the starting point and context for farmers entry to extension, with technical programs organised around CBI. CBI also has potential for working in different ways with different segments e.g. "high fliers".

3. Used by dairy program staff in development of industry programs

To carry on working with and utilising existing and new skills to continuously improve and innovate on how industry programs are delivered, to achieve better outcomes. There is also an opportunity to use this knowledge in the development of new programs, for example in the development of the Vic - Gatton business management program, for equipping farmers and other industry people with business skills.

4. Use for the management of Target 10

Both within the government supported dairy program as a more effective process of allocating resources, and as a process for the management of extension, and use with the Target 10 regional committees to improve the outcomes for that committee. For example as a process for the committee to achieve improved participation of people who are not currently Target 10 clients, or improve collaboration with other organisations and private industry.

5. Use as a development framework for how RD&E co-operate

This area would need further development, however a few different approaches could be trailed with different research groups.

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Knowing and Learning: Views of Extension Agents concerning their Training Needs for Agriculture and Rural Development in Myanmar

Khin Mar Cho[*] and Hermann Boland

Abstract

The main purpose of this paper is to examine how the agricultural training program in Myanmar could be improved by analyzing the perceptions of experienced extension agents towards their needs of further training. Although the Agricultural University and Institutes provide courses on basic sciences and various aspects of agriculture in their curriculum, only teach agricultural extension subjects during the students' final year of study. These training institutions have a vital role to play in development of agricultural knowledge. A number of in-service training for extension agents conducted at the Central Agricultural Research and Development Training Centre and the Central Agricultural Research Institute were mostly crop production oriented trainings. Training in extension education has been scarce. Much of these training emphasized on new technical knowledge and one-way communication skills needed for the transfer of technology. There was continuing emphasis on theory rather than practice and a lack of training needs analysis. The lack of skilled and well-trained personnel in agricultural extension is the main problem of current agricultural extension services in Myanmar. To improve performance and increase the motivation and job satisfaction of extension agents, a greater need for continuous training and guidance in respect to extension methods and content is required.

Introduction

In the process of developing the agriculture sector, conducting training and offering educational programs of international standard are crucial to the development of human resources. In Myanmar there are 7 State Agricultural Institutes and the Yezin Agricultural University. In addition, there are a number of national agricultural research institutes that provide a number of training in different areas for extension agents and agriculturists. In addition to the high education offerings, different types of in-service trainings are being carried out at the Central Agricultural Research and Development and Training Centre (CARTC) and the Central Agricultural Research Institute (CARI).

Although the Agricultural University and Institutes provide courses on basic sciences and various aspects of agriculture in their curriculum, only teach agricultural extension subjects during the students' final year of study. These training institutions have a vital role to play in development of agricultural knowledge. A number of in-service training for extension agents conducted at the Central Agricultural Research and Development Training Centre and the Central Agricultural Research Institute were mostly crop production oriented trainings. Training in extension education has been scarce. Much of these training emphasized on new technical knowledge and one-way communication skills needed for the transfer of technology. There was continuing emphasis on theory rather than practice and a lack of training needs analysis. The lack of skilled and well-trained personnel in agricultural extension is the main problem of current agricultural extension services in Myanmar.

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In addition to the government services, some United Nations organisations and international NGOs funded a number of projects in Myanmar. As Myanmar is a military governed country, it has attracted a total of 26 international NGOs, of which three are actively involved with agriculture and forestry extension activities at grass roots level. Both of the UNDP and NGOs provided extension training in participatory methods for their own staff and government extension staff that are working in the project areas. These NGOs and the UNDP have been instrumental in bringing to the extension scene, a greater emphasis on "bottom up" planning and action. Some NGO programs have been recently developed to provide broader understandings of specific target groups in rural areas. The sharing of experiences among these projects has been extremely valuable. The informal networking and joint lobbying resulted in teaming from each other's experiences, joint papers and workshops.

Purpose and Objectives

The main purpose of this paper is to examine how the agricultural training program in Myanmar could be improved by analysing the training needs of experienced extension agents. The specific objectives of this paper were:

1. Examine the educational qualification of extension agents and their experience in extension
2. Identify training experience of extension agents and their needs of further training to improve the quality of the knowledge and skills.

Methods and Data Sources

This paper is based on field research conducted from January to April 2001 in Myanmar. The field survey was done in seven regions: Ayeyarwady, Yangon, Bago, Magway, Mandalay, Sagaing Divisions and southern Shan State of Myanmar. These regions are agro-ecologically different. The research methods included personal interviews with 60 extension agents and distribution of questionnaire to 70 extension agents from the seven selected areas. The personal interviews focused on the training experience of the extension agents and their needs of further training to improve the quality of their knowledge and skills. The questionnaire focused on the training needs for potential extension agents in six specific topics, namely (1) agricultural extension philosophy, organization and administration, (2) sociological factors, (3) educational process and human development, (4) program planning, (5) communication in extension, and (6) research methods and evaluation in extension.

Key Findings and Conclusion

Educational qualification and experience in extension work

Out of the total 130 respondents through personal interviews and questionnaires, 48 respondents from interview and 59 from questionnaire graduated from the Agricultural University and 12 respondents from interview and 11 from questionnaire completed their agricultural training at the different agricultural Institutes. It is clear that 82% of respondents (107 agents) are University graduates and the rest 18% (23 agents) hold a Diploma in Agriculture. About 20 % of the respondents have more than 25 years of field experience in agricultural extension, 28% have 20-25 years of experience, 24% have 15-20 years of experience, 10% have 10-15 years of experience and the remaining 18% of the respondents have 4 to 10 years of experience in extension.

Training experience of respondents

It is important to analyse the training experience of agents, before identifying further training needs. Each respondent was asked to indicate the training participated in-country as well as abroad. Figure 1 presents a summary of the information that received from the interviewed extension agents about their training experience at the national agricultural research institutes (NARI) during the year 1995 to 2000. The NARI were CARTC, CARI, state and divisional research stations and seed divisions.

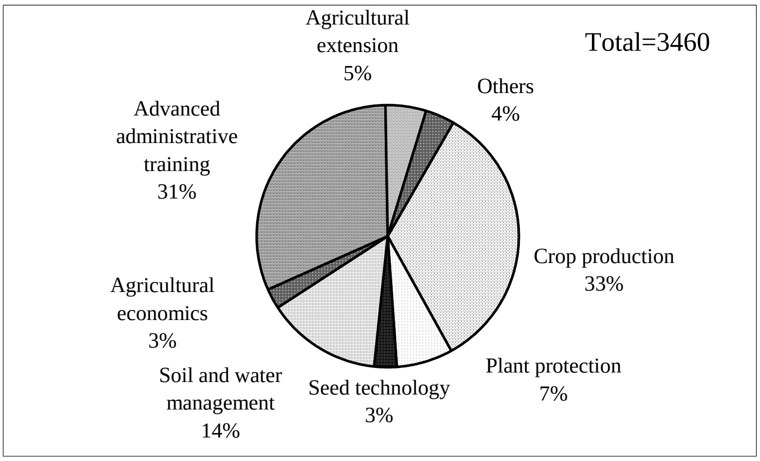

Figure 1: In-country training experience of the respondents (1995-2000)

The total duration of training participated by all respondents during 1995-2000 were 3460 days. Opinions of all respondents (60 agents) indicated that they have participated a total of 33% of their training in the area of crop production, 31% in advanced administrative training, 14% in soil and water management, 7% in plant protection, 5% in agricultural extension, 3% in seed technology, 3% in agricultural economics, and the remaining 4% in other. Advanced administrative training meant that the training, especially for extension agents who possess at least township manager positions, focuses on current agricultural development policies, administration, accounting, and budget. Such kinds of training take one to two months and aim to improve the knowledge and skills of extension agents and to exchange the experience and information between them. “Others” means the other short training course that did not belong to the areas stated above.

The abroad training experience of the respondents during 1995-2000 are presented in table 1. Among 60 respondents, only 9 have attended a total duration of 360 days in different areas of training abroad.

Table 1: Overseas training experiences of the respondents (1995-2000)

Country		Duration (Days)	Trainees	Areas of Training
1.	Mexico	120	1	Wheat production technology
2.	Thailand	20	1	Sustainable agriculture and rural development
3.	Thailand	40	1	Rice production technology
4.	Korea	40	1	Rice production technology
5.	Japan	40	1	Flower wheat cultivation and processing
6.	Nepal	5	1	Agriculture development in mountain regions
7.	Thailand	35	1	Post-harvest technology
8.	China	20	1	Hybrid rice production technology
9.	Japan	40	1	Integrated agriculture and rural development through participation of local farmers

It is clear that the majority of extension agents in Myanmar have more training experience in crop production than any other area. They have few training experiences in agricultural extension, agricultural economics, plant protection and seed technology.

Perceptions of the respondents towards further training needs

In order to improve the in-service training programs providing at the CARTC and the CARI, opinions of agents on their needs of further training to improve their quality in knowledge and skills were investigated. After discussing with a number of experienced extension managers and subject matter specialists of MOAI, ten important subject topics were selected to identify in this study. Table 2 represents the perceptions of extension agents on their needs of further training.

The training in the area of extension education was considered as the greatest need for agents. This topic received the highest mean score of 3.8 by assigning 80% of the respondents as "very much needed" and 20% as "quite needed". This was followed by the training need in rice production technology with the second highest mean score of 3.77 by assigning 77% of the respondents as "very much needed" and 23% as "quite needed".

Table 2: Perceptions of extension agents on their needs of further training (N=60)

Training Topics	Frequency [a] Very much	Quite	Percent	Mean [b]	SD
1. Extension education	48	12	100	3.80	0.40
2. Rice production technology	46	14	100	3.77	0.43
3. Market information service	39	21	100	3.65	0.48
4. Pure seed production	36	24	100	3.60	0.49
5. Post-harvest technology	35	25	100	3.58	0.49
6. Pulses and oilseeds crop production technology	33	27	100	3.55	0.50
7. Cropping system	32	28	100	3.53	0.50
8. Industrial crop production	31	29	100	3.52	0.50
9. Plant protection technology	28	32	100	3.46	0.50
10. Farm mechanization	0	5	8	1.83	0.55

[a]Number of very much and quite needed responses
[b]Scales: 1= not at all needed; 2= little needed; 3= quite needed; 4= very much needed

As rice is the major important crop for domestic consumption as well as for export, the modern and improved technologies for sustainable rice production were being needed. Although there were a number of training courses concerning rice production technology conducted at the CARTC and the CARI, agents thought that they needed further training in improved rice production technology.

The production of pulses and oilseed crops are the second most important target of MOAI after rice production. About 55% of the respondents indicated "very much" and 45% expressed "quite needed" further training in the area of pulses and oilseed crop production technologies. The production of industrial crops, jute, cotton, sugarcane and rubber are the third most important target of the Ministry of Agriculture and Irrigation. Extension agents felt that industrial crop production technology training is also important for agents. This topic was indicated as "very much needed" by 52% of the respondents and "quite needed" by 48% of the respondents.

In order to achieve the high yield, application of pure seed and systematic post harvesting and storage are very important. Therefore, training concerning pure seed production technology and post harvest handling and storage technology were considered as "very much needed" by 60% and 50% of the respondents respectively. Systematic cropping system is important for the crop production in different agro-ecological zones of Myanmar, this training topic was indicated as "very much needed" by 53% of the respondents and “quite needed” by 47% of the respondents. Due to the continuous growing of rice (at least 2-3 times per year), various kinds of pest and diseases are infested in farmers’ fields. As a consequence there is a great loss of rice yield still now. Training in plant protection technology is also quite important for extension agents. This topic was indicated as “very much needed” by 47% of the respondents and “quite needed” by 53% of the respondents.

Although training about market information service has been conducted for extension agents, this was not enough. This topic was indicated as “very much needed” by 65% of the respondents and “quite needed” by 35%. All respondents (60 agents) answered “very much” and “quite” needed for all training topics identified in this study except the last one “training in farm mechanization”. This topic received the lowest mean score of 1.83. This is the responsibility of the Farm Mechanization Department and not directly concerned to the Agricultural Extension Division.

It can be concluded that training in extension education, market information service, seed technology and post-harvest technology are very important need for extension agents to improve the quality of their extension work effectively.

Training methods and length of training

After discussing with a number of subject matter specialists, extension managers and extension agents from MAS, seven training methods were selected to identify in this study. Opinions of all respondents on their preference in training methods and length of training are described in table 3 and table 4.

Table 3: Perceptions of extension agents on the different training methods

Methods	Number of respondents (N=60)				Mean
	Very agree (4)*	Agree (3)	Disagree (2)	Very disagree (1)	
1. Group training workshop	47	13	0	0	3.78
2. Monitoring and evaluation	32	28	0	0	3.53
3. Field demonstrations	12	43	5	0	3.12
4. Distribution of written materials	12	43	5	0	3.12
5. Meetings/campaigns	0	5	45	10	1.92
6. Transporting of information	0	0	40	20	1.67
7. Management	0	0	35	25	1.58

* Figures in brackets indicating assigned scores for the corresponding methods

Data in table 3 shows that all respondents indicated training by group working or training workshop and by monitoring and evaluation as "very agree and agree". These two methods received the highest mean scores of 3.78 and 3.53 respectively.

Table 4: Perceptions of extension agents on the length of training

Length of training	Number of respondents (N=60)				Mean
	Very agree (4)*	Agree (3)	Disagree (2)	Very disagree (1)	
Two months	0	9	51	0	2.15
One month	47	13	0	0	3.78
Two weeks	39	21	0	0	3.65
One week	16	28	16	0	3.00
Two days	0	4	52	4	2.00

* Figures in brackets indicating assigned scores for the corresponding statements

All respondents said that “very agree” and “agree” for one month and two weeks training and these two items received the high mean scores of 3.78 and 3.65 respectively. About 73 percent of respondents answered that they prefer one week training depending on the subject and this item received the mean score of 3. Most of respondents are not interested in two months and two days training because they thought that 2 days is too short and two months is too long.

It is evident that extension agents prefer training by group training workshop as well as monitoring and evaluation with the duration one to four weeks.

Perceptions of experienced agents to training needs for potential extension agents

In order to improve the pre-service training program for potential extension agents, opinions of respondents were analysed. Potential extension agents mean students just finished at the agricultural University and the agricultural Institutes who have been provided pre-service training at the Central agricultural research and training centre or the central agricultural research Institute before they are going to work in farmers’ fields as village extension agents. After discussing with a number of extension managers and subject matter specialists from MOAI and reviewing the related literature, six specific training topics were selected as the training needs for potential extension agents. Perceptions of the respondents on importance of needs are compared by rank as well as mean values in table 5. Rank 1 to 6 meant the first priority need to the sixth priority need for training respectively.

Table 5: Perceptions of respondents towards training needs for potential extension agents

Training Topics	Number of responses (N=70)						Mean	SD
	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6		
Extension program planning	35	25	10				3.64	0.48
Educational process and human development	32	26	12				3.64	0.48
Research methods and evaluation	3	15	40	12			3.63	0.49
Agricultural extension philosophy, organisation and administration		4	8	48	10		3.54	0.50
Communication in extension				10	38	22	3.49	0.49
Sociological factors					22	48	3.31	0.50

Scales: 1= not at all needed; 2= little needed; 3= quite needed; 4= very much needed

The need for training in the area of program planning was rated as the rank 1 by 50% of the respondents, rank 2 by 36% and rank 3 by the remaining 14%. Analysing the agricultural situation in the local areas stands out as the most important topic for which agents have the greatest need for training in program planning. Respondents apparently believed that it was important for agents to learn how to analyse problems in the local areas before attempting to find solutions.

Training need in the area of education process and human development was rated as the rank 1 by 46% of the respondents, rank 2 by 37% and rank 3 by the rest 17%. Training in extension teaching methods, principles of extension and teaching-learning process appeared to be of major concern to potential extension agents.

The need for training in research and evaluation was rated as the rank 1 by only 4% of the respondents, rank 2 by 22%, rank 3 by 57% and rank 4 by the remaining 17%. All the respondents felt that training about the role of research in extension, conducting surveys, effective use of research findings, as the greatest importance for training needs of potential agents. This topic received the second highest mean score of 3.63.

The next training need in order of importance was agricultural extension philosophy, organization and administration. This topic received a high mean score of 3.54 by assigning 54% of the respondents as "very much needed" and 46% as "quite needed". This was rated as rank 4 by 69% of the respondents.

Opinions of respondents indicated that training about communication in extension was "very much needed" by 51% of the respondents, "quite needed" by 46% of the respondents and "little needed" by the remaining 3% of the respondents. This was rated as the rank 5 by 54% of the respondents, rank 4 by 14% and rank 6 by the remaining 17%. The high rating of training needs in the area of communication by extension agents indicates a feeling that the successful performance of the agents in their jobs depends largely on the ability to communicate with farmers.

The need for training in the area of sociological factors was indicated as "very much needed" by 37% of the respondents, "quite needed" by 57% of the respondents and "little needed" by the remaining 6% of the respondents. This was rated as the rank 6 by 69% of the respondents and rank 5 by the remaining 31%.

It was noteworthy that all six areas of training identified in this study were perceived to be important for potential extension agents. Since the scale ranged from one to four, the lowest mean score of 3.31 was relatively high on the scale and meant that it was of considerable importance in the training needs of agents. Respondents expressed their opinions based on their knowledge and experience in performing extension activities at farmers' fields, knowledge that they learned in University or Institutes and pre-service as well as in-service training.

Recommendations

Although the CARTC runs a number of courses for extension agents from township and village levels in a range of technical management training, most of the training is crop production oriented training. Training in agricultural extension and economics are very few and inadequate. Much of the training is on new technical knowledge and one-way communication skills needed for the transfer of technology. To improve performance and increase the motivation and job satisfaction of extension agents, a greater need for continuous training and guidance in respect to extension methods and content is required.

Based on the research findings the following training topics are recommended: In-service training programs should be emphasized more training in agricultural extension education and agricultural economics. In addition, training in post-harvest technology and seed technology should be emphasized. Pre-service training programs should be provided more emphasis on training in extension program planning, educational process and human resource development, and research methods and evaluation. Furthermore training in agricultural extension philosophy, organization and administration, the use of information and communication in extension, and sociological factors should be conducted. Many of these social science skills are lacking in the agricultural graduates working as extension agents in the Agricultural Extension Division.

A recommendation common to all responses of extension agents from personal interviews and questionnaires is that the social component of the in-service training program as well as pre-service training program should be developed and increased. The information from this study will be used as a basis and guide for developing the future training programs for field extension agents and pre-service training for newly recruited agricultural scientists, such that their trainings at CARTC and CARI will have more relevance to the work they later perform in the government extension services.

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FSR's possibilities and shortcomings – the necessity of learning from and with farmers' knowledge and worldviews. Insights from a Case Study in Peru[1]

Kristina Marquardt[*]

Abstract

A FSR study was conducted in two villages and describes the socio-economical conditions for the current agricultural production and its profitability. The paper discusses the shortcomings of such an FSR-study in understanding the farmers' reality and their farming system. In order to understand this, the research suggests a need to move the focus from *what?* to *why?* One way to do that is to include the topics of farmers' knowledge, farmer's worldview and to use interactive farmer participation as a point of departure for the research design. Farmers' knowledge is a resource when searching for new possibilities of small-farm development, which is grounded in the farmers' worldview, and involves farmers' interactive participation. If development research is striving for a focus on local problem description and wants to acknowledge the various knowledge systems that contribute with different insights, the farmers' world-view and knowledge should be welcomed and useful contributions for future research. This FSR-study was made as a part of a more extended research project on resilient land management in the Western Amazon.

1. Introduction

This FSR-study has been performed in the Peruvian part of the Amazon in order to "read the context" before starting up more specialised work in the area of soil conservation. The research is part of a research project on resilient land management strategies in the Western Amazon. Joint objectives for this study have been to define the boundaries for the coming work, to test an FSR-approach and to analyse its advantages and shortcomings.

The Peruvian Amazon is divided into the highland jungle (*selva alta*) and the lowland jungle (*selva baja*). The highland jungle is on the final hillside of the Andes where it meets with the Amazon forest. The temperature in the highland jungle is cooler and not quite as humid as further down the basin. This is a hilly area with a lot of small rivers flowing into the bigger rivers (like the Huallaga River) and finally into the lowland jungle and the Amazon River. The lowland jungle on the other hand is a flat area where the big rivers often inundate large areas. The area where this project is carried out is in the highland jungle, in the province of San Martín. Small-scale farmers working on marginal lands, wide-spread deforestation, decreasing fallow periods, field burning, soil erosion, land degradation, and heavy immigration are all real problems in San Martín, as well as in large parts of the tropics. San Martín is also a biodiversity "hotspot" area, which should be prioritised for conservation (Myers *et al.*, 2000).

[1] This paper is a selection of parts of a larger report made during fieldwork performed in Peru on resilient land management strategies in the Western Amazon. The report has been revised to become a scientific paper. This presentation at the IFSA-conference in April 2004 is a precursor to the scientific paper.

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2. Methodology

The study has been carried out in the villages San Miguel and Chazuta, both within two hours travel from the region's largest city; Tarapoto. The villages have been selected due to their differences in livelihood conditions and the possibility to compare different strategies to handle land degradation. The inhabitants in both villages are mainly colonists that arrived to the area two to three generations ago (in the low-land jungle literature often called *rivereños* and in the Brazilian context *caboclos*), but there are also minority groups of the indigenous *Kechwa-Lamista* people. The researcher has worked exclusively with non-indigenous farmers in this study.

The study was performed during the first part of a fieldwork that extended over 29 months. The researcher works together with a local NGO called PRADERA (*Proyecto de Apoyo Rural de la Amazonía*). Introductory meetings were organised where the researcher was introduced to the families in both villages with whom PRADERA cooperates. Later the researcher returned to the villages and made field visits with 8 families in San Miguel and 10 families in Chazuta. During the field visits, semi-structured interviews (Kvale, 1996) were performed exploring topics like family status, ethnographic situation, infrastructure, farm sizes, current situation of erosion and land degradation, use of soil conservation methods and the researcher also performed crop budgets (model supplied from CIAT-Pucallpa). Parallel to this, the researcher has kept a detailed research diary (McNiff, 2002) and summed up her understanding of the agricultural system in rich pictures (Checkland & Scholes, 1999).

3. Results of the FSR study

3.1 San Miguel and Chazuta

San Miguel is situated along the Marginal highway, which connects Tarapoto with the coast, in an area that is to a very large extent deforested, degraded and densely populated (densely in a Peruvian Amazonian perspective – meaning around 17 persons per km^2). Chazuta, on the other hand, is situated at the border of the river Huallaga, at the end of a poor quality road, with areas of primary forest still accessible to the village.

As Chazuta is located close to the border of the lowland jungle, the climate here is more humid than in most parts of San Martín. Statistics from the 1970´s from SENAMHI (*Servicio Nacional de Meteorología e Hidrología*) shows perceptions around 1400-2000 mm per year and temperatures around 24-26°C. In San Miguel precipitation is around 1000 mm per year and the temperature is around 27°C (Rengifo *et al.*, 1993).

3.2 The local agricultural system

The most common agriculture practice in San Martín is bush-fallow agriculture. The study collected information about the labour distribution throughout the year, and this information was elaborated into farming calendars. These farming calendars show two periods of land preparation; namely during the dry seasons (in March to June and September to October in San Miguel, and in February and August in Chazuta). Preparation for a cropping cycle normally starts with the farmer cleaning the smaller vegetation within the forest or fallow (*el rozo*) with machete. The larger trees are cut down with an axe (*la tumba*). Some of the larger trunks are taken care of for firewood or constructions and the rest of the plant material is chopped in to smaller pieces (*el pachqueo*). When the slashed plant material has dried the field is lit on fire with several smaller fires directing the fire up the hilly slopes (*la quema*). When the field is burnt the farmer sows in the incompletely burned plant material and the ashes.

The normal size of cultivated land in San Miguel and Chazuta is1-2 hectare of land and the rest is left in fallow. About 70% of the cultivated land in Chazuta and 50% in San Miguel (Arévalo, 2002, personal communication), is occupied by the staple crops for self-subsistence such as cassava (*Manihot esculenta*), plantain (*Musa* spp.), maize (*Zea mays*), rice (*Oryza sativa*) and several kinds of beans (*Vigna unguiculata, Vicia faba, Phaseolus vulgaris, Cajanus Cajan)*. Apart from the subsistence crops the farmers in the region grow an impressive amount of diversity on their fields; vegetables like caiwa (*Cyclanthera pedata*) local tubers like dale dale (*Calathea allouia*), yam (*Dioscorea*), michucsi (*Xanthosoma viridis)*, fruits like guabas (*Inga edulis*), bread fruit (*Artocarpus incisa*), zapote (*Quararibea*), caimito (*Pouteria caimito*), cocona (star apple) (*Solanum sessiliflorum*), avocado (*Persea americana*), rose apple (*Syzygium*) etc. During earlier work in the region, the researcher together with PRADERA, recorded over 50 different crops in the villages downstream of San Miguel (Marquardt, 1998).

Both in San Miguel and in Chazuta *choba-choba,* a traditional system of interchanging labour, is still commonly used. When working *choba-choba* the participants does not receive a salary but the host farmer has to give the workers two meals, also including the accompanying *chicha* (maize beer). Normally the farmers take most of the products for the lunch preparation from their fields; hens, plantain, cassava, vegetables, rice, chilli-peppers, maize and the only thing they buy is oil and dried fish. Including all costs, to invite the *choba-choba* members for breakfast and lunch, most farmers spend more than $1.00 per person.

The last decades have meant large changes in the locally developed agriculture, turning from a mainly subsistence agriculture to a commercial agriculture where, to a great extent, farmers have left their poly-cultured fields and instead focused on maize and cotton production. Continuous cropping of cotton and maize have in most cases not succeeded, as the yields have dropped drastically (Arévalo *et al.*, 1999). Many farmers state that they do not perceive erosion as a problem, although land degradation and “tired fields” are something that most see as an urgent problem. The farmers’ opinion is that there is very little to do about this, as it is an inventible process that the fields have to pass through. Most farmers are well aware of the green manure effect of plant material left on the field and now this plant material is not burned to same extent as it was before. Some farmers with medium size farms are experimenting with permanent agro-forestry systems with coffee, cacao, and fruit trees.

3.3 Farm sizes

The interviewed farmers have properties from 1 hectare to 60 hectares (see Fig. 1). All farmers have legal papers on their land. One can distinguish farmers in three different size categories. The small farms are about 1-2 hectares. It is obviously very hard to manage rotational forest fallow system with one or two hectares as it is impossible to let the fallow rest enough time to grow up to forest again. The farmers in this situation often try to find alternative incomes or look for additional land. One example of alternatives in this area can be to process sugarcane juice into *aguardiente* (sugarcane alcohol), sewing cloths or having a small shop etc. Another alternative for farmers with little land is to search for a farming system that does not need much rotation. One farmer in San Miguel for example, with only 1 hectare has specialized his production in plantain, which means that he does not have to burn the land each year as he maintains his plantain fields up to 15 years. Farmers with that small area of land is quite normal in San Miguel but less common to find in Chazuta.

The second size category, farmers with middle-sized land, which means about 7-8 hectares of land, is the biggest group of farmers in San Miguel. With 8 hectares you can still rotate and you can leave the fallow to develop a bit, however without skilful maintenance it will soon become "tired”, degraded land. The fields vary in what shape they are. Some farmers cultivate the same land that their fathers have done and it is still producing well. Others' lands are very depleted of nutrients, and the fallows do not produce more than bushes anymore.

The bigger farms are larger than 15 hectares. In San Miguel few farms are of this size and it does not necessarily means that these farmers still have primary forest on their land. In Chazuta this farm size is not uncommon and most farmers in this size have primary forest.

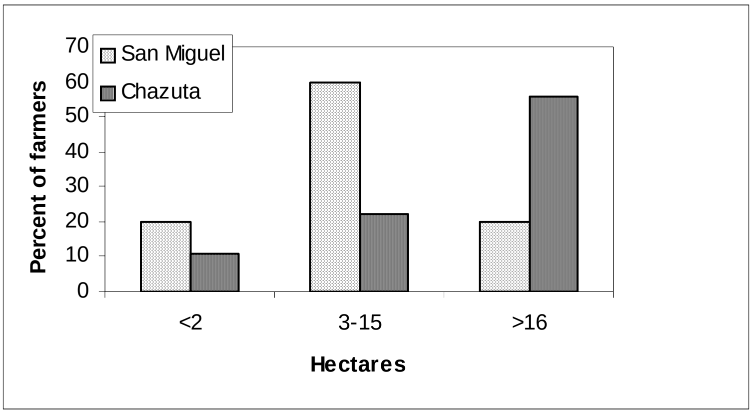

Figure 1. Distribution of farm sizes in San Miguel and Chazuta

Access to primary forest has been, and still is, an important natural resource for the households. The forest is an important protein source for many farmers by hunting animals in the forest. In the forest the farmers also get the lianas for constructions, medical herbs, honey etc. In San Miguel few farmers still own primary forest. Of the interviewed farmers 20% have primary forest, though this primary forest is comprised of small islands of forest or located in other areas further into the valley. In Chazuta more than half of the interviewed farmers own primary forest, and some farmers have up to 10 hectares of primary forest. In Chazuta even farmers without primary forest have access to it, and it is common to walk further into the mountains in order to hunt. In San Miguel hunting is quite a limited activity. To go and hunt today means a trip that last for days or a week. However many farmers trap smaller animals like rabbits and wild guinea pigs in their fields. The farmers in Chazuta fish a lot during certain seasons (mainly July- August), depending on the flooding in the Huallaga River. In San Miguel the fishery is a minor activity, mainly limited to crab fishing in smaller streams.

3.4 Variation in socio-economical realities - different strategies

Today it seems that many farmers in San Miguel have realized the risk it involves to be dependent on only maize and/or cotton and several farmers are coming out from the "monoculture fever", and are once again concentrating on having a diverse field (Arévalo, 2002, personal communication). Though the area is very degraded from a biological point of view, according to PRADERA, there has been an incipient cultural revival going on in the San Miguel area for several years. When asked which three crops that give the most income to their household, the answers given by farmers in San Miguel were surprisingly broad (see figure 2). In San Miguel, cotton is still an important cash crop, but fruits (such as papaya, avocado, mandarin), coriander and plantain are as important for the household economy as maize. Many farmers from San Miguel sell their products in San Miguel or take their products to the market in Tarapoto, depending on the price.

In Chazuta the scene is different. When asking the question of which are the three most important cash crops to the farmers in Chazuta, the answers were very homogenous (in contrast to San Miguel). All farmers mentioned maize and most farmers also said plantain. Several farmers had problems to mention a third crop that gave them any major income. The farmers from Chazuta almost exclusively sell their crops to agents in Chazuta. Only a few farmers process their crops into products like *almidon* (cassava flour) and *fariña* (small grated pieces of cassava that one puts in coffee) and go to Tarapoto with their products when the price makes the trip worthwhile.

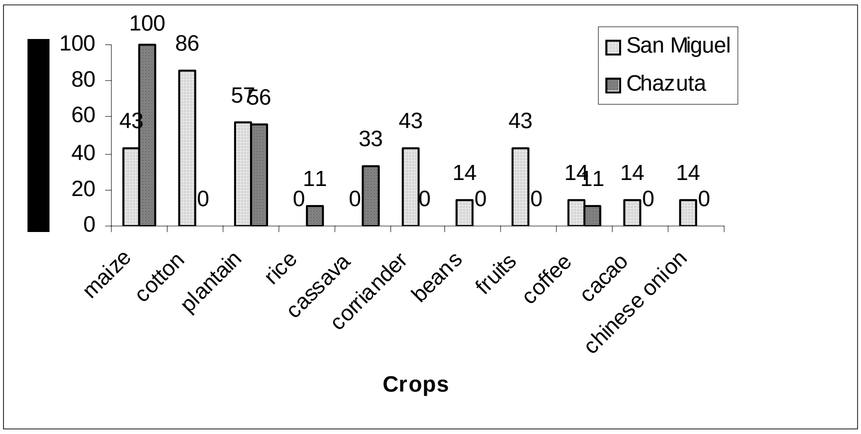

Figure 2. The most important cash crops in San Miguel and Chazuta. Percent of farmers who ranked a certain crop as one of three most important cash crop

The difference in farming strategy between the farmers in San Miguel and Chazuta could be referred to as a difference in access to infrastructure and a bigger market. However, another aspect of the situation might be that the level of degradation in San Miguel has forced the *sanmiguelinos* to look for other marketable options than maize. With degraded land, a demanding crop like maize gives a relatively low yield. Maize normally yields around 2500 kilos per ha in Chazuta, whereas in San Miguel it yields about 900 kilos per ha. The cost for producing the maize is also higher in San Miguel as the weed pressure is higher. The degradation, expressed in terms of weed pressure and labour, may be one explanation of the differences in the preferences of cash crop production between the villages. In Fig. 3 the profit per working day is shown for the most important cash crops in both villages. Maize is not a very profitable crop, and neither is cotton, the other traditional cash crop in the region. The tradition of growing maize in the region is deeply rooted, and though maize is a crop that does not pay very well, it does not keep any farmers from producing it. Apart from being a cash crop, maize is appreciated in the households for preparing *chicha* (maize beer), *humitas* and *tortillas* (maize pastries) and for chicken fodder. In contrast, the crops that stick out as being more profitable are plantain and coriander. It seems that plantain is a crop that pays off very well, however most farmers grow plantain primarily for their family needs (which is quite considerable as plantain is a staple food in the whole Peruvian Amazon) and only sell what is remaining from that harvest. Coriander seems to be a promising crop, but only a few families are using it in a more continuous production at present.

Why do the farmers in San Miguel and Chazuta bother at all to grow maize and cotton if the profitability is so low, with the risk of losing money when growing the crops? One main reason might be that many of the farmers' costs are not perceived in money and the farmers' and the family's work on the fields is not valued in monetary terms. Another reason is that these crops give one big harvest and the income is a large sum of money on one occasion (in the case of maize, the farmers can rely on a sure possibility of selling their maize, although sometimes at a very low price). Other crops such as plantain and coriander constantly produce and the farmers sell small amounts and get some money each time. The few farmers that are intensifying their plantain production are mostly farmers with land close to the village or the road, as it is quite a heavy job to carry the stems longer distances. The farmers that have started to grow coriander appreciate the relatively little work-investment in producing coriander.

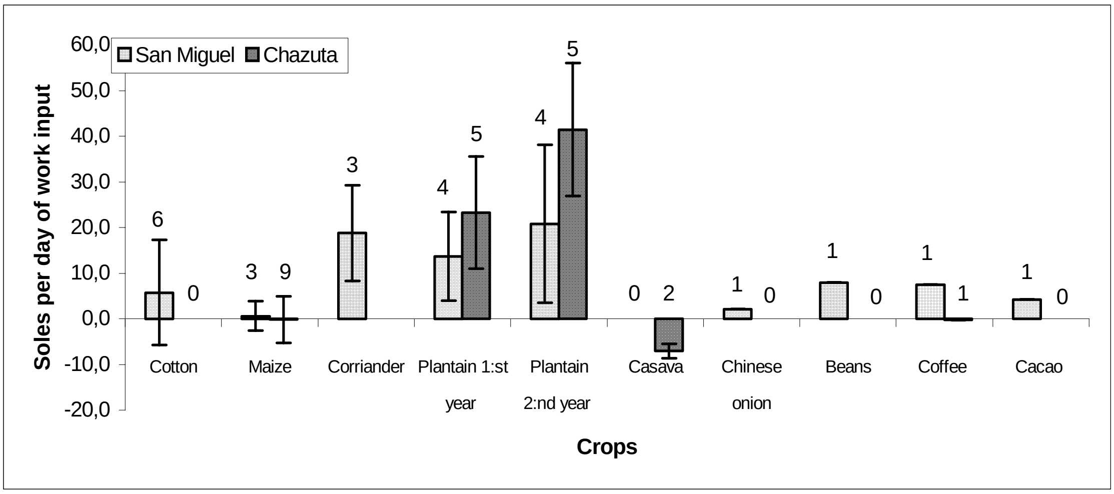

Figure 3. Profit/labour index in San Miguel and Chazuta. Lines in columns indicate +/- standard deviation. Numbers in diagram are numbers of farms per crop and place, from which average and standard deviation has been calculated. 1,0 USD = 3,5 soles.

4. Discussions on FSR's shortcomings – the human dimension

This FSR-study helps to "read the context" and the results show that there are important differences between the two villages. However it fails to help us to understand the dynamics of *why* they differ. The actual main actors - the farmers and their way of thinking and analysing, their framework for taking decisions, and their visions – have a peripheral role, which is a serious limitation for successful work on land degradation.

In reviewing FSR-literature there are critiques of FSR and how it handles the human dimension. Collinson (2001) suggests that FSR research is focusing on applied research and seeks the technical solutions for ideal management and therefore often misses its target. It leaves out the human dimension of production and the system's flexibility, which often is a prerequisite for successful farming. Collinson (2001) calls for a beneficiary-responsive FSR interface and the need for "*solutions to fit farmers' system"* in terms of their priorities, strategies and needs for flexibility. Striving for a local focus on problem description and acknowledging that there are various knowledge systems that can contribute with different insights, this paper suggest that a classical FSR approach is not enough in order to understand farmers' reality, their farming system and what potential actions they might take in order to prevent land degradation. In order to reach the "solutions to fit farmers' system" the research needs to shift focus from *what?* to *why?* If not, there is a huge risk of research and development work missing their targets. With this article I would like to present three themes that can help us approach this shift.

(1) The importance of adapting research *to include the farmers and their knowledge in the research process* in order to do research relevant for farmers. There are two additional areas, not mentioned in FSR literature, which I have found to be of great importance in my research, that need to be taken account of in order to get a good understanding of the farmers' agricultural reality: (2) The world-view or *cosmovisión* as it is called in Spanish literature, which is the very basis of how we relate to other people, to the nature, to spirituality and (3) "*Non-human knowledge*", an area absent in Western science. In the Peruvian highland jungle farmers explain e.g. that plants speak to them, that seeds may walk away, that the hands may have their own knowledge without processing it through the brain, or that dreams may teach you. How does Western science handle this kind of knowledge?

4.1 The interconnection between research, farmers and farmer knowledge

In the contacts with the farmers in San Miguel and Chazuta many of them expressed their disapproval and lack of confidence in agronomists in general, and certain projects and NGOs in particular. To enter a fruitful work on land management with these farmers means a huge investment in trust, for the researcher as well as for the farmer, and the experience of this research is that there is no other way around it than researcher and farmer working in a close collaboration. The very meaning of involving the farmers in the research process implies striving to make the farmer an equivalent and interactive participant and the farmers' knowledge equally valid in the research throughout the whole process. This is seen as opposite to so called passive participation with one-way dialogue; as for example when researchers collect data from farmers through participatory methods, but later the data is processed only by the researchers (Ison & Blackmore, 1997). The researcher needs to hand over some of the control of the process and go for more trust in a joint co-operation. This is what Svensson *et al*. (2002) calls *research with – a joint knowledge production*. A joint knowledge production means to do research together with those involved. In the work there is a constant and reciprocal learning process for both researchers and practitioners. The relation is based on the viewing of each other as subjects and to work as equals. This means involving the farmers in an interactive process from planning, to evaluating the results. It will mean to enter a learning process together with the farmers and to involve oneself as a person.

Small-scale agriculture systems as well as nature are complex and dynamic systems, full of uncertainty. When farmers farm they act in a system that is in constant change; storms, pests, family size growing/reducing, a new buyer of cotton establishing in the village, health problems, NGO projects etc. The complexity and uncertainty in the farmers' agricultural reality suggest that instead of focusing on separate activities within the farming system it is the farmer's *knowledge and learning processes* that should be the hub when looking at farming system (Folke *et al.*, 1998). In Chazuta and San Miguel farmers knowledge is richly expressed in terms of agro-biodiversity, and highly refined skills of seeing, perceiving, hearing and smelling changes in the field and forest. In the middle of the alarming reports of degraded lands in the Amazon, some of the Amazonian farmers farm the same land as their fathers and grandfathers have farmed and it still produces well. As Don Naldo does in San Miguel for example; he sustains his family on 7 hectares that his father and grandfather have worked before him and he states that his fields still produce everything he sows. Many Amazonian farmers have an impressive number of crops and crop varieties in their fields. Only in the valley of Bajo Mayo (where San Miguel is situated) 24 varieties of plantain, 18 varieties of maize, 12 varieties of cassava, 42 varieties of beans, and 38 varieties of chili-peppers have been recorded (Rengifo *et al.*, 1993). There seems to be little doubt that Amazonian farmers' possess valuable knowledge, both in terms of agro-biodiversity and medical plants but also land management, and it needs to be valued and taken seriously into account. Farmers' local knowledge may not be the answer to everything but it has to be the point of departure, because entering topics like land degradation and erosion are to enter complex systems that are hard for an outsider to get an complete overview of. "*We the non-farmers lack the basic understanding of farmers' own research methods, their schemes of information exchange, their informal farmer-to-farmer extension methods, and their approaches to generating new technology or designing new farming systems* " (Stroud & Kirkby, 2000:114). This means that the farmers and the kind of research approach that takes the view of the farmer into account and where farmers can express their knowledge are irreplaceable pieces in the agriculture research puzzle. Concrete applications of not involving the farmers and not adapting the knowledge process to the farmers' context is often seen in projects handled with "top-down" approach, as in the San Martín case when the agriculture experts worked with erosion control methods along River Mayo. The agronomists went out to the villages and handed out tree plants for the farmers to plant in their fields on the slops. However, when the agronomists left the villages most plants landed in the river. *Why* were the farmers, who many times are reforesting on their own initiative, not interested in the expert's plants? The farmers were never involved in the process of how to handle erosion in the area and the objective of the expert's work was not adapted to the farming context. In order to plant the tree seedlings, many farmers had to carry the plants long distances and without the understanding of *why* the agronomists wanted them to do this, most farmers preferred to get rid of the plants and continue to work with natural re-growth of forest and transplanting of sprouts of local tree species. An interactive discussion about the problems of erosion in the area and the local farming system was not reached and the target of erosion control was missed (though partially covered by the farmers' traditional land management strategies). Explicitly dealing with farmers knowledge is essential for successful research and improved practices (Sinclair & Walker, 1999).

4.2 The cultural context

Cultural different attitudes toward environment have implications for management (Folke *et al.*, 1998). Agriculture is not a neutral activity that takes place separated in time and space but something intertwined in the daily life with work in the fields and in the forest, relations, rituals and fiestas. There is an increasing recognition that the scientifically invented division between nature and culture is not a useful (Scoones, 1999), and here worldview is an important piece. If we do *not* understand the cultural context within which the agriculture is embedded, including its ways of knowing and learning, the probability that actions to support the farmers and their efforts to combat land degradation and erosion including their own experimentation, is very unlikely to become successful. If we want to understand the *why*-part of agriculture, it is necessary to enter the field of world-view, values and attitudes.

4.2.1 Farmers' world-view

Cosmovisión (henceforth translated as worldview) is a concept found mostly in Spanish literature that I find very useful. It may be defined as *"the way a certain population perceives the world or cosmos. Cosmovision includes assumed relationships between the spiritual world, the natural world and the social world. [] …the cosmovision makes explicit the philosophical and scientific premises behind farmers' intervention in nature"* (Haverkort & Hiemstra, 1999:15). Experiences show frequently that one cannot take for granted that all cultures relate to the world and its inhabitants in the same way. Western world-view is strongly anthropocentric, the nonhuman part of life is only given importance in proportion to their usefulness for humans (Gardner & Stern, 1996). Many rural societies are agro-centric, agriculture is put in the centre and life is inseparable from agriculture (Grealou *et al.*, 1991).

In the Western perspective the non-human knowledge is of little importance and in agricultural sciences it is rarely mentioned. However, in the *reality* of the farmers in San Martín it is as important and real as any kind of human aspect of knowledge, e.g. answers how to grow a crop are revealed in dreams, the different moon phases influencing the crop growing, and the different diets in order to sow a particular crop. When preparing the cassava field it is just as important to keep a certain diet and time in the right moon phase, as to sow the tuber in a soil appropriate for its vegetative development. This may be hard for Western science to grasp but has to be treated with the greatest respect and seriousness. These kinds of farmer knowledge are mostly interpreted by modern disciplines as beliefs, metaphors and superstitions. We, the agronomists and researchers, may not believe in this but it will influence our work. This research has evolved into a phase to do collective fallow experimentation together with the farmers and the time plan for the work necessarily had to be coordinated to the moon phases, as most plants according to the farmers in San Martín have to be sown in *mengua* (the days before and after full moon).

Including worldviews in the agricultural system gives us problems with how to define the boarders of the system/organism of the research; through what windows of focus should we look at the system? Looking at the local agricultural system and its production through the FSR-window gave the possibility to read the socio-economical reality for the farmers in the area, and these experiences will be connected to a longer research project on erosion and land degradation. However, experiences of working in San Martín (Marquardt & Rönnberg, 1997; Marquardt, 1998) and also this FSR study, showed that the topic of soil cannot be successfully treated as something separate in a land management perspective, but has to be viewed in close relation to the cropping patterns, the fallow, the forest and the farmer's worldview.

How should science seriously handle farmers' world-view? Is it possible for an agronomist to handle farmers' world-views with all that it includes and still communicate with the scientific community? Though I believe many researchers with field experience would agree that this is a topic of relevance and importance, many fear getting too close to the topic, and most researchers would not want to be accused of dealing with unserious research and superstitions.

4.3 How to proceed? A move from what? to why?

Padoch (2002) states that farmers' logic of land management is not always directly visible for an outsider. Not only are the farm systems diverse, but also the farmers and the transitional stages in change processes. In order to understand a diverse and dynamic landscape, the researcher need to spend considerable time in the field together with farmers and without a close understanding of the farming system and its stewards the dynamism can easily be misinterpreted (Padoch, 2002). The collaborative role of the local NGO PRADERA has therefore been important in this research, as they have a long experience in the area and are highly knowledgeable about the farming system, farmers' knowledge and their worldview. At the same time the researcher's work has been supportive for the local NGO as a reflective discussion partner throughout the process of action learning together with the farmers.

To move forward in the understanding of farmers, farming and land degradation in the Western Amazon the researcher has continued her research with an action research approach. The research strives to facilitate farmers' reflection on land management in a broader context that includes farmer knowledge and farmer worldview. However, this does not mean that the researcher passively accepts the statements and answers from the farmers, rather that there is an interactive dialogue between the researcher, the local NGO and the farmers, where the researcher try to understand the rich variety of actions and the sometimes contradictory statements from the farmers.

One of the challenges of tomorrow's research is how rural realities can be described, within their social constructions and complex embeddedness in their cultural context, from a local perspective (GFAR-conference, 2003). Striving for a local focus on problem description and acknowledging that there are various knowledge systems that can contribute with different insights, farmers' knowledge and world-view should be a welcomed and useful contribution for future research. The FSR is good at mapping the *what?* (what do you grow, what is the labour distribution, what size is the family, what crops are for sale etc.). It is interesting and useful information but not enough in order to improve small-farmers' situation. It is not enough to only understand the essential components of the system, but their interrelations as well when striving towards a more sustainable and resilient agriculture in the Amazon. Farmers' knowledge is a resource when searching for new possibilities of small-farmer development that is grounded in the farmers' worldview and knowledge and includes farmers' interactive participation. It is also a question of democracy and who has the preferential right of interpretation. Striving for a small-farmer development means to "put on the glasses" that will show the researcher the world from a small-farmer's perspective. When doing this, farmers' world-view and knowledge might be tricky to handle but are indispensable pieces of the puzzle.

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The Farm as a Pedagogical Resource: Background for and evaluation of the co-operation between agriculture and primary school in the county of Nord-Trondelag, Norway

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"When can we come to you next time, Tormod?" This question is one that Tormod has heard many times when meeting pupils from the local school outside of school hours. Tormod has taken over his ancestor's dairy farm in Northern Trondelag and has widened its range of activities in co-operation with the local school. This has led to the creation of school lessons, which are now held at his farm. "Why are the boys always so nice when they're at the farm?" a girl in the fourth grade asked her teacher. The children take part in the barn work and follow production at the farm. They have a lot of questions for Tormod and send him drawings and little stories. The way the children care for the animals and their intense interest and enthusiasm are important for him. From Tormod's point of view, the farm has a new source of income, but also more meaning. He has children in school himself and he knows that the pupils seldom look forward to the next lessons.

Tormod is one of the participants in the project "The Farm as a Pedagogical Resource" in Northern Trondelag, a region which lies just north of Trondheim in Norway. The project attempts to facilitate development of pedagogical work on farms in a co-operation between farmer and teacher.

Introduction

In Norway there is a growing movement to develop collaborations between farms and schools with a common interest. The project, "The Farm as a Pedagogical Resource," is the most important meeting place and source of inspiration for the movement. In this article we will give the background for this project and refer to summary results of an evaluation of the project undertaken by the Høgskolen i Nord Trondelag (Northern Trondelag University College). We will then discuss the possibilities and challenges for "The Farm as a Pedagogical Resource," as a source of income for the farmer, as a pedagogical platform for teaching, and as a source of identity for a population which is farther and farther removed from farming and primary production.

The Development of the Project

"How can we contribute to fostering hope, courage and resolve in children so that they may participate in a productive way in shaping their surroundings?" This was the question a group of teachers and students posed at the Agriculturural University of Norway (AUN) in 1995. More precisely, the goal was to create pedagogical spaces in which committed, caring and continuous work with nature could go on, enabling an experience of connection and belonging.

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This was the start of the national project “Living School” (1995-2000) in which examples of such spaces were developed. One component consisted of eight schools using the school grounds as an extension of the classroom – with gardening as an essential part. Another component consisted of eight farms which developed an intensive co-operation with neighboring schools to allow the pupils to participate in taking care of nature on a larger scale.

The eight selected farms in “Living School” were spread over the whole of Norway. The University assisted in making contact with schools and regional authorities, the latter regarding economic support. Conferences gathering all participants plus a newsletter enabled the exchange of experience and further development. Each farm developed its own “model” in respect to the needs and financial frames of their school partners as well as their own possibilities – both agriculturally and with regard to human resources. The common goal was to facilitate continuous contact between the pupils and the farm so that a “matter-of-fact” familiarity in relationship to the animals and the work at the farm could arise. Close contact with the teachers was cultivated so that the activities on the farm could really become a part of the regular curriculum.

In contrast to what school-farm connections have been in the past, this was not seen as an opportunity to disseminate information about farming. Nor was the goal to let the children see a demonstration of agricultural work and life. The emphasis was placed on participation over time that allows a greater identification and provides an alternative arena for children with differing capabilities to use their talents.

The Norwegian government, mostly through the Ministry of Education and Research and the Ministry of Agriculture, granted 1 million Euros to this project. The school authorities welcomed this initiative especially because they were in the process of renewing the school curriculum in the direction of more “outside” work involving direct experience and participation in practical tasks.

Results from these five years were presented in two Norwegian publications summarizing the experiences with school grounds as well as with farm-school co-operation (Hugo 2000, Parow 2000). We will focus here primarily on the work between farms and schools as this is the work that has given rise to a regional intensification of the project, “The Farm as a Pedagogical Resource”.

The Farm as a Pedagogical Resource

The pilot project farms and their partner schools found different economic solutions. Yet there remained a pressing need to find local and regional models for financing such school-farm links. Development of such models began in spring 2002, in the region of Northern Trondelag. The project here has a full-time project leader and an Executive Board.

The advisory work with the eight farms and schools in “Living School” has been a main foundation for the development of systematic training courses. This has made it possible to utilize their experience in assisting new initiatives. Since1999, accredited courses have existed for farmers and teachers who wish to work together.

The training courses are also based on long experience with continuing education courses for teachers, farmers and consultents at AUN. Earlier courses have showen that a pre-condition for satisfactory learning and use-oriented course results for the participants is a focus on their own work experience and goals connected to their everyday work tasks. This means that there should be a good portion of course time set aside to presentation of the participants own experience and project ideas. Further, the course material should be directly related to the participants' world of experience and projects and presentation of material should be formed in an accessible language with concrete examples. The best strategy is that the participants do projects at their own work place which are connected to the theme of the course and that there is extensive consultation given in connection to planning and execution of the projects. It is important that the participants are followed up and encouraged and given advice to improvements in the evaluation of the projects.

Thus, these training courses are built up around the following principles:

1. Co-operation between Farmer and Teacher
   The farmer and the teachers draft a pedagogical plan for the pupils at the farm. The intention is to find a foundation for the project and the pedagogical activities both at the farm and at school. The pedagogical activities are directly connected to "L97," The Curriculum for the 10-year compulsory education which forms the legal basis for the Norwegian school system.

2. A Common Vision
   The goal and the gist of the pedagogical activities takes its point of departure in visions for both the farm and the school which are to be developed by the farmer and the teacher. While the farmer is concerned with economic development, communicating traditions and values in agriculture, as well as creating new activities and significance regarding the work at the farm, the teachers are concerned with how practical and concrete experience from agriculture can facilitate learning for the pupils. The course emphasizes creating a common vision for the school and the farm through the projects. The connection between the utilizing of local knowledge, experiential learning and a reconstruction of local identity is a natural point of departure for such a vision.

3. Practical Implementation
   In the course of one year, the farmer and the teacher have the task of planning a concrete project, executing the initial stages and evaluating their experience. A sketch of a project is the entrance ticket to the course, i.e. concrete plans for a "pilot project" for each farmer-teacher team. The first session begins with a description of the pre-conditions and frames for the project (for example, a description of the farm and its production, the school community and school grounds, etc.). A presentation of all the course projects is made at the end of the course year. Thus the core of the course work is comprised of the contents of each individual project plus the experience the participants bring with them from what they have done between the course sessions. Through implementing and evaluating a pedagogical endeavor, the teacher and the farmer can illustrate and develop their ideas for utilizing a farm as a pedagogical resource – for themselves, for the pupils, for the school, for the local government and the local community. The intention is also that the spectrum of practical experience the participants bring with them creates a common space for reflection as well as support for the development and execution of the individual projects (see Schön 1987). In this way, the course members are co-workers in the continuous development of new examples which enrich the project flora of "The Farm as a Pedagogical Resource".

4. Experiential Learning
   The course has experiential learning as a basic principle, both for the participants and for their pupils (Dewey 1938, Kolb 1984). Through practical work with the development of each individual project, the course teams are engaged in making their own experiential basis. The principle of experiential learning is also relevant for the pupils who receive both practical understanding of where food comes

from, what goes on and is produced in their small town, as well as why it is important to learn theoretical subjects such as science and mathematics. The principle of teaching is phenomenological, according to Merleau-Ponty (1962), who maintains that consciousness is originally not about “I think that...” but about “I can...” According to contemporary teachers, the conscious use of all senses and physical abilities is a vital factor in motivation for environmental education (O’Loughlin 1998: 293).

The course also offers the opportunity to try different forms of art (such as singing, drawing, painting, etc.) and hand work (binding of wreaths, extraction of tar, etc.), which can be done with the children as a method of working with and through their experiences on the farm.

5. Close Advisory Work
Advice and counseling concerning the organization and financing of each project is an essential part of each course. The advisors are available between the sessions and the participants send reports through the network communication system to be read and commented on by the advisors before the next course session.

6. Differential Approaches for Varying Age Groups
The success of the work at the farm is dependent on finding the right tasks and the appropriate approach for each age group. Each course session attempts to work with a portrait of an age group. Thereafter, the participants are given concrete exercises in relationship to age related needs and modes of understanding. The intention is to insure that both the farmers and the teachers will be better prepared to look not only the work at the farm and the requirements of the curriculum, but also the age-related needs of the children when designing the sessions at the farm.

Participants in the courses write a paper about their goals, plans, implementation and evaluation of the pedagogical project, for which they can earn credits at AUN.

There are several different modes of assisting the participants during the course. We have already mentioned the advisory work done on a one-to-one basis. In Northern Trondelag there is established an organization of pilot project districts in which facilitates anchoring the project to the local governments. Once local governments were willing to support the farmers engaged in the project “The Farm as a Pedagogical Resource” (2002-2005) financially over several years, the region achieved the status of a pilot project district. These districts now receive modest economic support from the project. The coordinator of the project arranges meetings between the school administration and representatives of the local government to facilitate organization and financing as well as regional connections.

In addition there are network meetings of those who have completed the course at which they can exchange experiences, develop co-operation and receive inspiration through new ideas and viewpoints.

Who are the participants?

The farmers participating in this project have predominantly mixed dairy farms, although there are many exceptions with, for example, pig production and sheep farms. The average size of the farms is 15 hectares, but there is rented acerage, which comes in addition to the farm itself. The average age of the farmers is 43 years of age. It is not unusual that an older “retired” generation, which still lives on the farm, is also active during the school activities.

The schools are predominantly primary and junior highschools from the first to the tenth grade, but there are also examples of kindergardens and highschool (11th to 13th class) being involved at the farms. The teachers who accompany the children to the farms are usually general education teachers with class teacher responsibility. Specific subject teachers can be involved at higher levels, for example a natural science teacher at junior high school level.

More concerning the educational goals of the schools and concret examples of cooperation follows under the heading "A pedagogical alternative?".

Evaluation

The point of departure for evaluation of the project, "The Farm as a Pedagogical Resource" is connected to an "income" perspective for agriculture and a "pedagogical" perspective for schools. The income perspective is here intended to register the financial issues for those farmers who commit themselves to mutual school-farm co-operation. The pedagogical perspective encompasses a documentation and registration of the effects of the project as regards the goals of the school.

The evaluation is based on qualitative interviews with the individual farmers and teachers in Northern Trondelag who have taken part in the first and second courses. The interviews were conducted during the fall of 2002 on the farms of each farmer and at the schools of the individual teachers.

Why do farmers and teachers join this project?

Research carried out in Trondelag shows that farmers have become more dependent on extra income in agriculture and forestry since the middle of the 1980's. Earnings from work outside of the farm are the most important and have increased most, but also income connected to agriculture has increased (NILF 2002). In spite of this, only a few of the farmers say that they participate in the project for purely economic reasons. The background for their participation is generally more complex:

> *"Finding work to fill out the seasons at the farm and achieve a better balance during the year is important to increase the profit margin. At the same time, I must be patient and think long-term, because I want to work with children."*

Several of the farmers indicate that they are unsure about the economic aspect of the project. One farmer emphasizes that it is important to receive economic compensation; otherwise, the project will not be taken seriously.

One other farmer expresses his ambivalent relationship to the income side of the pedagogical project when he asks: *"Must this generate income?"*

In spite of the fact that economics is obviously a basis for the farmers in developing pedagogical work at the farm, it is clear that participation in the project and the contact with active and interested school children puts farming in a new perspective.

Several have characterized the collaboration between farm and school as a "lift" which is positive for their own feeling of worth. They have another type of contact with people in the local community when their children have been on the farm, as one farmer says:

> *"I come in contact with people in a completely different way when their kids have been on the farm. It's great when they come into the store and want to talk. I get to know the children."*

Many of the teachers have a connection to farming either through having grown up on a farm, being married with a farmer, having been a "hobby farmer" themselves, or through a combination of these things. When teachers describe their pedagogical motivation for participating in such a project and taking a course, there are some of them who point out that this is a way to fulfil the goals of the curriculum. Most of the teachers state the reason for their participation as seeing that the pupils have use for and enjoy experiencing things concretely, that all children should have contact with animals, that it is important to experience the cycles of life on a farm and that the pupils need to come out of the classroom. Agriculture as a part of the pupil's local environment is also given as a reason, as well as the values which are to be found in the cultivated landscape.

The course

The participants in the course emphasize the role of the course as a source of motivation and inspiration to further develop the ideas of school-farm collaboration. Meeting others with the same interests, both farmers and teachers, and having the opportunity to exchange ideas and thoughts, are the aspects which are mentioned most often. The course creates a feeling of fellowship around the practical pedagogical work at the farm (see: Lave and Wenger 1991) and generates interest for the new possibilities which co-operation opens for the farm, the school and the pupils.

Everyone who participates in the course becomes a part of a network. Through network meetings it is possible to hold contact with the others in the region who are involved in farm-school co-operation. These meetings are also appreciated for the opportunity they provide participants to exchange ideas and learn from each other. Some people refer to the meetings as "vitamin pills".

Economy, Contracts and Continuation of the Project

A common phenomenon of rural development projects during the last 40 years, is that the projects die out a short time after the project period has run out. Without economic support from projects and practical support from the coordinators of the project, there is the tendency for organized activities to dry up and local interest to disappear (Pretty 1997). According to Pretty's analysis, the solid anchoring of the project locally and the social contact which characterizes "The Farm as a Pedagogical Resource", should insure the continuation of the project. Still, with such tendencies in mind, it is logical that adequate economic compensation be an important foundation for the project to develop beyond the project period.

Of the 17 farmers there are twelve who have made contracts with the local government or the school. Three of these twelve farmers have been employed as teachers at the local schools in positions varying between 15% and 50%, along with having a contract for the use of the farm's resources and facilities. The nine others are paid by the hour for the time that the pupils are on the farm. For the last five farmers the economy is still more uncertain.

Among the teachers the economy is also a source of frustration. It's frustrating not to know if you can run the project next year, and all of the teachers express a wish to do so, because they feel that "the Farm as a Pedagogical Resource" has values which are important for the school and the pupils.

Pretty (1997) points out that viable projects are those that are characterized by local engagement and ownership. Local ownership is able to influence the political will to grant funds for compensation to farmers after the project period, something which is an important basis for the continuation of the work. Both teachers and farmers who participate in “The Farm as a Pedagogical Resource” are enthusiastic about the results of the pedagogical projects and the possibilities for integrating farming as a part of the life of the school and the local identity. There is still the challenge of getting the philosophy and potential of the project across to the rest of the teachers at the schools and to the school administration in addition to the local municipal administration.

A pedagogical alternative?

Activity in the Norwegian school system is guided by “L 97”, The Curriculum for the 10-year Compulsory School, comprised of one document containing a general statement of principles and another document containing descriptions of concrete subjects. The state curriculum begins with the following statement of goals:

“The goal of education is to equipe children and youth to be able to encounter tasks in life and to tackle challenges together with others. Each pupil should acquire abilities to take responsibility for himself and to direct his life, and at the same time have resources and will to help others” (page 15, L 97).

The basic principles of education are described under seven headings: The human being who searches for meaning, the creative human being, the working human being, the well educated human being, the cooperative human being, the environmentally aware human being and the integrated human being. These principles serve as guidelines in all schools and lay great emphasis on the importance of the local community as a learning arena for the pupils and stress the importance of utilizing the local community actively. It is also considered important to strengthen knowledge about and connection to nature as a means of earning a living and regarding traditions and the way people live in the local area. At the same time, emphasis is placed on practical work and the connection between theory and practice.

Within the project there is a goal that the activities on the farm should be an integrated part of the schools life and education. They shall not be in addition to the other things they normally do at school. The primary educational tool is experientiell learning, learning-by-doing.

At most schools, goal-oriented work with the curriculum has been done such that parts of the subject-matter for the different classes are allocated to the work at the farm. The activities at the farm become a part of the ordinary year plan, and the preparation and “digestion” of the events at the farm are done at the school. In this way, several of the participants try to connect the practical work on the farm to the school subjects. The teachers and the principal can become involved through pointing out how the goals of the curriculum may be met in practice by using the farm as a pedagogical resource and how the pupils may be inspired to learn the school subjects in different ways.
As a concrete example we can look at the activities of the 3rd grade class at a pilot project farm in Aurland. The pilot project in Aurland is located in the western part of Norway and was established through the national project “Living School”. A similar project is developed in Meraaker in Northern Trondelag.

In the course of the fallmonths the class will have several visits at the farm. They partake in the shearing of the sheep (they will follow the sheep through a whole year) and the collecting and sorting of the wool. Wool will be taken back to the school where the pupils will clean it, comb it and use it to weave a rug or a bag. They are also at the farm to pick apples, press them for juice and also dry them and bake applepie. During the winter months the pupils will some back to the farm to participate in the birth of the lambs. In the spring they follow the sheep to pasture and set out salt stones. This school has also a school garden where the children work in both spring and fall.

In addition to goals from the general part of the curriculum such as understanding work as an essential part of life, cooperating with others in work situations, becoming aware of environmental questions and understanding man's roll in relationship to domesticated animals, the school has also defined subject goals from the subject curriculum in the following subjects:

Norwegian:	- listen to Nordic myths and legends and other folk stories
	- listen to stories from earlier times with following discussion
Natural science:	- observe lifecycles of plants and animals, sow, plant and cultivate
	- become acquainted with some commen animals and talk about the relationship of man to animals
Social studies:	- plan and execute an outing and make rules for how to work
Physical education:	- be out in nature at different seasons in different landscapes
	- find activities and ways to play in nature
Arts and crafts:	- learn basic ways of making tekstiles: f.ex. sewing, braiding, weaving

The eighth grade at the same school is involved in a 2-3 week project at an old farm where they will participate in cultivation of the landscape, care and reparation of the tools, a study of the buildings and architecture. They receive instruction in swimming and firste aid before they learn to set fishing nets and prepare fish from the fjord. They bake "flat bread" on stoves at the farm and participate on a historical fieldtrip on the farm, guide tourists who visit the farm and learn traditional Norwegian dances. Integrated in this project are the following subjects:

English:	- use English for communication in written and spoken form
Norwegian:	- make an oral presentation of a subject for the class
	- use folksongs and dances to dramatize history
Natural science:	- learn to know minerals and soil types through field work with vegetation
Environmental studies:	- learn about forms of building and ecological consequences
Social studies:	- learn to see connectons between natural surroundings and culture
	- what one needs to know about nature and how we change it
Arts and Crafts:	- receive an introduction to village dances and music
	- learn songs which have to do with folklore
Physical education:	- learn first aid for swimming
	- learn to use the local environment for physical activity

There will always be a great deal of work in the classroom before and after activities on the farm as an essential part of the farm/school cooperation. How much time and which subjects are engaged, will be choices which the teachers make in planning the work at the farm together with the farmer.

The basis for evaluation of the educational goals is the observation which the teachers do on the farm and the pupils' reports. There is a broad concensus in relationship to implementation of the 7 basic principles in the general part of the curriculum (L 97). This seems to be well supported by the experience of the participants. As to evaluation of specific subject goals, emphasis is laid on the value of common field experience for the teachers and pupils as a foundation for classromm work. Math skilles such as addition and subtraction, weights and measures, ground surface calculations are trained at the farm through, for example, work with the animals (how many lambs to sheep, liters of milk per day etc.) baking bread (kilos and desiliters) and making food.

The integration of the activities on the farm in the classroom work is also a process of learning for the teachers. Several teachers have emphasized the importance of preparation and follow up work in utilization of the farm experience. It demands both independent work and pedagogical insight to develop the farmwork as a pedagogical tool.

The opinion of the teachers and the parents of the pupils

The attitude of the parents to the work on the farm has been charted using questionnaires (Lyngstad 2003). Thus far, the results from five schools show overwhelmingly positive opinion on the part of both the teachers and the parents that agree on following points:

- They are not worried that the farm work is done at the cost of theoretical learning. Quite the opposite, they strengthen the fact that their children and pupils have a chance to acquire practical "pegs" on which to hang their more theoretical learning.
- Both teachers and parents wish that the co-operation with the farm increase, and that this must be a priority for the school and the local government.
- Both teachers and parents see the value of the children's participation in practical work and that they receive values which a traditional school day can not give them.

The attitude of the parents is most likely a "mirror" of the standpoint of their children. When the youngsters look forward to the work at the farm, it is natural that also the parents are positive to it. The parents' relationship to the project and the pupils' experience seems to be important for the project's success and its foothold in the local community. Activating and involving the parents can give support to the claim that "The Farm as a Pedagogical Resource" is something quite different from traditional farm visits.

Conclusions: Identity and Rural Development

What do the pupils learn when the classroom is moved to the farm? Are there greater advantages for learning as compared to in the classroom? It is too early in the process of evaluation to say anything decisive about this, but the teachers are convinced that pupils do learn from their work at the farm. Many teachers stress the importance that pupils learn "other" things. The pupils see and do things in practice, they learn to work together, they become acquainted with a profession they may not be familiar with and they have contact with several generations.

The most serious barrier to the further development of the project is the depleted economy at the local governmental level. The schools are forced to cut their budgets and it is difficult to find financial support for new projects. Just the same, the overwhelmingly positive resultes with "the farm as a pedagogical resource" has caused politicians in several areas to set this as a priority. In Northern Trondelag the project is not considered primarily as a source of income for farmers, but as an agent to facilitate connection, identity and lifeskills at a local level.

The philosopher Martin Heidegger (1977) maintained that human beings create meaning through "stepping into the world." The construction of meaning occurs through action, through a "handling" contact with the world which surrounds a human being. Without any form of prior participation, one has nothing over which to reflect. Reflection will be empty or completely speculative. "It's not enough to have concepts to think with. One must also have something to think about" (Hylland Eriksen 1993: 45). Through sowing, weeding and harvesting in the garden at the farm, learning about plants and science can become more relevant. Taking care of rabbits and experiencing lamming gives food for thought about the cycles of life which can be a motivating factor in studying biology and the environment.

Those who are both teachers and farmers feel that the youngsters have a need for another type of school day (see: Tiller 2002). They notice that some of the children get a "kick" out of doing practical work. They also experience that it is positive for the children to be able to follow the life-cycles of plants and animals at the farm, and that, in this way, they achieve a greater understanding of the processes in nature around them. One farmer emphasizes this and adds that it looks as if the children also enjoy it. As he says, "*It's good to do things in practice when one has time for it – it leaves traces in the body.*"

When learning connects to the physical body, as knowledge-in-use, learning is at the same time connected to lived experience and to place (Molander 2000, Krogh 1995, Jackson 1996). If school stretches out its boundaries to include activities in the local community, the pupils also build up their identity in connection to a sense of place. This foundation and an experience of meaningful "rooting" will follow the pupils throughout their education and professional lives. In spite of increasing mobility, most Norwegians choose a primarily local base when they settle down to have their own family. If they have had meaningful experiences of integration into their local community as children, the probability will increase that they move back and choose the place they grew up in as their residence. "The Farm as a Pedagogical Resource" can contribute to impeding even greater more depopulation of Norwegian small towns. There, they need, above all, young people with go-ahead spirit and new impulses coming in from outside.

"The Farm as a Pedagogical Resource" is also a good example of a new kind of job within a society which, in to an ever greater degree, demands experience and a sense of identity. In the post-modern society, farmers, like all others, are forced to build up and develop their own identity (Giddens 1990, 1991). While their identity within an industrial society has been connected primarily to production of raw materials for food factories, completely different possibilities are opened by communicating history, stories, knowledge, skills and experiences, all of which are sought after in the post-modern identity-seeking society, "The Dream Society" (Jensen 1999). Production of raw materials gains another value, and, when farming reaches out and affects the local community and society at large, the farmer can see himself as an important contributor to a new understanding of society. The farmers express the significance and importance of these dimensions of the project in different ways.

The industrialization of agriculture and the development of The Dream Society are common traits of the western world. "The Farm as a Pedagogical Resource" is one way to meet the increasing need for re-dreating connection to nature, to agriculture, to practical skills and to work. Thus, the possibilities to generalize the experiences from the project for use in other western countries should be obvious.

The project is also part of a commitment within the field of cultural economics, which focuses on how local knowledge of nature, food and culture can be converted into actual resources for local development (Ray 1998). Several of the farmers see the project as a foundation for school "businesses," where the products of the pupils' work could be sold at the farm along with other local products coming either from the farm or elsewhere in the small town. This, in turn, opens up to new visions of uses and possibilities for the resources at the farm, for example in the restoration of old buildings.

This "cultural economics" approach has also a political dimension. When one builds on what already is there, on the local history, the people who live there and the activities they persue, the local population will have a chance "to localize economic control – to (re)value place through its cultural identity" (Ray 1998:3). But this demands increasing attention in rural development to new private and public markets which need services with their origins rooted in local characteristics.

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Change in Management of Information Systems in Czech Agriculture

Milan Slavik and Emil Kriz*

Abstract

The Department of Education of the Czech University of Agriculture, Prague conducted studies of the information systems for Czech agriculture, during 1994 – 1998. The farms studied were categorised as small-scale (average size about 50 ha) and large-scale (average about 500 ha) private farms, new cooperative farms and company farms. Conclusions were drawn about the farms, farmers, farming systems and sources accessed for information needs. It was considered that in 2003 a repeated study (with some new elements) would be useful to those currently concerned with developing the information system for farmers.

The 1998 conclusion that the farmers' educational and agricultural educational levels have a major influence on the number of information sources they use is confirmed by the 2003 study.

Farming in 2003 is shown to differ, in some important ways that affect the management of information from that seen in 1998. Small farms have more crop production, and a little less livestock and mixed farming systems.

The two studies in 1998 and 2003 have made a contribution to understanding the Czech agricultural information systems and what is needed to develop these further, and perhaps most fundamentally, an informative policy can only be derived from national and (increasingly) EU policies for agriculture and rural development. The article describes the main findings from this research study.

1. Introduction

1.1. The farming sectors in the Czech Republic

Changes in land ownership since 1989 have produced a structure of farming which, for the purpose of studying the information systems, can be considered tripartite. Private farms of widely differing sizes comprise about 26 % of the total farms, a proportion, which has increased only little in recent years. Company farms have substantially increased in number during 1995 – 2000 and now account for nearly 44 % of the total farms. The newly constituted cooperative farms have decreased as a long-term trend, declining from 47 % in 1995 to 30 % in 2000. Ministry of Agriculture statistics for 2001 show that there were then 35.219 private farms with an average size of 29 ha, 2095 company farms with an average size of 887 ha and 728 cooperative farms with an average size of 1464 ha. *(Green report 2001, Ministry of Agriculture Czech Republic)*

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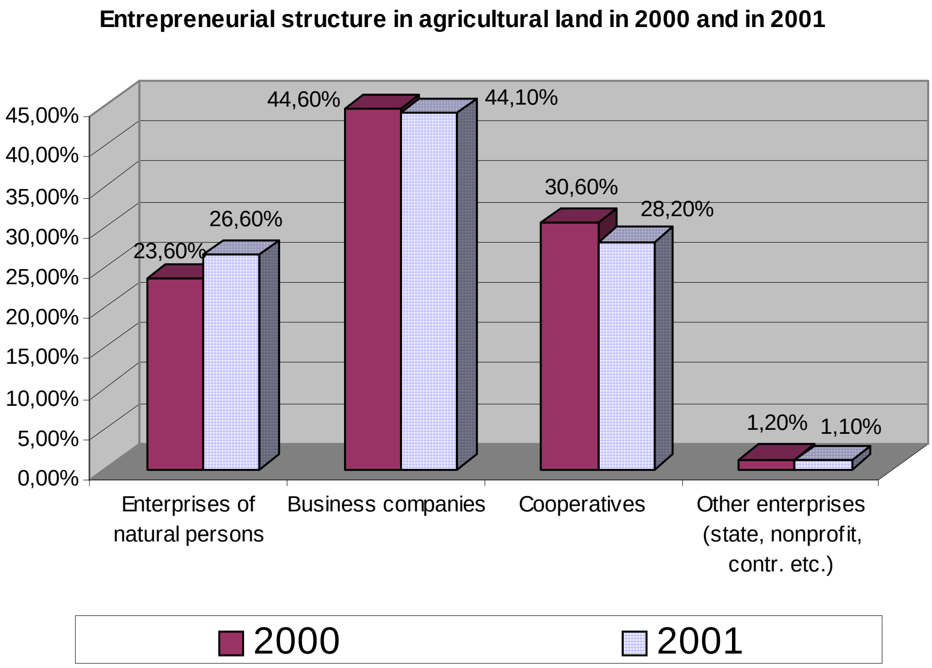
Fig. 1



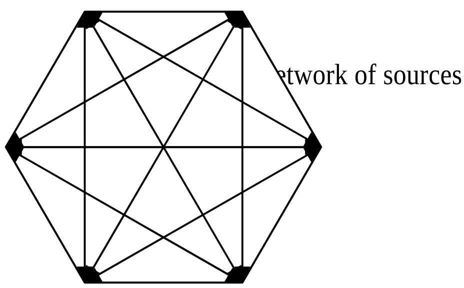
1.2. The study of information systems

Information systems are as old as agriculture itself: there has presumably always existed some degree of very informal sharing among people who farm of their knowledge, information, ideas and beliefs gained from experience of solving problems (some common and some more unusual) in farming. During the nineteenth century, however, formality entered into the arrangements made to expand and disseminate agricultural information through publicly funded research, education and extension work, with the farmers as recipients of information transfer to promote technological change.
Changes in concepts and models are following:

1. Transfer of technology model (1950 – 60s)

RESEARCH ⇄ EXTENSION ⇄ FARMER

2. Agricultural information and knowledge model (1980s)



3. Farmer information and advice system (1990s)

FARMER	→	MULTIPLE SOURCE SELECTION	↔	INFORMATION SYSTEM ADVICE SYSTEM
(Level of education)		(Management goals and objectives)		(Other similar farms) (Larger farms)

At the outset, in 1997, it was assumed that farmer-centred information systems would have three major components. These were:

- the personal characteristics of the farmers, including their experience of farming and their expectations for the future of their farms;
- the technical characteristics of the farms and the farming systems used for production;
- the adequacy of the supply of information for access by the farmers to meet their needs.

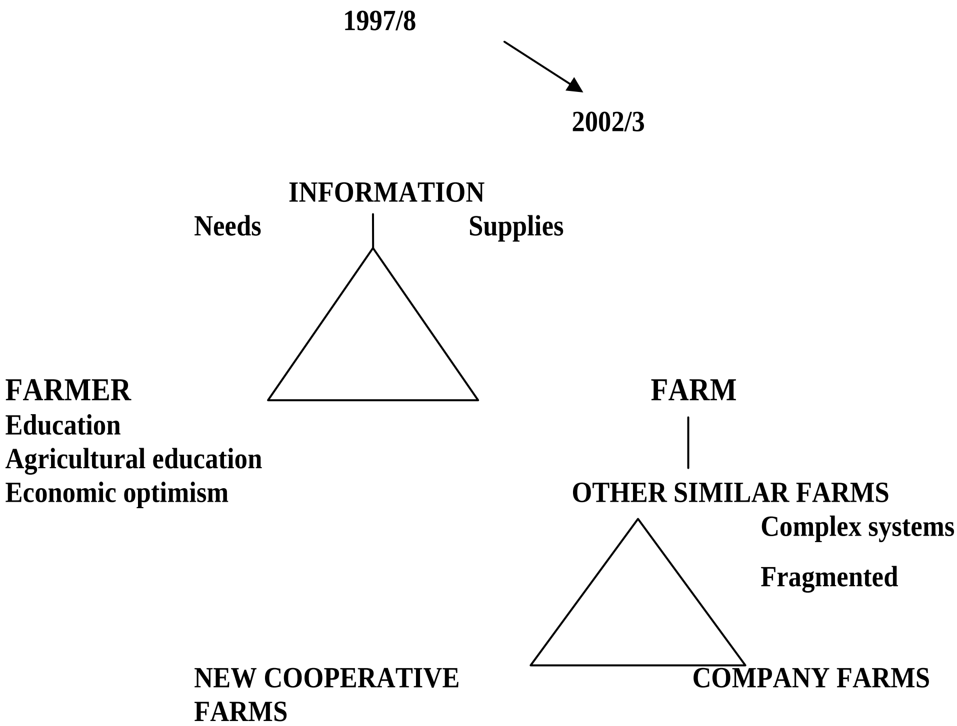
The research in 1997 – 1998 showed that some sources were considerably more important than others to farmers in general, and that particular farmers selected sources to construct individual information systems, and (somewhat different) advice systems. The number of sources in the systems (i.e. their size) was most closely related to the levels of general education and agricultural education of the farmers. As these levels increased from Basic Schools to Universities, so too did the acquisition and search for information. The farming systems and the kinds of information available appeared to have relatively little influence on the size of the information system. There was also a great deal of transfer of information between similar farms, and also with farms that were larger in scale.

2. Research Method

The aims of the study in 2003 were to:

1. repeat the 1998 study with the same categories of farmers, and the same respondents if possible, but with a larger sample, in order to assess the changes made to the information systems during 1998 – 2003;
2. give more specific attention to the use of PCs in managing information on farms;
3. include specific questions on the use of research results on farms, and the farmers' views on research priorities;
4. give more specific attention to the contribution made by consultants to Czech farmers;
5. explore the nature and extent of diversification of farm businesses, now and as anticipated in future;
6. appraise the level of economic optimism of the respondents, and their expectations of the effects of possible membership of the EU on their farming.

The model of the information system which was developed from the previous study, and used to plan the 2003 follow-up study, was as follows:



The study used a modified form of the questionnaire employed in 1998. It was discussed with officials of the Ministry of Agriculture, and with the 14 Agriculture teachers and 30 consultants who, later, conducted the interviews.

3. Some results and Interpretation

Because there were two kinds of interviewers, namely the teachers and the consultants, two questions immediately arise. The first step in data analysis was to answer these questions. First, did the two kinds of interviewers work with respondents whose characteristics differed in ways that could result in different data sets? Second, did the kind of interviewer influence the responses given by the farmers?
A comparison of the education levels of the respondents shows that, as may perhaps be expected, the teachers interviewed more farmers with Secondary School education as their highest level, and the consultants more farmers with University qualifications. The levels of economic optimism of respondents were not consistently different between the two kinds of interviewers.

3.1. The farmers and their resources

The majority of the respondents were male; 93,5 % for small-scale farms, 86,6 % for large-scale farms, 92,6 % for company farms and 87,9 % for cooperatives. These are similar to the numbers in the 1998 survey. The average age of all respondents (44,9 years) is notably younger than for farmers in some other European countries; for example, it is 58 years in the UK and continuing to rise.

Education
The importance of education as a factor influencing a farmer’s information system has already been noted. It should be stressed that in this 2003 study the respondents are, in general, the managers of farms and their level of education is likely to be higher than that of the total agricultural labour force. However, viewed as managers (Table 1) the situation appears to be quite good, on European standards.

Table 1: Level of education of respondents by category of farm, 2003 (%)

Level of education	Small farms	Large farms	Company farms	Cooperatives
Apprenticeship School	37,1	15,2	4,0	4,6
Secondary vocational School	36,1	40,6	40,7	38,6
Academic School	1,5	2,2	0	0
University	21,5	42,1	54,2	55,7
Postgraduate	4,0	0	1,0	1,3

It is interesting that, whilst the number of respondents with Apprenticeship School education was highest among the small farm respondents, there was also a substantial number (21,5 %) of University graduates and all those with postgraduate qualifications (4 %) from this category of farm. The small farm respondents also differed from other categories of farm in respect of their specific agricultural education. The situation is shown in Table 2, and it differs markedly from that reported in 1998. Then, just over half (51,9 %) of the total workers on the farms had received some form of vocational agricultural education. The 2003 study indicates that, on the small farms, 69 % of respondents had some education in agriculture. This figure compares to the 56,3 % of such farmers who had received agricultural education in the 1998 study. It is understood that there have recently been Ministry of Agriculture initiatives to give more agricultural education to farmers (especially to newcomers), and it is possible that the 2003 data reflect this. About 90 % of the (mainly managerial) respondents on large-scale, company, and cooperative farms, had received agricultural education.

Table 2: Level of agricultural education by category of farm, 2003 (%)

Agricultural education	Small farms	Large farms	Company farms	Cooperatives
Yes	69,0	87,0	91,8	94,4
No	31,0	13,0	8,2	5,6
Yes, the higher level	65,9	89,2	87,2	92,1
Higher level of education not in agriculture	34,1	10,8	12,8	7,9

3.2. Current sources of information and advice

Relative importance of types of information

In the 1998 study, farmers were asked to rank in the order of importance to them, ten suggested types of information. There was a large degree of agreement in their replies. Marketing and processing/selling were most highly valued by all categories of respondents. EU policy, basic science and external (environmental) effects of farming were the lowest ranked types of information. The same question was asked in 2003 in order to explore possible changes. Three additional types of information were specified in 2003, namely legal/regulatory information, finance/accounting, and architectural/building. The initial ten types of information are discussed first. The data are shown in Table 3.

Table 3: Importance of types of information by type of farm by year of study

Type of information	Rank order of importance							
	Small farms		Large farms		Companies		Cooperatives	
	1998	2003	1998	2003	1998	2003	1998	2003
Marketing	1	1	1	1	1	1	1	1
Processing; Selling	2	3=	2	5	2	2	2	2
Investment	4	2	3	4	5	4	3	5=
Products; Resources	3	3=	4=	2	4	3	5	3
Czech Government policy	7	7	4=	3	3	5	4	4
Decision-making	5=	5	6	7	6	10	7	9=
Locale - specific	5=	6	7	6	7	8	6	5=
External effects	8	10	8=	9	9	9	8	9=
EU Policy	10	9	8=	8	8	7	9	8
Basic science	9	8	10	10	10	6	10	7

As can be seen, there is a striking stability in the rankings, which have remained little changed during these five years, for all categories of farms. To some extent this may be thought disappointing. For example, despite the generally accepted importance of limiting potential harmful effects of agriculture on the environment, the external effects type of information remains at a low ranking, and government policy information is perceived by small-scale farmers to be less important that its ranking by the other farmers. Processing/selling information appears to have decreased in importance for large-scale farmers, though the reason for this is not shown by the study. For company farms, basic science is now considered to be more important. This may be related to new food safety concerns and regulations. Decision-making information is now less important for companies: perhaps their use of technology is not changing.

3.3. The management of information

Information on farms is managed mainly by the farmers. An information 'specialist' was employed or functioned on 11,5 % of the small farms, 9,7 % of the large farms, 10,9 % of company farms and 11,3 % of the cooperatives. The information kept on farms was reported to be stored in the five ways shown in Table 4.

Table 4: Storage of information on farms by category of farm

Respondents' methods of storing information (%)	Small farms	Large farms	Company farms	Cooperatives
Library	31,7	26,2	18,9	19,2
Information centre	0	2,1	0	3,6
PC database	38,0	49,6	73,7	60,7
Technical office	14,8	30,5	72,9	78,4
Diary, Notebook	61,3	53,3	61,8	54,8

Use of computers

The use of computers was examined in greater detail. They were used by 68 % of the small farm respondents, 83,6 % of the large farm respondents, 100 % of the companies and 97,7 % of the cooperative respondents. The 141 small-scale farmers had 109 computers, 55 large-scale farmers had 78 computers, 126 from the companies reported having 745 computers and the 88 cooperative farm respondents had a total of 482 computers. Overall, 86,3 % of respondents stated that they used a personal computer.

Respondents were asked to state by whom the PC was actually used (Table 5). On the private farms, the users were mainly the farmers themselves or a member of their families: both farms and computers were essentially family concerns.

Table 5: Users of PCs on farms, by number of respondents (%) by category of farm

Users of farm PCs	Small farms	Large farms	Company farms	Cooperatives
Respondent/farmer	62,3	54,1	38,6	27,5
Spouse	24,0	29,0	0,6	0
Other family member	33,2	69,3	0,6	0
Employee	0	9,9	71,5	60,9
Other person	2,1	13,5	9,0	20,7

The PC is widely used for access to internet. Of those who have computers, 64,3 % of small farmers access the worldwide web, as do 70,6 % of the large-scale farmers, 62,8 % of companies and 77,3 % of cooperatives. A wide range of software was employed, both general (such as Word and Office) and special to agriculture (such as Zootechnic and Agronom).

Training in using PCs and information.

The last aspect of computers on farms to be studied in this Report concerns training courses. Data were obtained on the numbers of respondents who had attended a course, and on the numbers who wished to receive training (Table 6). No time frame was included in the question, but it is assumed that attendance was in the recent past, and that an interest in training relates to the near future.

Table 6: Courses of training on PC and information systems: attendance and interest to attend by respondents by category of farm (%)

Attendance and interest in courses	Small farms	Large farms	Company farms	Cooperatives
Have attended course on PC	21,1	24,0	42,8	33,8
Have attended course on information systems	12,7	6,9	20,9	22,1
Have not attended a course	66,2	69,1	36,3	44,1
Would like a course on PC	29,6	25,8	31,1	36,3
Would like a course on information systems	18,3	17,1	37,8	28,2
Would not like a training course	52,1	57,1	31,1	35,5

It is clear that there has been less involvement in training courses by respondents on the private farms, and that less than half of those on company and cooperative farms had attended a course. Where training had been undertaken it was most often on PCs rather than information systems. Presumably informal instruction and personal practice were the main ways in which farmers had learned to use PCs, and to develop their information skills. Interest in future courses was highest on the cooperative farms. More than half the private farm respondents had no interest in future courses.

4. Conclusions

Farming in 2003 is shown to differ, in some important ways that affect the management of information, from that seen in 1998. There is evidently an increase in ecological or organic production which has doubled on small farms, and increased more than four times on the large private farms, in the past 5 years. At the same time, integrated approaches to using inputs have decreased, making the polarisation between conventional and ecological farming rather stronger.

In terms of their personal characteristics, the new data re-inforce the 1998 evidence about the relatively low average age of Czech farmers – probably about 15 years less than farmers in the UK, for example.

In general, the 1998 conclusion that the farmers' education level has a major influence on their information system is re-affirmed by the 2003 data.

The actual sources of information and advice used, and hence the components of the information system, are evidently changing. In discussing the associations between level of education and the number of sources of information used, it was noted that the respondents using the largest numbers (11–18) of information sources are also associated positively with levels of education.

About half the component sources in the information systems have remained stable in their importance. The systems hence appear to be quite robust. Print media still dominate the ranking of importance.

The PC has now become an important aid to management on farms. As might be expected, on the private farms the operators are mainly the farmers or members of their families, and on company and cooperatives it is the employed staff who mainly use the PC. There has been a large investment in PCs on farms since 1998; they are now (2003) used on 68 % of small farms, 84 % of large farms, 100 % of company farms and 98 % of cooperative farms. There is much use of the internet, especially by company farm respondents.

Diversified activities and income generation on farms is a feature of agriculture in Europe, and a major influence on the information system needed for modern farming. The data obtained in 2003 show that many farms have diversified, and that more expect to do so in future.

Future expectations, as stated by the respondents, are for increases in growing energy crops, ecological (organic) produce, tourist accommodation (agrotourism), horse riding, food processing and farm shops. Most of these changes (perhaps two thirds of the responses) are in activities that remain close to the traditional skills of biological production. There are also significant changes in the use of resources such as buildings for agrotourism or for business development.

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Learning and professional development in advisory services: supporting the reflective practitioner

Mark Paine*, Ruth Nettle and Steven Coats*****

Abstract

Advisors working in extension have rarely been viewed with equivalent status to researchers in farming systems projects. This paper investigates the possibilities of improving the professionalism of extension by referring to a national series of workshops for advisors. The content for these workshops was based on the findings from a learning research project for building professional learning relationships between farmers and advisors. A series of six workshops spread throughout the main dairying regions of Australia provided an opportunity to gather quantitative and qualitative data from advisors in the field about issues and perceptions challenging the development of professionalism in extension. Thematic analysis explains advisors' perceptions relating to professionalism in routine work situations, challenges to the profession, needs for professional development and the role of learning research, together with specific assessments of the workshops. We conclude the extension profession is undergoing a crisis of identity but that this could be resolved if more effective inter-disciplinary research methods were used in farming systems projects. The development of these methods depends in part on the effort made by investors to support research into learning and change management.

Keywords

Professional development, advisors, learning research.

The changing world of extension

The period spanning the mid 1980's through to the mid 1990's witnessed some exceptional developments in the conceptualisation of experiential learning (Kolb, 1984), professional service provision (Schon, 1983; Schon, 1987) and the role of science in society (Latour, 1987; Pickering,1992). For those of us working in the area of farming systems this provided a stimulus to reflect on the ways we were approaching our research and extension activities. It was hoped that critical reflection on our areas of work would identify new methodological advances to address environmental and productivity issues confronting Australian land management.

Unfortunately these eagerly anticipated advances were not realised during the period from the mid 1990's to the present. In this paper we suggest some reasons for extension and adult learning disciplines failing to develop sustainable communities of practice that effectively engage with other communities. While this failure is in part due to global trends, it is primarily a consequence of our own making. We offer a constructive response to this situation based on learning research that developed into a national program for advisors. This paper will report on the development experiences and observations arising

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from a series of workshops with advisory practitioners. Our work is guided by the question, 'is it possible to improve the professionalism of service providers across an entire service sector?'

Professional advisory practice

Argyris and Schon (1974) observed that all professional practitioners need to not only be competent in their actions, they also need to reflect on their actions as a means of improving their competence. They claim that professional actions have corresponding theories (or logically interconnected propositions) that enable practitioners to explain, predict and/ or control their actions. Theories may be espoused (what we claim to be the basis of our actions) or 'Theories in use' (what actual informs our actions). Schon described science-based professions as following a technical rationality to perform in practice, "With research-based theories and techniques, agronomists solve problems of agricultural productivity, soil erosion, plant disease and insect control.' (Schon, 1983, p.169). He observed that this problem solving description of professional practice was incomplete as practitioners often encounter situations and issues that do not fit well known categories and therefore need use strategies to cope with these situations.

Schon describes these strategies as 'reflective conversations' akin to a design process, more artistic than scientific in character. Advisory professional therefore draw on some combination of scientific and experiential knowledge to perform in practice. Experiential (or tacit) knowledge is typically less formalised or systematically organised compared to scientific knowledge. Regardless, professionals possess a capacity to recognise the variation in competent performance among their peers – an aspect of professions that has attracted criticism as those 'outside' the profession observe an 'exclusive club' that tends to protect one another from external critique. Yet critique is a powerful stimulus to the renewal of professional practice. Critique can therefore arise from within a profession or from outside a profession as circumstances change. The conditions under which Australian dairy advisory services operate have been a powerful stimulus for change in recent times. We briefly outline these pressures for change before introducing our work with advisors in the field.

Global trends influencing learning and extension programs

Recent trends in technological innovations for agriculture in developed countries are, like healthcare, dominated by higher investments in biotechnology and information technologies. Our analysis of these trends is specifically in relation to service providers. Here we encounter a growing concern about the privatisation of knowledge, the growing complexity of farming systems and the acceleration of the technological treadmill.

The privatisation of knowledge

Of most concern to authors writing about trends in privatization of extension services is the impact of knowledge markets or the privatization of knowledge on innovation within the agri-environmental sector.

Leeuwis (2000) is concerned that a 'supply and demand' approach to knowledge carries with it the idea of a clear division of tasks between users and providers of knowledge and disregards the studies of innovation that refute such a linear model. He argues that in everyday practice researchers, extension agents and farmers are all occupied with the development, exchange and use of knowledge, and that it is precisely the recognition of this non-linear and non-exclusive task-sharing that can contribute greatly to the achievement of successful innovation (Engel, 1995; Röling, 1996; Leeuwis, 1995).

Leeuwis (2000) raises three main issues when considering market-oriented knowledge policies: Exclusion risks (some farmers will be excluded from relevant knowledge), substitution risks (research and extension will focus on those issues and/or methods for which money is easily available, that is on well-resourced clients), and possibly high transaction costs ('bureaucratisation').

In conceptual terms, the key problem here seems to be that applied knowledge and information are considered as ready-made 'end-products'. However, in the context of sustainable agriculture it is probably more accurate to consider applied knowledge and information as 'building blocks' for local-level innovating. Innovation requires numerous knowledge 'transactions' and exchanges. Leeuwis (2000) thereby challenges the idea that the capacity to innovate towards sustainable agriculture can be optimally maintained through a knowledge market. Institutional arrangements other than markets are likely to be more effective when generating relevant knowledge for innovation at the local-level.

Complexity in farming systems

The agriculture sector is under increasing pressure to bridge a growing tension between a neo-classical economic view of farming as a small business food and fibre factory; and a liberal socialist view of farming as one of several "multi-functional" uses of landscapes. The latter view requires land managers to recognise the ecological, social, educational, aesthetic, and local economic development attributes (eg, tourism, food services etc.) that at times require the development of sophisticated collective methods in communities (Barrio and Vounouki, 2002).
Historically farming has been viewed as a food and fibre business. The growing influence of consumers and urban interests in debates about the merits of the food derived from our farming systems the sustainability of these systems is resulting in more voluntary regulations of farming practices (through pricing instruments) and compulsory regulations (using legislation).

With the growing privatisation of knowledge resources farmers also find themselves adapting their practices to comply with patents and property right regulations over genetic resources, or to register procedures and maintain individual animal records for traceability requirements for market access.

Complexity at the level of farm management has corresponding implications for those working in the knowledge systems that service farmers. Advisors are now required to have well developed technical skills across a broad range of farming systems. Perhaps even more demanding than this technical requirement is the need for advisors to have well developed socio-political perspectives on the place of farming in society, and a competency to debate these perspectives across diverse social forums (Wenger, 2003). Those working in learning professions therefore need to move beyond participation to engagement in social transformative processes involving food and landscape systems (Paine and Beilin, 2003).

Managing the technological treadmill

Cochrane (1958) first coined the phrase 'technological treadmill' to explain the phenomenon of more capital inputs, larger scales of productions and reducing margins from productivity gains that is associated with an increasing dependence on technological innovation for competitive advantage over other suppliers. The net effect is that small and 'inefficient' producers are driven out of the industry by larger businesses, and those that allocate their resources more effectively.

Hubert and others (2000) referred to some of the negative effects of this 'treadmill' such as aggravating rural poverty and the promotion of unsustainable farming systems. This position was criticised by Petit (2000) who claimed the position of Hubert ignored the interventions of governments, and the opportunities arising from product differentiation for small farming businesses. Joly (2003) has since argued that neither position is adequate as an explanation of technological innovation because government assistance has not improved the lot of the small farmer, nor is it correct to claim that deregulated markets exacerbate the treadmill effect. Under deregulation it is possible for small producers to effect more product differentiation if adequately supported by policy and knowledge resources/ processes.

The challenge for learning professions in farming systems is not to equate the technological treadmill with deregulation and therefore oppose liberalisation policies, but rather to catalyse and support innovations by farmers and scientists that fit diverse farming systems over a range of ecological and market circumstances.

A call to address learning as a dairy sector wide issue

The organisation of advisory services for dairy production in Australian varies from State to State. Some States are fully privatised (South Australia) and others provide extensive public sector extension services (Victoria). At a federal level research and extension is 'purchased' with a view to improving the sectors capacity to compete in international markets by Dairy Australia (previously the Dairy Research and Development Corporation). Learning has been identified as a sector wide strategy for capacity building of producers and service providers (McKenzie, 2002). Managing the growing demand for evidence of responsible farming practice, and managing the complexity outlined above, depends on the capacity of people in the sector to manage change, regardless of the different public/ private provider policies and infrastructures across the States. It was to this capacity building requirement that the Learn Plans project was launched.

A project was designed on the assumption that an effective learning environment in the dairy sector required a farming population that was empowered to demand services that developed their skills for capturing future business opportunities. A farmer empowerment process would require advisors who appreciate the perspectives that farmers had in relation to their multiple roles when managing a farm and family business. These advisors also had to foster the empowerment of farmers in relation to different needs that arise at different stages in a farming career. Furthermore an empowered farming population would become an effective partner with advisory service managers in an effort to continuously improve services.

The "Learning Plans" project as a response to the call

A Dairy Australia funded research project "Learning Plans" was implemented in Victoria, Australia in 2001 and 2002 to investigate ways to build relationships between advisers and farmers that improve the performance of farming systems, create demand for learning that in turn develops the capacity of both advisers and farmers to manage change. The survey and action research components of this study were reported at a previous conference (Paine and Kenny, 2002). Use was made of a previous market research survey to provide a preliminary insight into various types of grazing management as practiced by farmers in the South-West dairy region of Victoria. Four case studies were undertaken of farmers who were selected by extension staff with extensive networks and experience in the region. Three farming systems were identified through this process: extensive (low input - low output systems); intensive (high input – high output systems); and consolidating (systems that have undergone extensive change). We also determined a difference in orientation to grazing management: responsive management practice was characterised by adaptation to the environmental and situational pressures operating on the grazing system; transformational management practice was a more proactive approach to create the grazing system desired by the farmer.

Findings from the case studies, combined with results from the market research, were used to design a semi-structured questionnaire that was then conducted with farmers who corresponded to the general types of farming systems described above. This second round of interviewing focused on issues of learning and change in relation to farming practice. Additional interviews were conducted with new farmers until no new concepts nor issues were uncovered with respect to each type of grazing system: extensive (n = 6); intensive (n = 5); consolidating (n = 8). The duration of each interview was approximately two hours. Qualitative analysis of the interview data culminated in the development of a conceptual model that explained the learning behaviour of farmers who practice dairy grazing management.

Action research with advisors in the field

Research on learning plans aimed to improve the definition of farmer learning needs as a way to improve extension programs. This work extended beyond mere description to embrace a group of extension workers in a development process for building a methodology for facilitating the emergence of learning partnerships with farmers. This paper reports on the next stage of the project that used outputs from the research stage to build a professional development program for advisors.

The conceptual model referred to above was used in a second stage of this project that involved an action research group who were charged with the task of using the initial research findings to develop practical outcomes for the Target 10 program. Five advisors from the program participated in the action research team. A series of workshops and piloting of workshop outputs (eg. methods etc.) were conducted by advisors and ourselves as researchers to document process. After about 12 months of development work the team organised their findings into a methodology referred to as ‘Germinator’. This methodology provides the advisor with a series of tools organised in a simple step-wise process that together facilitates the formation of a learning partnership with the farmer. The first step was to develop a profile of the farmers’ learning needs, this was followed by a step that investigated key aspects of the farmer and their farming system that enabled the advisors to better position their contributions to the farmers’ learning needs. Having established the needs and context for learning the advisor then moved to investigate issues relating to the change of practice as defined by the farmer. The methodology concluded with a step that assessed the fit of extension resources with the learners’ requirements (effectively a negotiation phase that often involves consideration of both institutional and inter-personal issues).

From research to workshops

A series of workshops were designed to use results from the research project in a way that focused on the needs of extension professionals around Australia, locating workshop activities at their place of work.

The aim of this stage was to:

- Foster effective adviser-client learning relationships using key messages from the research phase as a resource for workshop activities;
- Introduce a "model" for the role of extension in building effective client-adviser relationships. It was hoped this model might have relevance for extension professionals in their routine work.
- Draw on regional and local advisory experiences using interactive exercises.

A premise in these workshops was that the adviser-client relationship could be improved using results from the earlier research on learning processes. Prior to attendance, participants were asked to make a note of a particular client relationship (individual or group) that they would like to improve.

Participants were introduced to a concept of learning as a relatively permanent change in behaviour, with behaviour including both observable activity and internal processes such as thinking, attitudes and emotions (Burns, 2002). Learning was described as fundamental process for managing change (Beckhard & Pritchard, 1992). Farmer learning was initially represented to participants based on the work of Kilpatrick and others (1999) who had found that Australian farmers were overwhelmed with choices of products when trying to fulfil their needs for new knowledge and skills. Risks attached to wrong choices included opportunity costs for time, negative experiences with learning and inappropriate learning outcomes. This situation was exacerbated by the ad hoc way farmers' planned to learn – they rarely set formal plans to acquire new learning skills.

We then contrasted this farmer learning situation with the role of the advisor by stating that it was no longer tenable for the adviser to behave as a walking reference manual – what was now needed was an adviser-farmer relationship that was amenable to adaptation according to the farming situation.

Principles for building effective advisory relationships were then introduced to participants using a workbook approach that embodied outcomes from the learning research (Paine and Kenny, 2002). These principles were directed at understanding learning needs; distinguishing between learners' actions, intentions and worldviews, and making sense of interactions between these factors in the learning relationship. Workshop participants then applied these principles to cases in their work situations using tools and processes provided in a manual developed from the Learning Plans project (Nettle and Paine, 2003). This manual provided methods for determining learning needs; embodied tools to help better position extension as a response to these needs; outlined methods for creating a demand for learning (using action as the starting point for learning); and included guidelines for building the learning relationship (building professionalism in extension, meeting client demand and using a tool to build the advisory relationship). The session was designed as a one day exercise culminating with each participant developing an action plan that provided a framework for continually improving their advisory relationships, while simultaneously extending their own professional development.

Six workshops were delivered at sites that corresponded with all but one of the Regional Development Program regions of the Australian dairy sector. A workshop was planned for Northern Victoria but a severe drought was occupying advisors in the region at the time. Nevertheless, 75 of the 80 professional advisors employed by State Departments across Australia participated in the workshops between May to June 2003. A comprehensive evaluation of the workshops provided quantitative and qualitative data on the contribution of the sessions towards improving professional practice.

The remainder of this paper draws on the perspectives and feedback from professionals during the workshop sessions. In a way the workshop can be viewed as a type of research instrument, providing a mechanism to focus professionals on their learning relationships, and then capturing experiences from these advisors using a mix of data collection methods (review sheets, group based evaluations, semi-structured questionnaires etc.). Quantitative responses and written qualitative responses were gathered from 65 participants (10 participants did not return forms or had missing data). Group based responses were gathered from 75 participants.

Professionals, learning relationships and development issues

Participants used a five point scale to express their views on the relevance of the learning research for the extension profession. Their views varied from 'Very Relevant' (35%), to 'Relevant' (51%), and 'Neutral' (11%) for all regions. Using a similar scale they considered the workshops were either 'Very Useful' (15%) or 'Useful' (72%). Some participants were 'Neutral' (11%) about the usefulness of the workshop to their professional practice. This differed from their more distributed assessment of the usefulness of the workshops for their team: 'Very Useful' (21%); 'Useful' (54%); 'Neutral' (21%).

The professionalism of advisors was explored in relation to learning and change using six qualitative questions. These were coded and analysed thematically.

1. What are the current issues you encounter when going about your routine extension work?

Advisors are seeking improved methods to engage people who have a desire to change their current practices. An ethical issue is recognised by advisors in situations where farmers feel they are performing adequately, yet advisors believe the current performance is unsustainable – is it appropriate for the advisor to create a sense of dissonance as part of a needs analysis with farmers? Advisors are seeking improved methods for tracking changes at the level of practices (improved pasture management) and systems design (alternative feedbase management systems). This tracking of changes needs to contribute to more effective advisor work practices such as setting priorities on the types of farmers to work with and the selection of services to use with these farmers. They recognise a need to improve the customisation of services to meet a range of farmer needs. Advisors want to build on their professional relationships to engender cultural changes and empower a type of farmer client who can reposition the role of advisors, from acting as a reference source to becoming a partner that supports managers as they plan and communicate change when adapting to challenges within and beyond the farm.

2. How is the extension profession being challenged?

An issue of identity is challenging the extension profession. Advisors are asking questions about their core business, their place relative to other service providers, and the balance between building local networks versus strengthening linkages with science teams. The profession is aware others do not recognise extension as a science. Concern is therefore expressed about the diminishing support for advisors in the field, with declining numbers of workers resulting in a loss of critical mass. This has a negative impact on the mentoring of new entrants, and on the career opportunities for experienced workers. Advisors recognise a need provide more evidence to investors regarding the value of extension and change management programs. Evaluation is of increasing concern to field workers who are required to operate in projects. Monitoring is less difficult in project work, but advisors are having difficulty legitimizing non-project work. Information management (quality of information, helping farmers cope with numerous information demands etc.) is a perennial issue for the profession. However advisors are now referring to the need to combine their services with others to cope with this information issue. Environmental issues are particularly challenging as Government policies change. These issues often involve changes that need to extend beyond the life of a project, and the responses usually require inter-disciplinary teams to address complex problems. An associated challenge is the need for advisors to influence and inform the design of policy, rather than take a reactive role to policies developed by others.

3. What professional development are advisors seeking?

Professional development needs to start with new entrants to the profession and continue throughout their careers. Advisors are looking for a practicum approach (Schon, 1987) whereby advisors acquire new skills and capabilities through specialised workplace activities that have specified learning outcomes and a high degree of supervisory support. Advisors recognise the need to build stronger linkages with research and development in areas of learning, change and professionalism in extension. Part of this linkage ought to include researchers joining project teams periodically to provide independent but informed critiques of practice in the field while simultaneously identifying new research questions. Professional development ought to also include opportunities for inter-state and international exchanges and sabbaticals.

4. What R&D in learning and extension will be required in future?

Research teams needed to interact more with advisors in the field using these types of workshops as they provided an opportunity for all participants to reflect on their discipline. Advisors were enthusiastic about the focus on farmer driven RD&E and on improving the interplays between the practices of farming, extension and research. Time was a critical constraint to many advisors who want to participate more in research activities as part of their routine practice. Regular publication and distribution of research work was also called for. Advisors requested a style of communication about research findings that included the use of many examples and the development of case studies that would provide participants with an opportunity to determine how the research related to their professional practice.

5. Where should RD&E in change management focus its efforts?

Advisors are seeking more effective evaluation frameworks and tools that provide robust non-economic tools to measure change and assist with defining the attributes of the client they are working with. Improving partnerships with other professionals and improving the overall professional performance of extension were high priorities. Some technical competencies were identified as deficient across the current population of advisors, including skills with supply chain management and dealing with environmental challenges like water use efficiency and biodiversity. Extension needs to develop a research orientation to its practice that continuously explores and refines advisory processes, informs policy and helps resolve dilemmas between regional, national and local development priorities.

6. How relevant was this learning research to the profession of extension?

Pragmatic requirements raised by advisors during the workshops included questions about the robustness of the approach – how to apply it in different forums, with different groups that were working on a range of issues. Assessments of relevance were conditional on follow-up activities that ensured practices were embedded in the routines of advisors in the field. The very act of explaining what professionals actually do was highly valued by many advisors who have had difficulty positioning their work relative to that of others like scientists or policy makers. A number of participants requested more time to think through the material from the workshop as they operate in the field. Tools introduced during the workshop were considered important to building a professional image among others and contributing towards improving professional standards. More work was called for in the area of evaluation that would underpin position statements from extension to Government and policy makers.

Professional development as reflective practice?

We questioned whether it was possible to improve the professionalism of advisors across an entire service sector. Our tentative conclusion is that the series of exploratory fieldwork, action research and professional development workshops have gone someway to assisting advisors reflect on their professional practice. Ultimately changing professionalism is determined by the advisors themselves. By using workshops that focused on improving the learning relationships between advisors and farmers an excellent opportunity was created to explore perceptions of professionalism in extension. We concluded from our analysis that improving the professional status of extension is primarily an issue of self organisation to enable a more effective representation of advisory work to others. Unfortunately many advisors are suffering from considerable 'self-doubt' about their profession which hinders the formulation of a strategy, or the development of a compelling vision to engage others. Advisors are calling for better methods to undertake their routine work and to provide more evidence that their contributions are making a change in the primary sectors. The strength of ties between field practitioners, researchers and professional development workers are currently fragmented. This situation is likely to become more critical as numbers in public service institutions decline and private sector organisations have to take more responsibility for the development of new entrants to the advisory profession. Paradoxically, the complexity and indeterminate issues that are arising from new environmental and rural social policies may provide a catalyst to stimulate more effective collaborations between public and private sector organisations to resource initiatives that address this impending crisis for advisor services in future.

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Strenthening local food systems: tracing learning of knowledge and skills by content and discourse analysis

Minna Mikkola*

Abstract

The local food systems meet the food systems of scale on the local market, where the local and regional chains are looking for ways to survive and even to strengthen. The operations of local food systems become decided by many actors embedded in a socially complex local environment. Yet there is very little understanding about the actors' perceptions and learning about the local food systems and the effects of this on the operations of the system. Also the meanings for the local food system implied in the speech and activities of the actors are part of a dynamic but unvisible reality in the food system. The understanding of the role of learning of knowledge and skills as a possible dynamic development factor in the local food system is needed. This paper discusses some approaches to learning in the food chains and some qualitative research methods to capture learning in the chains through empirical material. The main research question, the learning of the actors in the local food chain and the effects of learning on the activities of the local food chain are opened as more detailed and operative questions. They concern the thematic fields of knowledge and skills, the ways of knowing and the communication of knowledge within the chain, which is considered as an indicator of contextual learning. The study is expected to reveal knowledge interchange activity and connectedness by knowledge in the local food chains. Also future development potentials of the actors of the local food chains can be referred to. First of all, knowledge and skills – represented by speech and activities of the actors in the local food chain - is thaught to be manifest result of learning. The categorisation of knowledge is suggested to be used as an analytical dimension in combination with thematic dimension in content analyses highlighting the contact points of the chains. Also discourse analysis is proposed to be used as a research method offering cultural view of actors' positions in the chain and actors' views of the different production methods. On the basis of this understanding, it is planned that the actors and public bodies can reflect upon their future activities.

Introduction

The local food systems meet the food systems of scale on the local market, where the local and regional chains are looking for ways to survive and even to grow. The operations of local food systems become decided by many actors embedded in a socially complex local environment.

The concept of local food has been used in Finland for some years. It obviously influences – like distant food – on the cultural, social, economic and ecological aspects of the locality. Strenthening the local food system is seen as a way of supporting and stabilising the rural community and landscapes as well as the economic structures of the society. When looking for ways to develop food systems, the idea of learning food systems has been presented by the Finnish Ministry of Agriculture and Forestry (Puolanne et al. 2002).

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The understanding of the role of learning of knowledge and skills as a possible dynamic development factor in the local food system is needed. What is learning in the context of food system? Are possible results of learning represented in the speech and activities of the actors in the local food system? What is learned, by whom and in which connections? Has learning a role to play in current and future operations of the local food system? Can learning be enhanced? In addition to several studies in the fields of economics and marketing, it is essential to look on the food system actors' 'inside' view and to converse this 'close look' made intelligible by researchers for readers in relevant fields. This would add to the understanding of the contextual past and present as well as possible future developments by the food systems' actors and public bodies on different levels.

Studying learning of knowledge and skills in the local food system is a rather elucive and scattered research theme, which presents some methodological difficulties. This paper deals with defining learning in a way suitable for this research and choosing feasible methodology, which covers both chain level factual and community level cultural aspects of learning of knowledge and skills. Learning is understood in its informal and vocational context. Ethnography, content, conversation and discourse analysis are discussed as possible methodological approaches.

Empirical context of the local food system

The locality chosen for the site of the study is Juva, a small South-Eastern municipality of 7,500 inhabitants. Juva is located near to Mikkeli, the South Savo regional capital, where the Helsinki University Institute for Rural Research and Training is located also. In Juva there are about 400 farms and 6 dominant industrial units for organic milk, turkey meat, beef and pork, fresh mixed sallads and additionally two glass house growers. About 18 % of the cultivation area is in organic production. (Juvan kunta, Toimintakertomus, Juva Municipal Annual Report 2002). The local consumers shop at the two main supermarkets in the centre of the municipality. The locally and regionally remarkable purchasers are the municipal caterers, which are members of the region-wide purchasing network. The purchase network buys food stuffs for about 3,5 million € yearly for alltogether 36 catering units, of which the Mikkeli Central Hospital's share is c. 3 million € (Anneli Oranen, personal communication, 29.11.2003).

The employment in Juva by agriculture and food industry is about 30 % of the working force (Juvan kunta, Toimintakertomus, Juva Municipal Annual Report 2002). The municipality has a strategy based partly on agro-food sector, which, although of low productivity, offers long-standing development possibilities due to the rather stable population in Finland in spite of the slowly decreasing population in the region. (Heikki Laukkanen, personal communication 3.7.2003)

Empirical reduction of the local food system to local food chains

The starting point of the study was to make the social structures of the local food system visible by identifying the actors and groups of actors attached to the system. This structural information would base the approaches for learning of actors at individual, organisational, interorganisational and system level. Because of the qualitative approach, the local food system – although very small compared with that one of big cities – proved to be too extensive by the number of commodities, enterprises and retail customers. According to Etelä-Savon TE-keskus (Employment and Economic Development Centre for South Savo, 2002), there are more than 40 different crops and about 5 animal species in production in Juva. According to the Juva service information, there are tens of local small scale food enterprises in addition to the industrial units named above.

This is why the local food system, producing commodities for basic Finnish diet, was simplified by analytical reduction from a local food system as a network to a local food system as food chains. This corresponds to the understanding of the food system as the flow of food in the form of different commodities through the relevant sequences from production to consumption. This physical understanding of the flow of food is basic to the social structure as well; the flow of food is socially organised and carried forward by the actors of the chain, whether they be individuals or organisations forming the chain.

The chains were identified and chosen from the deliverers of the municipal caterers in Juva and Mikkeli on the following criteria: they represented both conventional and organic production of different volumes, all actors were serious entrepreneurs (making their living in the food chain, except one organic farmer) and they have established their activities at least some years ago, having experience of the operation of the food chain. These criteria resulted on commodity level as one chain of conventional and one chain of organic milk and two chains of conventional vegetables and one chain of organic vegetables. All the five different chains have the same end user: the municipal caterers and regional purchase network for hospitals, schools and nursery units.

Already now it can be concluded, that the inherent heterogeneity of the local food chains was surprisingly large. In addition, their business relations varied from weekly to one or several years of duration. This diversity emphasises the need for understanding the operations and embedded learning in the local food chains.

Constructed and contextual learning

Concepts of knowledge, skills and learning are basically very intertwined; all knowledge and skills are learned, and they have manifest results as speech and activities. Learning can be theoretically divided to acts of knowledge transfer, transaction for the knowledge and transformation of the knowledge to part of one's own knowledge constructions. Knowledge transfer is appearing widely, but obviously only part of this available knowledge becomes the object of transaction by learners. Transaction, the trial to merge the knowledge into one's own knowledge structures, can be followed by true transformation. There the knowledge structure is richer than earlier and it is also personalised in the way that the actor has access to his knowledge and all the possibilities it potentially holds. In this study only the results of transformation, which have very concrete expressions as occupational activities, relations or speech, are observed. The cognitive processes are left beyond the focus; only the visual, auditive or material evidence of learning of knowledge and skills are studied.

Basically individuals learn; organisational, interorganisational and chain level learning is understood as new ways of organisational operations and developments in contact network by adding or subtracting actors. Also new ways to talk about oneself or the other actors as well as the efforts and goals are considered learning. Toiviainen (2003, 28) separates learning-to-network and learning-trough-network, which are both followed separately as learning in this study. Learning-to-network is indicated by communication with the (new) actors and learning-through-network by knowledge and skills learned within the contacts.

The physical and social structure of the food chains is the context for learning. Chain structures, when studied more closely, show remarkable variation in the size of volume and personnel, geographic extension and differences in the number and nature of contact points. These features can also be understood as physical and positional dimensions of power. Mutual relations of the actors and organisations may bear on what kind of information is shared within the chain. Unequal, competitive or tensed relations can effect to the sharing of knowledge. Individual and organisational positions as well as the passing of knowledge in the chain become objects of negotiation, which demands social skills.

The contact points between actors and organisations are also essential turning points in the development of businesses. Actors negotiate – based on the knowledge they have - agreements about the flow of the food for certain periods in the future. Evidence for critical changes are extremely important for the actors and this knowledge is most important to catch from the chain. It is also the question of trust, legal frame and feasibility for actors, who must adapt to their micro environment and change their partners accordingly. Following Durkheim, who maintained that social relations are to be treated like material things, knowledge can be perceived in the same way. Knowledge is passed on as material packages - whether talk, print or electronic - which can be given by an actor to another one in the chain. In this study, learning is followed within contacts by individuals in and between organisations and on the chain level. Also local processes like public projects can be included, because they offer the actors fora for learning.

Categorising knowledge and skills in the food chains

The generic idea of socially constructed origin of knowledge (Berger and Luckman 1984) suits well to knowledge developed in informal, every-day occupational activities. Knowledge learned like this is so pervasive, that it is not easily identified; yet, without it, it is very difficult to know how to find one's way to a specific place or site, deal with people in the work place, use machinery or make contracts. All the operations of the actors, whether individuals, organisations or chains are embedded in cultural and occupational knowledge. In this study, learning is traced in the chains by analysing knowledge and skills of different kinds on the basis of actors speech and trusting on actors' own factual statements of their learning (Nerbonne and Lentz 2003).

Concept of knowledge is strongly dependent on the content of knowledge (Voutilainen et al. 1990, 17); this offers the categorisation of knowledge wide possibilities in the field of philosophy, sociology, education and occupational activities. Dewey (1929) emphasised the active relation to knowledge through the practise instead of the passive spectator theory of knowledge. Knowledge is active, constantly developing in the relation between the actor and the world (Dewey 1929). This activity for use and creation of contextual knowledge may come close to occupational knowledge and skills. These are according to Plato (in Niiniluoto 1992, 51) acquired with time and effort and put to practical experience, and they represent genuine knowledge as 'knowledge of the doer'. Plato considered skills to consist of knowledge and accuracy. Probably Aristotle (VII 1989) was also describing skills in his Ethics of Nikomakhos as ‘tekhne’, which includes understanding how the result is created. Nonaka and Takeuchi (1995) divide the knowledge into tacit and explicit. They draw on Michael Polanyi's (1966, in Nonaka and Takeuchi 1995, 59) distinction between 'tacit' and explicit knowledge. Tacit knowledge can not easily be verbally explained and thus its tranfer is limited. ‘You have to feel it’ states Japanese Nagashima according to Nonaka and Takeuchi (1995, 9).

In this study explicit and tacit knowledge are understood as pragmatic, consisting of propositions as factual statements by the actors (Niiniluoto 1992, 40, 54-55). Tacit knowledge is especially connected to skills and labor. Although it is not transferred as such, it can be referred to in the way that the existence of skills becomes visible. Niiniluoto (1992, 55) discerns several types of factual statements: singular, general, statistical, modal, conditional, explaining, instrumental, evaluative, knowledge concerning norms and possibly metaphorical knowledge.

When using categories by Niiniluoto (1992) for the speech of actors in the food chains, some adaptations are necessary. Because mainly all knowledge dealt with here is singular - historical, individual and cultural – knowledge, it is not used as a category, but rather as the contextual and meaningful knowledge category it covers all the other categories. Even the general scientific knowledge has for the actors a contextual and constructed character. They use all kinds of knowledge intermingled, be it scientific (by source), statistical, conditional, explaining, instrumental etc. and all these categories are crucially important when working, sharing knowledge, learning new things and putting them into action and developing one's business. The following categories of knowledge are suggested to form the basis of the analysis for the knowledge and skills of the actors in the food chains:

1. General knowledge, which is important to discern because it has connections to scientific knowledge and scientific worldview
2. Statistical (or numerical) knowledge
3. Conditional knowledge describes analysed possibilities and consequenses of certain actions
4. Explanations are based on the idea of cause or reason for something to happen
5. Instrumental knowledge, which describes the 'means' to be used in order to achieve something
6. Evaluative knowledge sets an object against it's criteria stating the value of the object in relation to the given set of criteria.
7. Knowledge concerning norms of generally accepted nature
8. Metaphores – although seldomly used, serve to explicate a sharp understanding of a matter
9. Explicated (tacit) skills, desribed in some way, often referred to just as labour or a specific phase in the daily work.

Toiviainen (2003, 29) states that the concept of knowledge tends to remain abstract and the content of learning remains undefined in some texts of organisational learning, which are concerned with learning dynamics. It can be expected, that the knowledge and skills of the food chain actors have a strong connection to their point of view, which directs their interests for knowledge. These themes are to be found in the contextual speech of the actors; methodologies need to be chosen in order to create and document that speech and identify those themes in that speech.

Methodological research orientations of the 'bricoleur'

The operating chains' individuals and organisations are 'silent actors', who do not often have – as Davies (1988) indicates - powerful position as writers or speakers in the local community. Every-day actors' informal learning of knowledge and skills is mainly unrecorded. There are some official interorganisational materials available, especially from the bigger units like Central Hospital of Mikkeli, but practically nothing about the every-day encounters and operations of chain actors. This study has thus the basic task of social inquiry: to make the silent, invisible and unstructured heard, visible and structured. Still, there are plenty of possibilities in the space of qualitative study for choosing different methodological approaches. This study was understood as a task for a 'bricoleur' (Denzin 1998, 4).

Ethnography as the most 'immersed' contextual method offering a multifaceted 'inside-view' would be an excellent way of increasing the understanding the plurality and scale of phenomenons going on in the site of local food chains. The more there are options, the more clarity and connectedness to theory is needed by the researchers for the phenomenon to be studied. This richness of options in 'thick description' is the difficulty of ethnography as well; the study is not easily planted on a theoretical basis (Geertz 2001). The possibility of ethnography was rejected for practical reasons only. The study consisted of so many separate units in five chains (13 alltogether) that ethnography would have been too time-consuming. Ethnography is more suitable when there is one location and ample time until unvisibility. The time needed to record the happenings is needed also. According to Emerson and Pollner (1998) ethnographic researhers need to find a 'niche' in the community, they can be helping hands, problem solvers, representatives for the group or they are asked to join as genuine members...these positional questions need to be solved on the site in relation to the members of the community to be studied. In the case of local food chain actor, researchers should have become 'part' of a family farm or a manufacturer environment. This could call a status of an agricultural trainee, for which there were no possibilities. Ethnography, not chosen for this study, could offer the best material for cultural activity – including talk, gestures and a clearly 'labour labelled' look on the local food chains.

Another option would be to deal with local text material for authentical local view. Newspaper texts as public documents have perhaps a stronger touch for local politics than for speech and discussions concerning local food chains. These spheres of text are private and their documentation is a problem. The question of documentation ties the production of the material into close connection with the possible methods of text analysis.

If there would be authentic discussions available these could be used in conversation analysis; the short discussions or agreements of the food chain actors emerging during the operations would need possibly a continuous taperecording device, accepted by all the persons in touch with the carrier. This arrangement seemed somewhat difficult both socially and technically. Conversation analysis itself would be the method when describing subtle, quickly changing turns in interaction, where sometimes very sophisticated formulations make the the positions and power of participants visible. This method can manage of only reasonable amount of texts, and discussions pile up considerable amounts of material. The scattered nature makes chain level study difficult by conversation analysis. Conversation analysis, not used in this study, would open the cultural microworld of interaction and show the fine threads of relations between actors.

Producing texts for analysis can be done by interviews, which offer a balanced work load for producing, documenting and analysing texts.
Of many types of interviewing the open-ended, lightly structured interview could suit best for this study to open up a close look into the worlds of the food chain actors. The focus here is upon their concepts, understanding, activities and mutual relations but not in an unfocussed way; the food system is the common point for departure and the area surrounded by the speech. Interviewing is an art of staying close to the respondent and simultaneously allowing him/her the space to speak and during the speech to explicate things which have not been explicated in the same way earlier. The basic principle would be to allow the interviewees to make their sphere of concepts and activity visible and through this visibility to define and even create the field of their activites, social relations, the interorganisational and chain level, their history and future, difficulties and conceptions concerning different modes of production. Interviews can be held at the respondents' premises or at Helsinki University Institute for Rural Research and Training. Interviewing is easier when there is experience about the settings in agro-food sector, the words, expressions and their interpretations.

These texts can be approached by content or discourse analyses, or both. Content analysis means categorising topics or selecting words on the basis of research interest , often in order to test a hypothesis. Especially content analysis carries an air of rigor, and of these two it can be thaught to achieve that rigor with partly mechanistic keeping to single words, counting their presence at certain defined instances according to speaker, audience, situation etc. In this way content nalysis offers a structured, very directly text related view of the phenomenons described in the text. Also the numerical and statistical way of presenting results supports readers' orientation to results. (Holsti 1968). Bos and Tarnai (1989) clarify the content analysis in a flow diagram, which makes clear that the 'qualitative difficulty' of defining the object of study is inherent in content analysis - as well as in discourse analysis. Of the many variations of content analysis (Bos and Tarnai 1989) the ones combining well based qualitative categories with statistical methods could offer this study a close look into the occupational in the food chains. Especially different statements about concrete world of labour, ideas of production methods and contact points could help to build up the inside view of the operations of the food chains.

Moving on from the situational view as described by content analysis to discourse analysis could offer societal and cultural views about the food chains. Parker (1992) offers a realist reading of discourses; he understands them as describing intertwined social and material reality, where the material cannot be separated from the social. Parker (1992, 23-41) maintains that studying discourses is investigating how they reify and change the social and material world; discourses effect upon how the material world like food or nature is perceived and how the societal rules about it develop. Actually, the social often speaks 'materially' in many different ways. Discourse analysis dealing with meanings given to the material flow of food, its environment and the actors in the food chain makes possible to see the positions of the actors and their ways to perceive the food chain and change it. This approach of ontological constructionism taken to discourse analysis is a realist one, where the material reality is thaught to be reflected in the speech (Juhila, K. 1999). Especially the dimensions of production, labour and nature – although dealt with as categories of knowledge – are considered to be present in texts by actors producing the texts and by readers understanding the text as references to the material and social world. The shared meanings, dominant and challeging concepts can open up future optional developmental paths. Discourse analysis, from the point of this study, offers the cultural permeated by the subcultural, which reveals dynamics of larger societal scale in the food chains.

Knowledge and position crystallised in the social structure of the food chain

Methodology and methods must be estimated on the basis of their ability to answer the research questions. Methodologically speaking, thematic content analysis combined in matrix with knowledge type analysis looks promising when we want to understand what are the relevant themes and what kind of knowledge they represent for the food chain actors. When collecting this data from the contact points in the food chain, we come to the social interchange of knowledge in the food chain. It is expected, that this analysis makes the connectedness by knowledge of the food chain visible; there may areas of dense interchange of knowledge, and then again areas of disrupted interchange of knowledge. Perhaps some relations function well concerning knowledge interchange, some again not; reasons for this situation would be interesting to analyse. Possibly some of the chains could be shown to have a thorough flow of knowledge. Here it is assumed that operations become easier for the chain actors when they have access to operatively important knowledge.

The plans for future are crucially interesting when the chains are looking for ways to survive and even to grow. Thematic fields concerning future activities and the types of knowledge referred to can reveal something of the restrictions and possibilities, their reasons, consequenses and norms. This information could help extension to analyse the needs for knowledge and skills for the actors of the food chain. Also possible networking for knowledge could be activated in the food chains when the actors perceive themselves in a new way through the research.

The local food chains are not independent of the surrounding society. The activities and development in the food chains are connected to societal structures and ideas about different production methods. Discourse analysis is used to open up these enlarging cultural circles (Juhila 1999) and it is expected, that the food chain actors both participate in common perceptions of production methods and their position, partly challenge these. Partly the knowledge themes and types can be used to describe the discursive dimension, which represents developing cultural understanding on the chain level. The controversial discourse about the current and future position of conventional, organic and local food as well as gmo food will be concretised by knowledge categories. The rise of themes and their struggle to be present in discourses, their transfer and cementing to organisational, interorganisational and chain level knowledge means qualitative changes in the local food system. The sites in the chains where these fenomenons become visible, are interesting sources for 'turbulence'. Perhaps there are even 'turbulent' chains in relation to societal perceptions.

It is not enough, however, that the methods in themselves are suitable for answering the research questions; they must be valid and reliable. The huge issue of validity and reliability is not taken up here. Huber (1989) maintains, that quality and quantity are complementing one another. This research represents the view that quantity and quality are dimensions of the same phenomenons, often quality forming the core of quantity. Quality is actually what is being measured and quantitative results are often interpreted in a qualitative way. Yet food chains need to be studied qualitatively as well, and these qualities have certainly quantitative dimensions, to be studied in future studies.

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From farm advisory work to new practices facilitating learning in rural areas: The case of a saffron association in south-west France

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Abstract

Over the last twenty-five years, agriculture has been shaken by several crises and as a result has undergone shifts - first from a productivist approach to quality production, and now also to multifunctionality too. This shift is bound to affect the practice of agricultural extension workers and advisors. Agriculture has now to demonstrate its legitimacy, with development agents no longer being able to rely on their initial training alone: they need to have additional skills of their own and to invent new practices to match the situations they are encountering.

This paper is based on a particular case – the revival of saffron production in a small region of south-west France – which we consider a good example of these new challenges for agricultural development, since traditional advisory work would not have been possible here.

We analyse the collective action process, while focussing on the facilitation practices of the development agent seconded to the saffron association.

We describe the two main principles which seem to underlie this agent's success, namely being a facilitator within an interactive knowledge network, combining different types of knowledge and learning modes.

The analysis of the saffron situation, together with other work we have done with development agents and instructors, raises three main issues encountered by these agents, all to do with new types of learning for those involved in rural development.

Introduction: facilitation at stake in industrialised countries

With 35 producers, half of whom are not farmers, for a total of 3 kilos of saffron produced per year and, sold at a price of 30 euros per gram, saffron production in the Quercy area (in south-west France) is hardly a typical example of traditional agricultural production… In addition, an 'agricultural advisor'[1] of the local Chamber of Agriculture has been seconded to a saffron association, which makes this example seem even more like a fairytale than an innovation. Our purpose is therefore to show why this example is in fact a relevant case (Mitchell J.C., 1983) of new practices and ways of learning that are emerging in agricultural development. In particular, an analysis of facilitation practices in this particular case allows us a better understanding of the shift from 'agricultural extension' to 'rural facilitation'.

Over the last twenty-five years, agriculture has been shaken by several crises and the role – and title - of development agents in charge of facilitating agricultural activities in the rural world have changed a lot (table I):

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1 'Agricultural advisor' ('*Conseiller agricole*' in French) is usually the official name given to development agents from Chambers of Agriculture.

- The first crisis concerned the legitimacy of the productivist scheme in the farming sector itself, as it appeared to be a model that did not suit all types of farmer (Jollivet M., 1988). Based on a management perspective, the response of agricultural sciences has been to widen their scope of interest from agricultural activity to farming systems (Osty, 1978): producing knowledge to maximise yield was no longer sufficient, extension workers had also to take into account farmers' objectives. They then had to widen their scope from 'technological packages' to the whole farm, shifting from being 'extension workers'[2] to being 'farm advisors' (table I), whose job was to help farmers solve management problems (Cerf and Hémidy, 1999). Social justification of development then moved from 'legal rationality' (complying with the norms of agricultural productivism and good practices defined by agricultural sciences alone) to 'result rationality' (complying with criteria defined by the people involved in the process: producers and clients or consumers) (figure 1).
- More recently, society's demands on farmers are being reformulated, by development institutions and researchers, to include two different notions: multifunctional agriculture (Hervieu, 2001) and social accountability. In particular, farmers are being asked to deal more with local/regional concerns (kinds of landscape suitable for recreational and tourist activities, patrimonial issues, among others) and with environmental aspects. Communication with society at large, while reasserting ties with the local/regional base is becoming not merely an extra issue but a fundamental one. All these changes are bound to affect the practice of development agents. Social justification of development action then moved again from 'result rationality' as defined above to 'consensus rationality' (negotiated 'here and now' with the local community as well as society as a whole) (figure 1). Good practices defined from a management perspective in order to fulfil environmental and societal requirements viewed as 'external' criteria, were no longer sufficient nor legitimate. Agriculture has now to demonstrate its legitimacy, and its value to society in the broad sense and also within a particular local community. Development agents who previously established their own identities as 'farm advisors' or even as 'extension workers', can no longer rely on their initial technical or management science training : they now need to develop additional skills of their own which we can call 'facilitation skills' (Röling, 1998).

Table I: Roles and designation of development agents over the last twenty-five years

Knowledge and facilitation issues	**Terms used to describe development work and development agents**
Technological packages for production processes to maximise yield	Agricultural extension, extension workers
Farm management: combination of technical means to meet farmers' objectives	Farming advisory work, farm advisors
Rural development	Rural facilitation, rural development agents

[2] The term 'extension' arises from a particular tradition – form the North American land grant university model meaning 'to extend knowledge from a centre of learning to those in need of this knowledge' {Ison, 2000 2611 /id}.

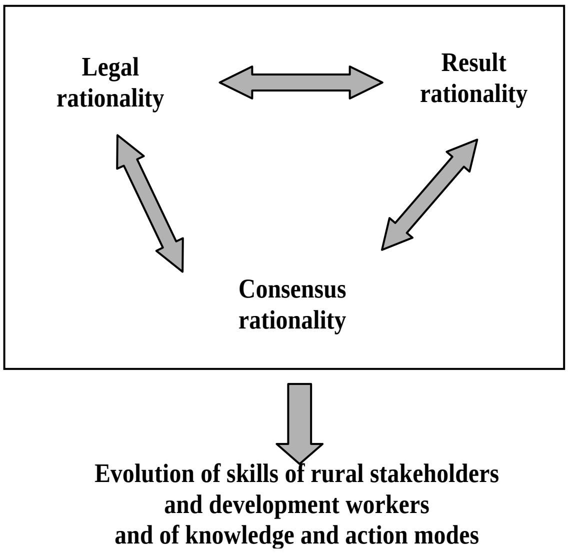

Figure 1: New ways of legitimizing public action (Albaladejo, 2004)

The point we want to put forward in this paper is that these new 'facilitation functions' are no longer functions of 'experts' nor 'specialised technicians': they are first of all functions of the community as a whole, which we have to consider as such in order to be able to understand the emergence of new development métier[3]. This is why we prefer to analyse the facilitation process as a whole, instead of focussing solely on one development agent. The purpose of this paper is thus to illustrate that facilitation in rural development relies nowadays on interactive knowledge networks, which means a large number of stakeholders (including a development agent involved in facilitation), organisational features and procedures. We will then emphasise the role of the development agent in this system, showing that this kind of professional will play an essential role in such a mediation process, in the design stage as well as the implementation stage.

We first describe our case study, the origin of the collective project and why traditional extension or advisory practices would surely have failed. We then analyse the practices and position developed by the people involved, particularly the development agent, in order to facilitate this collective action. Lastly, we draw a parallel between this case and the problems encountered by other rural development agents, with particular emphasis placed on new types of learning for those involved in rural development.

Our case study: an exemplification of the general context

This study is part of a broader research project on facilitating agricultural innovations in rural world. For that purpose, we have been observing this saffron project since its beginning. Moreover, our analysis is drawn from data collected through 10 long interviews we realised with the main actors of this project in 1999, and then again 10 long interviews once the collective institutions have been functioning and the project engaged in quality proceedings.

[3] Following (Schön D.A., 1994), we distinguish the "profession" (involving the application of general principles to specific problems) and the "avocation" ("métier" in French), because the latest is based upon customary activities and modified by the trial and error of individual practice

1.1. Saffron production: why and how?

Commercial growing of saffron disappeared in Quercy with the French Revolution of the 1790s. Individuals passed saffron bulbs down through the generations, but there was no longer a saffron crop in this region (Helfer S., 2002). In 1997, a cultural and patrimonial association established in Quercy set out to start growing this spice again. However, saffron ordered from a Dutch plant breeding cooperative was not in fact saffron (*Crocus sativus*), but another variety of Crocus. This non-agricultural association then sought help from a 'farm advisor' from the local Chamber of Agriculture. They subsequently decided together to expand saffron growing, bringing in many more partners from both agricultural and non-agricultural sectors[4]. As the organisational side of the project grew, they set up a local body (*'Association des Safraniers du Quercy'*[5]) involving a wide range of producers and growers[6] (farmers, non-farmers, hobbyists, etc.) as well as local tourism organisations and a local agricultural cooperative.

Since saffron growing in Quercy is tied in with developing the region’s specific image, two trade and cultural fairs are held every year to promote the spice, and a quality drive has been organised to obtain French (Label Rouge) and European (PGI[7]) certification.

As a result, two part-time jobs have been created: for a farm advisor from the Chamber of Agriculture and for a saleswoman employed by the cooperative. Saffron growing is now a side activity for forty producers and several craftspeople are also involved.

1.2. Facilitating the project: the predicted failure of traditional development practices

Several aspects demonstrate that facilitating this project is not a straightforward matter.
First, the lack of scientific knowledge, for instance about saffron growing and storage (Viard, 2001), shows that science cannot be counted upon (Girard and Navarrete, 2004). This means that extension services lack technical packages for the crops, and are not able to prescribe any standard practices. Some authors have shown that advisory work necessarily implies a prescriptive attitude (Maxime and Cerf, 2002): the lack of technical knowledge of saffron production makes farm advisory work impossible in this type of development procedure. In such situations, the role of a development agent is not to focus his action on the solution of a specific problem, but to help a local group, not only farmers, to deal with the more complex process of building collective skills. This approach is very similar to what authors like Röling (Röling N., 1994) call 'facilitation'.

Next, the saffron group is a loose voluntary body rather than the usual farm-sector group or syndicate. The diversity of its members is striking, in fact, with teachers, pensioners, motor mechanics and employees of various local businesses alongside the so-called 'professional farmers' employed full-time in agriculture and for the most part heavily involved in sector-based organisations. Besides, this project demonstrates that 'agricultural activity' nowadays has a much wider scope than 'farming activity',

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4 This dichotomy among rural partners may seem rather crude, but it has been present in all rural development representations for over a century since all non-agricultural activities were excluded from French rural areas (called 'agriculturisation' of the countryside by some authors), and it has only very recently been questioned {Hervieu, 2001 2709 /id}.

5 http://www.safranduquercy.com/

6 Among the members of the Association, it is worth distinguishing the 40 'producers', aiming at selling saffron, and the 100 'growers'; growing saffron without any commercial objective, and we will use these two different terms in the rest of this paper.

7 Protected Geographical Indication.

because in this age during which agriculture is not the only activity recognized in the countryside (see n°4), agricultural activity is also carried out by non-farmers whose involvement in this area is increasingly being recognised by development institutions. We would therefore have kept Röling's idea of 'agricultural facilitation', if it were not for the fact that facilitation, as the saffron project clearly shows, has to reach beyond agricultural activity and resource management, to include all rural activities: this is why we prefer the term of rural facilitation.

In the saffron project, there is a corresponding mix of technical and social aims among the members, and this too is bound to modify extension practices. For most of them, growing saffron is a social rather than an economic activity, but none of the 35 'producers' consider the economic dimension to be irrelevant. The facilitator will thus need to place at least as much emphasis on inclusiveness and cohesion of the group as on the production aspects.

Results: innovative practices and attitude developed in the course of action

As we want to show that facilitation may not be the prerogative of just one central facilitator, the term 'the farm advisor'[8] will be used when referring to the development agent[9] from the Chamber of Agriculture who is working with the saffron producers' association.

1.3. Facilitating a project throughout its development

Even if the various stages may appear to be separated, while in practice they are combined, the project's progress can be described in 4 partially concomitant stages (figure 2) (Labatut J., 2003). We examined facilitation practices throughout these different stages.

- The **starting point** of this facilitation process was in fact the problem encountered with the Dutch bulb supplier and the involvement of the Chamber of Agriculture, then establishing contact between patrimonial and agricultural worlds;
- The **first stage** involved **forming a group**, by establishing trust among the different participants involved in the project. The farm advisor had to get to know each person involved in the project, his personal history and facilitate meetings. Conviviality is therefore an important value in group facilitation to enable successful debates. This mutual understanding between participants and the farm advisor enabled him to help the group to define individual roles and responsibilities, calling upon the skills of each. Rather than being a sole authority, the advisor is a facilitator who distributes the roles and helps individual or collective initiatives to emerge and to be recognised by others.
- The **second stage** of the project was to **get local institutions to recognise the project**, in order to ensure legitimacy and provide a solid basis for its development (Labatut J., 2003). This " local institutional strengthening " (Hagmann J. et al., 1996) is seen by these authors as the 'major focus ' of a facilitator's activity. In fact, the farm advisor working with the saffron association got in touch with numerous people in various fields such as tourism, commerce, and the craft industry, and also people in political circles in the Lot Department and Midi-Pyrenees region. He then managed to

8 As we already mentioned, this is the official title of his position in the Chamber of Agriculture. However, as we will argue, it does not fit his real activity and personal identity.

9 Drawing our analysis on interviews we made with him, we will use the male gender to refer to him. In wider observations in Argentina, Albaladejo (2003b) observed that young women are more numerous among the most "innovative" rural development agents (actually the ones who develop new attitudes and professional identities and also who are working for the "new employers" of rural development such as municipal government, city administrations). But it was not our objective to analyse here this gender issue.

enlarge the scope of the project by involving a number of people who had no initial link with saffron or any agricultural activity. In this way, he created a network which was essential for the proper development of the project. Actually, this stage began at almost the same time as the 'forming a group' phase, because right from the start, the farm advisor needed political support from both within and outside the Chamber of Agriculture in order to go on working on this 'non-traditional project'.

At this stage of the project, the saffron fair organised on the advisor's initiative and with his help provided an opportunity to:

- structure the saffron producers’ group and reinforce the links between members by proving to them that they were able to organise a concrete collective action;
- play a role of ‘shop window’ for the project to attract and influence local and regional political circles.

This dual role of the fair (both internal and external) shows that the advisor was active on two different levels at this time: this is why we consider that the first and second stages were concomitant.

- The **third stage** was the **development of the project** itself: seeking to achieve professionalism and an increase in production, and organisation of sales and marketing. Because of the lack of data and knowledge available about saffron production, specific procedures needed to be adopted to capitalize knowledge and for experimentation purposes. To this end, the farm advisor first made an inventory of saffron producers, and then set up a survey network to list producers’ practices and results obtained. Meetings based on these data were then set up to facilitate discussion and learning among producers at the end of each campaign. Moreover, training meetings about peeling techniques and field tours were organised during the harvesting period, notably for new growers. At the same time, a professional firm (an agricultural cooperative) was involved in the project to ensure efficient marketing of the product and luxury packaging was also created.
- Lastly, in the **current stage of formalisation,** where it is hoped that the product will gain recognition by the French Government as a 'higher quality product ' ('*Label Rouge* ') and by the EU as a PGI[10], the advisor has contacted the relevant partners (IRQUALIM[11]). He has helped the group draw up technical specifications, while taking care to ensure that growers retain sufficient freedom and innovative space to preserve their motivation.

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[10] cf n°7

[11] IRQUALIM = Regional Institute specialised in quality signs for agricultural products of the Midi-Pyrenees region.

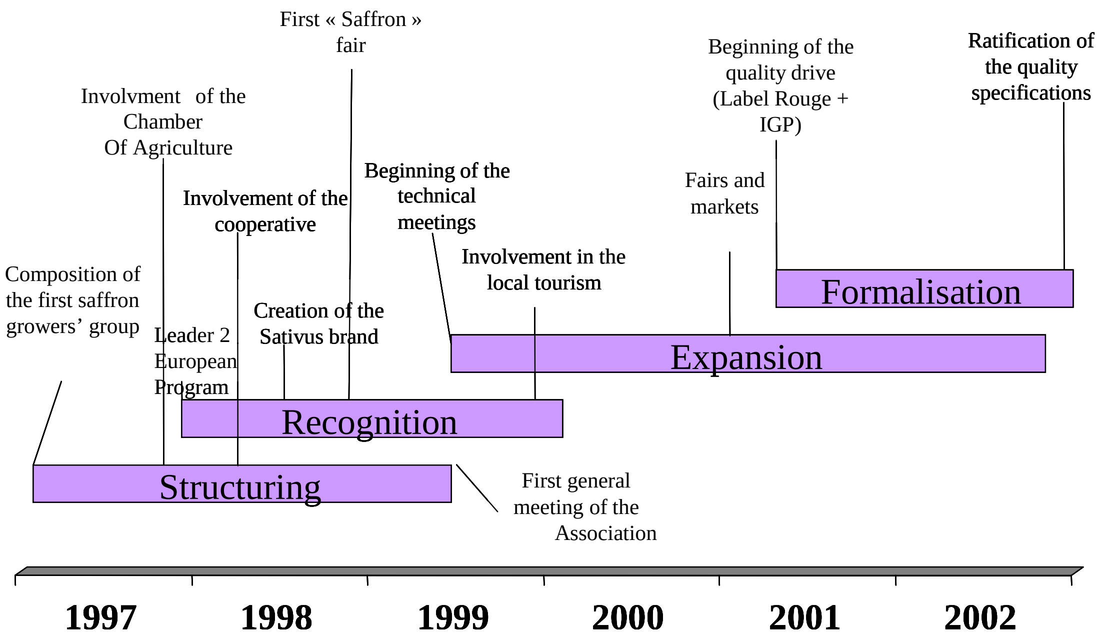

Figure 2: Four stages to describe the progress of the saffron project

What we can see from the history of the project is a dual and vital process of institutionalisation:

- on **a territorial basis**, thus dealing with local elected representatives and territorial institutions (county, local private associations, etc.);
- in the **professional** agricultural area (Chamber of Agriculture, cooperatives, etc.) dealing with corporate elected representatives (who are more numerous than, and different from, local elected representatives).

None of these legitimisation processes can be postponed. The consequence is that rural development can no longer be restricted to the well-established agricultural professional world. Not only professional skills and knowledge are at stake, but also private skills and knowledge (Albaladejo, 2003a). This situation is highly unusual for a 'farm advisor'. We think that, in the Quercy saffron project, the farm advisor is helped in his function by his past experience in mastering complex pedagogical situations.

1.4. Action principles and problems

From the project progress, we can identify two main action principles which seem to underlie the farm advisor's success.

1.4.1. The fact that he is facilitator within an interactive knowledge network and not a sole expert interacting only with farmers

Firstly, he has negotiated an original position in which he is not an expert, but a facilitator.

The position he adopts in his activity is neither prescriptive nor offering technical diagnosis (traditionally ending in recommendations being made). Both approaches would be untenable in view of the lack of technical knowledge about saffron, and also the way people relate to the saffron business and knowledge of it (establishing their own identities, a partly private relationship, etc.). On the contrary, the facilitator is constantly trying to find way of helping the participants to manage their projects in a totally or partially autonomous manner. His position is clearly one of a facilitator aiming at coaching participants in a project, trying to reach a consensus and using a communicative strategy rather than one of 'teacher'. His role is not to impart knowledge, but to help partners coordinate to acquire and synthesize knowledge from different sources (Hagmann J. et al., 1996). This kind of facilitator thus has a 'facilitating project logic' (Laurent et al., 2002) . The principles used by the farm advisor in the saffron project also resemble what Röling and Jiggins (1998, p. 306) are hoping for in an 'ecological knowledge system': *"A key feature of facilitation is that it can only be partially based on technical expertise. A major component is the enhancement of interactive processes for social learning, negotiation, accommodation and agreement. This means that facilitators must be well versed in both technical expertise and skills and in social science expertise and process skills*".

Besides the saffron producers' association, it is obvious that progress, particularly concerning the management of saffron growing, does not depend exclusively on research or on producers themselves. On the contrary, progress will rely on the multiple participants of an 'interactive knowledge network', taking up the idea put forward by the OECD, for whom Agricultural Knowledge Systems have gone from '*a model of unidirectional generation and transfer of knowledge […] to a model of interactive knowledge networks with multiple participants' (OCDE, 2000).* One may find the same idea in the concept of *'multi-stakeholder learning platform*' (Röling N., 1994) (Kibwana O.T. et al., 2001)). In fact, the Quercy saffron producers and their farm advisor are part of a network with diverse partners, such as a regional institute specialised in quality signs for agricultural products (see n°11), a research centre which leads agronomical experiments, chemists at Toulouse University undertaking sensorial analysis of saffron, and the regional tourism committee to ensure the promotion of saffron. All participate in some way, in acquiring knowledge of saffron and its cropping. For the facilitator in charge of the project, it is a matter of being able to interact, to initiate a dialogue and even to negotiate with very different partners, who are far removed from the technical aspects of saffron cropping. The last point may refer to the place of technical knowledge in the avocation of development agents; it should not be as predominant as it was in the past, according to authors such as Röling and Jiggins (1998), because agricultural questions can no longer be treated from a narrow sector-based perspective. The scope of action for the development agent is also broadening to what Giddens called situations of 'co-presence' (Giddens, 1984), and does not remain restricted to situations of 'face-engagement', which are only one type of 'co-presence' (involving gatherings, social occasions, unfocussed interactions and routines). In this respect, the evolution from former agricultural extension to farm advisory work has somewhat limited the social situations in which development agents exert specific skills. The time now seems right to broaden their professional scope again.

As a consequence, the farm advisor does not have a monopoly on project facilitation, even if he has this official role. The President of the association, the cooperative director, and other participants – whether or not they are saffron growers - also participate actively, taking initiatives, engaging in actions, and taking on responsibility. This is in fact the explicit position the farm advisor has adopted and he has constantly to re-negotiate it in relation to the actions of other participants. By facilitating dialogue and free expression within the group, the farm advisor encourages individual and collective ability to find ideas and to elaborate knowledge, enabling participants in the project to respond to new situations. It thus seems natural that saffron growers have become very involved in the project, even coaching newcomers or implementing their new ideas by themselves.

Beyond these participative practices, the advisor's aim is to ensure the long-term viability of the project. For this reason, he has always kept the group open to newcomers and to the participation of outsiders. In this way, he wants gradually to pass on his responsibilities to other people, in order to make the group autonomous.

This situation seems to us a very good example of what facilitation in rural development should be: successful facilitation requires a whole network and not a single, central individual. This leads us to suggest using the generic term 'rural development agent' (table I), instead of 'facilitator'. Facilitation is a skill and a function that this agent has to develop in addition to other skills, among other local partners, to ensure the success of a mediation process between a local community and external development structures and partners (see the notion of 'territorial project', Kayser, 1994).

This implies a significant change in the role and professional identity of the development agent. When we chose the case of saffron production, we knew that this production, although supported by the Chamber of Agriculture, was on the fringe of the professional AKIS[12] based on traditional agricultural production on farms of more than two equivalent workers and by full-time farmers. We make the assumption that professional institutions, like the Chamber of Agriculture or the cooperative, would probably feel more 'comfortable’ supporting radical innovations in saffron production, i.e. innovations that could change the hegemonic position of the professional AKIS. Some leaders and officials of the 'professional' system are aware that the AKIS has to change, which is why some 'social experiments' may be accepted on the fringe of the system. However, this remains risky for the evaluation and careers of development agents who agree to get involved in these 'experiments'.

1.4.1. Types of knowledge and learning modes

The interview held with the farm advisor in charge of the saffron project confirmed that he explicitly encourages the expression of all types of knowledge and that he combines different learning modes.

Contrary to the traditional one-way contribution of information, he facilitates the confrontation between different types of knowledge. For him, legitimacy of knowledge does not come solely from science but also from activity, requiring that scientific and empirical knowledge be blended in 'hybrid knowledge' (Girard and Navarrete, 2004). For instance, he manages to allow expression of different types of knowledge during saffron growers’ meetings, including less documented areas such as the moon’s influence on saffron production, which would be marginalised in professional agricultural circles. He also set up an experimental project with a local research centre to test the assumptions made by growers about the connection between technical operations and saffron yield. All saffron growers, whether or not they are farmers, are recognised as being able to further knowledge of saffron and saffron production simply because they grow saffron. Therefore, there is a transformation of the relations between the farm advisor (usually introducing a rational and scientific perspective on a crop) and growers, here recognised for their pragmatic and empirical point of view: in this situation, expertise does not come from the advisor, but from the growers themselves, putting them in a situation of potential cooperation instead of dependency. But on the other hand, such a situation may be new for development agents who have not always acquired maieutic skills.

Furthermore, the farm advisor combines deliberately different learning modes within the group of saffron growers. Firstly, since the beginning of the project, he has organised a process of formalisation, favouring in this way a 'cognitive learning mode' (Ingham M., 1994). For example, confronted with a problem of endless discussions between growers, he tried to normalise the observations made by growers by establishing observation units and a chart synthesising the results obtained, the soil conditions of each plot and the cropping practices, for each planting year. Initially, it was a way of establishing a 'common ground' (i.e. assumed mutual beliefs and mutual knowledge: Clark and Brennan, 1991) among growers: their diverse socio-professional origin had created a gap between their individual knowledge bases and such a gap is known to limit learning possibilities in a heterogeneous group (Ingham M., 1994). But this normalisation activity was also a way for him to create 'mediating representations' (Ford et al., 1993) in which observation units and charts on production results become 'soft models' (Checkland P., 1981), facilitating communication among growers.

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[12] Agricultural Knowledge and Information System (see Röling).

He also organised observation situations ('field tours' of saffron plantations of each grower) and collective actions (peeling training sessions), encouraging an 'experimental learning mode' (Ingham, op.cit.) Based on the idea that growers need a common experience (in the sense of (Kolb D.A., 1984) in order to understand each other, these two types of meetings allowed participants to exchange ideas while observing and practising together. This is close to the idea of Local Professional Groups (Darré, 1988) or the concept of 'pasture walks ' (Hassanein N. and Kloppenburg J.R., 1995), leading to the 'horizontal organisation' of exchanges (i.e. between producers) concerning experiential knowledge. According to these authors, the exchanges are spontaneous and do not need any guide: individual knowledge can then be extended and socialised. However the example of the saffron association allows us to point out that socialising knowledge in this way may be neither easy nor spontaneous. On the contrary, we would like to emphasise the crucial role of development agents, whose job is not only to stimulate knowledge production in a group of peers as claimed by Ruault (Ruault C., 1994), but also to be a mediator between different forms of knowledge in heterogeneous groups.

Discussion

1.1. Main issues for new extension practices

It is difficult for an extension worker to handle such a position and many problems can arise:

- First of all, it is difficult to **legitimate a position of mediator** with an employer who is used to agricultural projects. The mission of the advisor seconded to the saffron association is very different from the activity of institutions such as French Chambers of Agriculture. The presence of non-farmers (requiring the advisor to expand his network of 'clients') and the importance of issues external to the agricultural domain (namely patrimonial or cultural issues related to saffron) are not readily accepted by institutions which are strongly linked to the agricultural sector. To make this transformation easier to accept, the advisor has to be very careful to get institutions to recognize the interest of the project (cf stage 2 in the saffron project).
- This **diversity of the people** involved in the project is also difficult to handle. When participating in groups the farm advisor is usually the person to whom farmers submit their ideas before discussing them with the group. In the saffron group for example, non-farmer producers are not used to this approach and do not recognise the need to go through the advisor before any collective discussion. Initiatives and ideas proliferate, which makes it difficult to keep the project going in a channelled, coherent direction.
- Likewise, without a facilitator, individual initiatives remain isolated and cannot be compared: the group cannot learn from the results or observations obtained. Facilitation is thus a crucial task, which also relies on the **balance between facilitation and independence** of the group. It is difficult to help a group while maintaining some distance from the project, so that the group can continue on its own without the facilitator.
- Although **tacit knowledge** may be expressed, as in the saffron producers' group, it is often difficult to make use of it. For example, the saffron advisor focuses his technical work on raw data regarding yield, but recognises that it is impossible to draw any conclusions from it which may help producers to manage their crops. This is similar to the point made by (Nonaka I. and Takeuchi H., 1997), for whom tacit knowledge is the most difficult to share and would necessitate a formalisation process which could distort it. Moreover, recognizing that empirical knowledge has a value in such a process constitutes a major change in the way an AKIS legitimizes knowledge, which implies a different kind of participation and the emergence of a different kind of knowledge.

- Lastly, these development agents have to deal with different projects and different partners, which makes it difficult to **accumulate know-how and capitalise on it in a given area of competence** (Laurent et al., 2002) It may therefore prove difficult to train a facilitator of this kind.

1.2. New types of learning for rural development partners

The analysis of the saffron project, alongside other research we have carried out with twelve development agents and instructors[13] (Albaladejo et al, 2003), raises some convergent issues, all to do with **new types of learning for rural development partners**.

According to one instructor, agricultural advisors in the Chambers of Agriculture are now learning new skills in "*establishing relationships and communicating, organising and helping to elaborate strategy*". One Chamber of Agriculture department head summed it up as follows: "*we have to change our perspective, which is too narrowly focssed on farmers and farming*". These new trends are even clearer when it comes to personnel working for rural agencies. One of these people believes they have an advantage over agents working for Chambers of Agriculture, because they do not intervene solely for a specific theme in a given area (their activity is not restricted to the agricultural domain). However, the same person said, with what appeared to be a mixture of pride and disappointment, "*we are not specialists in any particular field, but we create ties with everything and everyone*". This point seems to be linked to the problem of non-recognition by local development professions even if product-specific procedures and more institutionalised approaches have given agents some recognition. This problem of recognition appears to be even more acute in Chambers of Agriculture: "*it's not very rewarding work*" said one rural development department head, "*we're a little like GPs […] we are supposed to be like an octopus with 8 arms and do everything* ". One response to this problem of identity, when compared to specialist agronomist colleagues, was to give rural development agents more specialised tasks to carry out, or *'side specialisations"* (e.g. river contracts, extension work in the management of permanent grasslands, etc.) which apparently do not need (or perhaps merit) full-time advisors. The idea is to give these rural advisors from the Chambers of Agriculture, their own '*technical expertise*', which some agents have referred to as a '*breath of fresh air*'. However, this type of response raises the question of whether this is not merely internalizing the fact that others, perhaps the whole profession, do not recognise development agents as having any particular status. This solution, which does not add anything the professional status of rural development professions, could in fact be a temporary or intermediary solution.

Several extension workers (among those who raised the theme of the crucial importance of group animation), farmers and more globally stakeholders and citizens in rural areas, stressed the fact that it is an '*exhausting activity*' or that '*it is not always pleasant to get on with*' ('*we are running out of steam*', '*too much commitment, all the time, it's tiring*', '*we cannot be perpetually hard at work*'. This is why they think it is important to '*know how to last in this profession…*'. They stressed in particular the importance of complementing the work with groups with work with individuals; this type of work also allows them to get to know better the people with whom they have to work. This is more feasible for the Chamber of Agriculture agents whose job includes individual follow-up advisory activities.

The answer is no doubt to be found in the development of collective skills, often referred to by the twelve people we interviewed. Rather than "*concentrating all of the skills in one person',* we should try to *'organise work collectively*", or, in other words, set up teams which combine skills.

[13] In the LEARNing project (entitled 'Learning in European Agriculture and Rural Networks: institutions, networks and governance), steered by B.Hubert and funded by UE, contract n° HPAM–2002-00056

Conclusion: towards an 'RKIS' for rural facilitation?

Through the case of saffron in Quercy, which we consider as a telling case, we have shown that the farm advisor involved in this project has undergone a dual shift, both in his attitude (being a facilitator, not merely an advisor), and in the scope of his action (moving from the agricultural world to the rural world).

We thus support the view that rural facilitation now relies on:

- situations of co-presence and not face-engagement;
- legitimacy of knowledge based on activity as well as science, requiring development agents to have the ability to combine the two types of knowledge;
- new ways of learning, combining cognitive and experiential learning modes and social learning, as well as organisational methods;
- interactive knowledge networks, connecting both global and local knowledge networks;
- a worldview of agriculture as being larger than farming, as well as a private activity, thus requiring development agents to combine private and professional knowledge

In short, the Agricultural Knowledge and Information Systems traditionally used for research on rural development (Röling and Jiggings) and relying on one facilitator seems to us too narrow to encompass all aspects of rural facilitation, perhaps pointing to the need to extend the concept of AKIS to become a Rural Knowledge and Information System (RKIS).

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Learning from change – A case study method to support learning and evaluation within systems projects

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Abstract

Farming systems projects are under increasing pressure from RD&E investors to be "applied" enough to improve the adaptation and uptake of research results and technology and so contribute to achievement of sustainable industry goals. One challenge is how to attribute changes in industry performance to farming systems projects. Another challenge is for the projects themselves to continually adapt to industry needs.

This paper describes a method of case study analysis used to meet these challenges in an Australian dairy industry milk quality and udder health project. It provides an overview of the method and includes some results. The strengths of the method were the extent of learning by project management through exploration of aspects of farm-level change; a greater appreciation of the processes of change associated with the project; and an ability to explain issues around change to project stakeholders.

The paper concludes with a framework for the choice of such a method for other farming systems projects, including its use for program improvement, development of new products and services and the development of skills and capacity within a project team.

Introduction

Since 1980 the Australian dairy industry has seen the number of dairy farms halve, milk production more than double, milk yield per cow rise by more than 40 per cent, the average dairy herd size double to 190 cows and milk output growth rise at 5 per cent per year (ADC, 2002). In this time the industry has undergone de-regulation and the opening of milk markets, has an increased focus on export markets (due to fairly static domestic demand) and removed regulatory restrictions on competition (free market policy). In 2003 (a drought year) 10,654 dairy farms produced 10.3 billion litres of milk and more than 50 per cent of this production was exported for a total value in 2002/2003 of $A2.5 billion. Australia accounts for 17 per cent of world trade in dairy products (ADC, 2003).

The Australian dairy industry vision for Research, Development and Extension (RD&E) is to have: *"A growing, internationally competitive, innovative and sustainable dairy industry through promoting a higher rate of improvement in farm productivity, promoting sound environmental practice and regulatory frameworks for farm and factory ensuring a strong R&D innovation base"*. (ADIC, 2002)

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Farming Systems RD&E

In Australia, a national (across States and regions) approach to farming systems research, development and extension has been justified by: the need to increase return on investment in RD&E and the rate of productivity gains in the farm sector; the reduction in, and restructuring of, government funding for extension; and an overall requirement to achieve triple bottom line outcomes (social, environmental and economic) (Crawford et al, 2003).

Farming systems research in Australia has evolved into a holistic approach, involving farmers, specialists and policy makers (Petheram and Clark, 1998). Researchers work with farmers and extension practitioners to ensure that research developments meet the needs of the end-users. There is also the recognition of a role for complementary social science to research the learning and understanding of user needs, and development and refining of learning opportunities (LEARN, 2001).

It is the complexity of farming systems projects, the need to continuously improve projects and to understand aspects of change that creates a challenge for evaluation. An analysis of the contribution of evaluation approaches to the demands of Farming Systems projects is presented next.

Evaluation approaches

Evaluation involves determining the worth or merit of whatever is being evaluated (Scriven, 1991). These judgements can be used to assess program impacts, improve program design or plan new programs. Owen (1993) categorises five main purposes of evaluation: evaluation for impact assessment, evaluation for program management, process evaluation, evaluation for design clarification, evaluation for program development. Most authors agree that the evaluation strategy and the form of evaluation should be considered prior to selecting methods.

A review by Dart, et al (1998) suggests that many evaluations of agricultural programs are driven by a focus on summative evaluation, i.e. focused on program or project impacts at or near the end of project life. The authors encourage closer examination and uptake of formative (program improvement focused) and qualitative approaches that can assist project innovation. In this vein, Flood (1999) suggests that different possibilities for improvement can be located by examining four areas: Project processes (i.e. the reliability of flows of events and control over flows of events); Project structure (i.e. the effectiveness of functions, their organization, co-ordination and control); Project meaning (i.e. people’s viewpoints on the meaningfulness to them of what is going on and choices of improvement strategies); and Project knowledge-power (i.e. fairness in terms of entrenched patterns of behaviour where what is said to be valid knowledge and proper action is decided by powerful groups). He suggests these categories help locate types of issues and dilemmas encountered in project (and organisational) life.

Such an approach appears appropriate for complex farming systems projects and provides insight to the areas (or windows) for exploring “whole program” improvement. What is missing is a guide to specific steps (method) that a small team of people could develop for project improvement. Some authors criticise what they see as “methodological domination” of evaluative thinking towards *how* an evaluation is done (methods focus) instead of *why* (purpose focus) (Green, 2001). Alternatively, we would argue that evaluation methods should enable the purpose to be continually informed. What is required is a theoretical framework to explore the relationship between purpose and method in evaluation. The framework that is suggested is based on practice theory that has as a central tenant "doing" as a basis for learning.

The "practice" literature and its relevance to evaluation

"Practice" (eg. the practice of evaluation, the practice of farming) is a social domain of action where *doing*, not knowledge is central (Gremmen, 1993). A "practice" theoretical approach sees the people (farmer, scientist, adviser) as actors in many practices, with these practices being social domains of action. The motivation to attain a competent level of performance within a practice comes from the reflection on and comparison of an individual's current performance with what is defined as being competent. Such performance within a practice is rationalized and improved through the interaction with other practices.

In order for researchers, evaluators or project teams to enter into communities in ways that facilitate the gathering of information on learning processes and practices, observations of the rules[1] which describe and define action[2], an understanding of the people who take the action and the context within which they operate are required (Paine and Kenny, 2002).

What does this mean for projects looking to evaluate their performance?

A practice approach begins by studying the learner's actions in a workplace setting or context. A practice perspective refers to the variations in performance among a community of practitioners as the basis for identifying new learning opportunities. A practice approach also observes performance as a result of a project by investigating changes in the practice itself.

In conclusion, a gap has been identified in the field of formative evaluation for the support of complex projects (such as farming systems projects). Practice theory was suggested as a theoretical framework that could support the development of a method to help project managers learn about project performance as well as refine their understanding of the relationship between purpose and methods in evaluation outcomes.

The next section of the paper demonstrates the steps in the development and application of a method that builds on practice theory to support the evaluation goals of a National milk quality project in the Australian Dairy Industry.

The context for the development of the method reported

As part of their dairy industry research and development role, the authors supported the Australian dairy industry national programs in project design and evaluation. One of the first National programs, Countdown Downunder[3], had recently completed the first three years of the project (Brightling, 2001).

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1 Rules are used here to refer to the guidelines that define membership of a community.

2 The focus in the evaluation and this paper is action rather than behaviour. That is, the focus is not solely on observable behaviour (eg. changing their teat spraying practices after the course) but on the subjective aspects of human activity (eg. their intentions in changing teat spray or what changing teat spray means to them and their overall orientation to milk quality). That is, the interest is in meaningful activity (termed action) rather than activity alone (behaviour).

3 www.countdown.org.au.

The Countdown Downunder project

In 1999 the Countdown Downunder project was instigated to promote best practice in terms of mastitis management on Australia's dairy farms. International expectations for milk quality were increasing, and with the high reliance on export markets by the dairy industry, the focus was on exceeding international standards. The project aim was to achieve progress toward a national cell count goal (90% of herd milk cell counts below 250,000 cells/ml and 100% of herd milk cell counts below 400,000 cells/ml), reduce the number of clinical cases of mastitis by 20% and contribute to sustainable and effective use of antibiotics in the dairy industry. The project design involved: the establishment of best-practice farm guidelines for mastitis control (developed by farmers, advisers and scientists); creating a regional advisory capacity for mastitis control and milk quality; choosing a new extension "frontline", promoting a multi-disciplinary approach to mastitis issues (promoting the "off-farm team" role whereby the different practices of farming, veterinary science, advisory services and technicians contribute to the achievement of goals); adding facilitation skills to technical strengths through a Countdown training team and supporting change toward best practice on farms through the Farmer Short Course.

The Countdown Farmer Short Course

The Countdown Downunder management team predicted that there would be two windows of opportunity to support change toward best practice on farm: firstly when farmers had direct one-on-one interactions with their advisers, and secondly when they participated in continuing education experiences designed to help them improve their management planning in mastitis and milk quality. This approach was underpinned by the recognition that the knowledge and skills to improve performance on farms already existed in the industry however these resources tended to be locked within disciplines and there was limited capacity for professionals to work together to solve complex, multi-factorial problems.

In 2000, Countdown designed the Farmer Short Course for farmers to develop practical plans to improve performance on farms. Although the Farmer Short Course was designed for all farmers, the project team recognised that many people were less inclined to participate in "formalised" learning. In addition, many farms consistently achieved low cell counts and low numbers of clinical cases. This was why the Farmer Short Course was just one element in an integrated approach that also emphasised the role of the off-farm advisory and industry support people and their capacity to give clear and consistent messages based on the best practice guidelines. A key target audience for the course were those farms with cell counts over 250,000 and/or high incidences of clinical cases (estimated at 25-35% of dairy farms[3]) and advisers were key people in motivating these farmers attendance at the course.

The course was designed to suit an environment where the milk quality specifications that determine farm goals are becomingly increasingly stringent and the need for plans to include on-farm teams is necessary given the expanding herd sizes increase and increasing number of farm employees. The Farmer Short Course (still being delivered across Australia) offers dairy farmers, managers and staff involved in milk harvesting resources to manage mastitis and a framework for using and integrating service from dairy advisers. It also encourages farmers to build a team approach to issues on their farms and to be comfortable about seeking advice from professionals.

Over the course, participants build a "Mastitis and milk quality action plan" for their individual farms using the Farm Guideline recommendations. In the final session each participant is asked to present the plan for their farm to the group. This allows others to contribute comments and increases the chance of individuals taking home plans that are meaningful and practical to implement. Since the start of Countdown Downunder, 77 courses have been held across Australia involving over 1600 farmers.

The basis of an evaluation method

In January 2002, the Countdown Downunder project had completed 6 months of their second funding cycle (2001-2004). Their focus was more toward working with the whole team of operators who influence farm performance (farmers, farm workers and external advisers) after the first project funding cycle (1999-2001) demonstrated strong progress toward industry cell count goals. The Countdown Downunder management team wanted to capture field experiences to design and promote high quality relevant services for dairy farmers, assess the impact Countdown Downunder has and is having on adoption of best practice on farms and describe the factors driving this change (AMAC, 2001). The purpose of the work therefore crossed the boundaries between formative and summative evaluation, and an interest in process (how the program is contributing to change in milk quality) and outcome (have desired outcomes been reached) evaluation.

The stated purpose of the evaluation became: *An evaluation of on-farm change through the Countdown mechanism. This will provide insight for stakeholders, the program management team, the regional managers, trainers and network members about the extent of on-farm change and the role of Countdown (particularly the farmer short course) and other factors in this change, as well as potential for improvement in the programs key domains of activity.*

To meet these aims the method was required to:
- study real farm experiences of milk quality management
- capture aspects of change in real time
- allow for learning at the program level
- enable understanding of the role of Countdown interventions in change.

Extensive quantitative and routine methods (surveys, statistics on cell count distributions, etc) were available to the project team to look at numerical change in milk quality across the national herd. For this study a qualitative approach that provided rich, first hand information was preferred by the project team.

Participants in the Countdown Farmer Short Course were highlighted as a key group of farmers at the interface of many of the project interventions. Although course participants represented farms that had a particular preference for learning in this mode and a particular issue with milk quality status (and therefore potentially viewed by some as “non-representative”), they were viewed as offering the greatest opportunity for project learning and the best way to access farming practice around milk quality and also allow exploration of the impact of the Countdown intervention and the relationship with the other practices involved in milk quality (i.e. technicians, advisers, veterinarians, farm employees).

Case studies

For Mitchell (1983: 191) the case study is *"the documentation of some particular phenomenon or set of events which has been assembled with the explicit end in view of drawing theoretical conclusions from it"*. For this project, case farms that had attended the Countdown Farmer Short Course were seen to be able to offer insight into general principles of change. It was considered important to the evaluation process to explore the ways in which respondents construct and report their views (Cassell and Symon, 1994: 1-12). It was also seen as necessary to explore processes of change through real-time (compared with a "one-off" capturing of information about changed practice).

Participatory research

A participatory approach was required between project management, the project team and social researcher in terms of data collection and analysis to ensure learning between the results of the study and the project team. This "action researching" approach is necessary to allow for learning and change to occur through the research. If the focus of the work was on practice – then changed practice, the way it is understood and the situations in which the practice is conducted is required (Kemmis and McTaggart, 2000: 595).

The method

Case farmers who attended a farmer short course were monitored over time to determine their achievements in terms of affordable milk quality and how the course, the use of the guidelines and the role of advisers contributed to their achievements (i.e. a focus on their *how* and *why*). The aim was to assess how the farmer short course influenced on-farm change (or not).

The data for these cases was obtained through semi-structured interviews with a selection of participants in the farmer short course from Southern Australia over 14-16 months. Cases were selected based mainly on a) a range of types of on-farm udder health problem experienced and b) the farmer approach to udder health management (ability to change, their concept of agency in change, beliefs about need to change).

Other components of case selection included a mix of characteristics in the following areas:

1. On-farm role (owner and family members, herd or farm manager, employees)
2. Participation in training in last twelve months (frequent participator in industry events, infrequent participator, non participator)
3. A mix of gender
4. Advisory network: (regular users of veterinary and advisory services, irregular users of veterinary and advisory services)
5. A mix of herd size (100-1000 cows)

The case selection criteria (above) was important as it allowed access to some farms that did not normally participate in "formalised learning" and were not necessarily involved in other dairy industry activities – offering key insight to what would normally be described as "non-participators"[4]. The case farms were chosen with the assistance of farmer short course trainers and regional project managers. The questions to case farmers revolved around farming practice in milk quality prior to and after involvement with the farmer short course and the place and role of Countdown resources. Questions that encouraged exploration of how case farmers grasped concepts and processes used in the course and the use of that knowledge were explored. The use of mastitis action plans and planning processes were examined over time, along with the role and contribution of advisers, the Countdown farmer guidelines

[4] A common issue in farmer programs is the concern that those farmers that have a particular preference for group learning or formal "course-based" learning are the target of many programs and not enough emphasis is placed on those that don't attend but may have a greater need for support. In this evaluation, understanding the processes of change on a whole range of farms allowed insight into the role of advisers in general – not just those participating in the course. However, further research in this area is warranted.

and seasonal events in change. Particular attention was focussed on any "outside routine" practices and how high and low performance and changed performance may be explained. All interviews were audio-taped and transcribed to allow for evaluation team analysis which occurred after each group of case farm interviews. Eleven case farms in total were studied over 15 months, with 4-5 interviews per case held within one week of finishing the course (face to face) and then during critical event times through the year (over the phone). Final interviews were held in September 2003.

"Insights to farmer progress" - Case study analysis

Two members of the project team conducted the interviews and these members, the project manager and social researcher were involved with analysis. After the first round of interviews, the group discussed the name of the evaluation task and decided on *"Insights to farmer progress"* demonstrating the importance the project team placed on learning from change that was occurring on farms as farmers implemented best management practice after course attendance.

Case study analysis involved reading through interview transcripts and identifying themes around changed practice and the role of the Countdown project. Each case study was then analyzed to look at change in milk quality status after course attendance and progress in putting in place their mastitis action plans. Key emphasis in the analysis was on the interaction between external events, actions taken by the farmers, planning, information sources and role of the on- and off- farm team in making progress.

The evaluation team examined the cases to observe change over time, what the stand-out features of the case were, what changes occurred and how and why (processes of change). From this, general themes, principles or concepts emerged from the cases. These were explored as they related to key questions of relevance to Countdown - they became the "Insights". These "Insights" came from the conceptualising of learning and practice change and the role of Countdown.

These "Insights" were then used to inform the development of future Countdown activities, supporting advisers in enhancing their capacity to respond to farmers, informed the project steering group on the necessary strategic direction of Countdown and informed aspects of farming system and extension project design and delivery in other National dairy industry projects. A diagrammatic representation of the method appears in Figure 1.0.

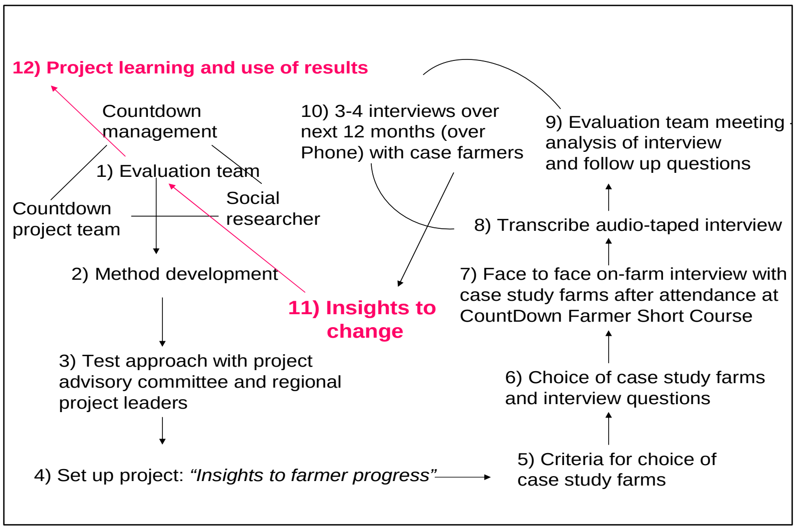

Figure 1.0: The development and application of the evaluation and learning method process in Countdown Downunder (represented as 12 steps)

Results

It is not the intention of this paper to report in detail the specific results of the evaluation work however, to demonstrate the role of the method in informing the project team and other practices, a summary of the findings and use of the findings from two case farms is presented here (Box 1.0 and 2.0).

Box 1.0 – A summary of results from Case Farm 1

The development dilemma

Steve and Carla milk 150 cows and are relatively new to dairying. Their farm is at a development stage and they are very keen to seek out lots of information. It was their vet who suggested they attend the Countdown farmer Short Course. As a consequence of their actions straight after attending the course they halved their bulk milk cell count, yet still had difficulty lowering the number of clinical mastitis cases at calving. They were having trouble prioritizing critical elements to success in reducing clinical cases with so many farm development needs, they were choosing easily implemented but partial remedies. They were not backward in seeking lots of information – however it tended to come from informal "chats" with various service providers and they did not develop a real sense of direction – more "clutching at straws".

This suggests that their "Mastitis Action Plan" developed from attending the Countdown farmer short Course provided a useful framework for action in milk quality, but given the overall dairy system issues, Steve & Carla needed a clear path to adviser support – not just in the technical needs – but support to help them implement and review their plan and goals. The key finding was that advisers need to be able to identify this form of need and position their service appropriately. Countdown could have a key role in supporting advisers in being able to modify and position their advisory practice to identify and meet the needs of different farm trajectories. This "relational practice" had not been a focus of any previous interactions between the Countdown project and advisers. In addition, the project, although having a focus on milk quality – by building advisory capacity in such 'relational areas" would build overall industry capacity in support to farming system changes.

How did the project use this case study for project improvement? This particular case was used in a presentation to over 400 advisers attending Countdown conferences around Australia to help advisers identify different needs like that of Steve and Carla. As a result, many advisers gave thought to how they can better understand and meet needs.

This case also demonstrated to the project team (and stakeholders) the importance of the combination of farmer course work, trained advisers and tailored advisory support. For instance, Countdown learnt about the importance of supporting advisory capacity in the farmer-adviser relationship (eg. advisers need to look beyond what the milk cell count is telling them and look to the needs of management, advisers need to follow up farmers after course attendance and help farmer planning and focus, veterinarians need to look to promoting their herd level rather than individual cow level competencies). Countdown began to look at project opportunities in assisting advisers identify the triggers and business opportunities around better identifying needs and meeting them.

Box 2.0 – A summary of results from Case Farm 3

Can an employee make change happen?

Jason is a new herd manager on a 470-cow farm. The owner has an active role in the farm on a day-to-day basis – however they tend to operate separately – with each having separate working times and tasks – a bit like "ships passing in the night". The owner also attended a farmer short course the previous year. Their cell count isn't too bad - sitting under 250,000. Jason wanted to reduce clinical mastitis during lactation and to maintain a BMCC below 200,000. They had implemented quite a few things since the course such as scheduling monthly machine checks, and taking immediate action to reduce clinicals through culturing milk samples and treating with the appropriate antibiotic rather than treating repeat clinical case cows with the same treatment. Jason's biggest challenge was to encourage the owner to allow more herd testing so better decisions could be made about problem cows. Jason's confidence in tackling the mastitis issues for the farm had increased through the course and he continued to re-read the farm guidelines. He was able to reduce cell counts to under than 200,000 fairly consistently for 6 months, however he was not able to convince the owner to do the extra herd testing. A year later

Jason had left the farm and took up an opportunity on his family's farm where he was working on improving milk quality there.

This case shows the issues around the on-farm team as Jason struggled to implement his plan and reach his goals because he was unable to communicate this to the farm owner. In addition, rather than a cell count goal, Jason really needed a plan that included how to achieve the goals with the owner. A jointly decided goal and the processes to achieve it would have yielded a better outcome for the farm. Therefore, his mastitis action plan could actually have been a mastitis "process plan". Course trainers could help this process more. What happened instead was that Jason's "personal goal" of under 200,000 was superceded by the owners goal of remaining under 250,000 – an "industry acceptability goal". This suggests the need for discussion and priority setting around goals – and the need to be able to communicate and "advocate" for a particular goal between owners and employees. Advisers can play a key role in this. Despite Jason not able to fully achieve the change he desired on the farm – the skills he picked up were transferable to the next farm – and the principles learnt were being used as a basis for new forms of change there.

How did the project use this case study for project improvement? This particular case was used to help trainers understand the different needs of employees (or others not in key decision making roles) in relation to achieving their goals and the need to have joint action plans. From cases like this the Countdown project is developing a new product targeting employees and milkers. The case is being used to demonstrate a different aspect of the impact of milk factory price signals on changed performance whereby a greater capacity may exist to achieve higher performance – yet the price signal can prevent this capacity being exercised due to perceived "no financial benefit" from lower counts. This case once again shows the key role of advisers in supporting processes where employees can feel they are able to adequately influence farm practices as well as their role in supporting people in achieving the (not necessarily technical) change they desire.

Across all the 11 cases, the project team was able to build a conceptual model of change in risk management and on-farm practices across the cases and the role and mode of influence of Countdown. They were able to demonstrate concrete evidence of change attributed to Countdown (impact), through the variation across the cases and to explain the relative impact of Countdown on different types of change (eg. in milk quality). This provided an opportunity to develop guidelines for improving the support given to farmers to cope with implementing management plans outside of the short courses – the "where to from here?" The cases also allowed the project team to critically assess the place of the project elements like the best-practice guidelines, the current level of adviser training and the place of the course and modify and plan for improved future approaches. Further, the multiple disciplines involved in change and understanding change (farming practice, veterinary/advisory practice, social research) meant a depth in learning about each others practice, evidence of change within the practices, an assessment of the worth of such a methodology and the valuing of the social research by each practice.

Time and resources involved

The organisation and administration of the method, conducting and transcribing interviews and analysis of cases took approximately 56 person days over 16 months. The across-case analysis and documentation of the "Insights" for different project audiences took a further 10 person days over 3 months. The eleven cases were sufficient to generalise across many aspects of the whole Countdown project because of the variation they covered and the depth of analysis. The area least informed is that of non-participants in the course and their relationship with advisers, Countdown resources and change in milk quality.

Strengths and weaknesses of the approach to guide future use of the method

The method provides a realistic response to the criticism of evaluation focusing too much on methods rather than purpose by simultaneously addressing both levels (the why and how of evaluation and project purpose and design).

By maintaining a focus on the "doing" (farm practice around milk quality) as suggested by the framework of practice theory, the project team was able to understand practice change (who is doing what and why, what practices changed and by what process).

The development of "Insights" occurred for all project levels: participants, industry, project and stakeholders through this examination of practice and allowed the development of an appreciation of the how and why of change around a project intervention. The project team became intimately aware of the learning from the studies of change because of their involvement in data collection and analysis – compared with (say) an external report prepared by a consultant. The method allowed the development of new product ideas (eg. the project team are developing a new course for employees milking cows: "Cups on to cups off", the Insights work has provided a guide to the development of this product).

It did not allow for attribution to the project at an across industry level (attribution was at the case level). There is scope for analysis at the industry level using survey research that is designed using the results from the 'Insights' study. The method may be viewed by some as expensive in terms of time and resources. Such judgements need to be weighed against the level of project learning, which is argued to be much higher through this approach than some other quantitative and survey based methods that operate external to the project team. In addition, the project management team are continuing to use the Insights results in discussions with project stakeholders.

Finally, method development was supported by a social researcher trained in agricultural systems. Such competencies within project teams are often either scarce or not seen as a priority capacity in projects. Support and input from a social researcher is a suggested way to improve the design and customisation of methods to meet specific project requirements.

The principles of evaluation using this method hold for programs that are sector wide, involve multi-faceted problems (systems based) and involve a mix of disciplines with a focus on learning and change.

Conclusions

The complexity of farming systems projects and the unpredictability of the environment in which farming systems operate has not diluted the call for more accountability and understanding of impacts of project interventions.

This paper has reviewed some of the challenges to evaluation approaches given these increasing demands. What was required was a method that enabled the exploration of the nature of changed practice at the farming system level – but involved the project teams in learning from this understanding to inform project development, understanding of impacts and ways to communicate project outcomes to stakeholders.

A method involving action research within a project team examining longitudinal case studies of farming and advisory practice change associated with project interventions was demonstrated. Such a method was suggested as appropriate for ongoing project learning and for developing a sophisticated understanding of impacts and change. Such "learning through change" is suggested as a suitable approach to other projects that are multi-disciplinary, have a focus on "doing", involve numerous stakeholders and are seeking further understanding of the nature of change. The practice theory framework provides a strong basis for the development of methods to support evaluation frameworks.

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Role Models and Farm Development Options: A Comparison of seven Swiss farm families

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Abstract

In recent years, a high degree of flexibility has been required of farm families, because the framework of agricultural policy has changed dramatically since the 1990's with the introduction of direct payments and the enforcement of various agrarian reforms (Agricultural Policy 2002 and 2007). This study concentrates on illustrating the action orientations of farming families and farm development strategies by the method of case reconstruction (Hildenbrand 1999). Different role models on family farms were shown by analysing seven farm families (theoretical sampling). A new aspect here is that the study examines the role of women as well as of men and deals with the consequences for both the family and the family farm. One of the findings of the study is that rigid gender role allocation limits farm development options because it restricts freedom of action, whereas role models with flexible role sharing within the family are better able to exploit and implement existing development potential.

1. Introduction

In recent years, a high degree of flexibility has been required of farm families, because the framework of agricultural policy has changed dramatically since the 1990's with the introduction of direct payments and the enforcement of various agrarian reforms (Agricultural Policy 2002 and 2007). The previous price- and sales-supported policy has been replaced by a policy aiming at economically, ecologically and socially sustainable agriculture. On the one hand, this means ensuring more market proximity and competition in the agricultural sector. On the other, it entails environmentally sound production techniques that are compensated by direct payments (without the complete compensation of price decreases). This new framework has altered the room for manoeuvre of farming families considerably, thereby creating new challenges for them. Farming families must increasingly consider their family farms to be agricultural enterprises that need to be managed according to the principles of economic efficiency. Furthermore, they must fulfil certain ecological criteria. Because of these changes, many farming families must reconsider their situation and farming practices and come up with a new orientation.

This study will concentrate on illustrating the action orientations of farming families and farm development strategies, in particular, on the basis of the social structures within the family that lead to certain decision-making patterns and action structures. Moreover, we will attempt to analyse the effects of these developments with regard to options for economic development. From an economic point of view, a farming family may have different options for development. However, these choices do not always prove to be compatible with the individual's concept of family life. Therefore, we will also be asking ourselves what "moral" laws, rules and values the farming families adhere to and how these can

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affect the long-term orientation and development of a farm. Basically, we wish to understand how farming families perceive and live their lives.

2. Methods

In order to illustrate the complex interrelation between families and farms, individual case studies were carried out. There are various scientific concepts on and approaches to individual case studies. Within the scope of this study, we chose a reconstructive approach based on the theory of social action, namely the method of case reconstruction (Hildenbrand 1999). The method of case reconstruction is based on the dialectic of the general and the particular. The general represents the objective possibilities for action of a case (a family). The particular comprises the choices the family makes with regard to these possibilities (Oevermann 1991, p. 280).

These choices are not random, but produce and reproduce the social order of the family, thereby forming a pattern specific to the individual case and the family's decision-making process. Such a pattern is also referred to as "case structure". Consequently, the main task of case reconstruction consists in identifying and describing case structures. The case structure is described in form of a hypothesis (= case structure hypothesis), because the reconstruction process of a case structure is based on the development and verification of hypotheses and because this process – just like social reality – is open (Hildenbrand 1999). Therefore, within the scope of this study, we will refrain from deriving issues and hypotheses from a theoretical model or supplying empirical proof. Instead, we will derive theories on the action orientation of farm families from empirical studies. In principle, it is possible to develop a theory on the basis of one single case, because case reconstruction takes into account the general as well as the particular. Nevertheless, the theory to be developed will be more significant if the cases used to develop the theory are systematically contrasted in minimum and maximum comparisons (Hildenbrand 1999, Strauss 1991). By means of contrasting (theoretical sampling), the theory is constantly checked and case structure hypotheses are formulated. Based on the structure hypotheses thus derived, the next contrast case is looked for each time. Case contrasting continues in this way until it is possible to develop types. This provides a distance from the theoretical starting position and enables theories to be formulated on the basis of own data (grounded theory). Consequently, research is not a linear process but a circular one, that only comes to an end when it appears that the data gathered will not yield any new knowledge.

In this study, contrasting primarily takes place at the social level (education, interests, activities and traditional and/or socialising backgrounds). Contrasts involving the farm structure (position, type and buildings) recede into the background and can be derived from the social contrasting.

The case reconstruction method can identify structural problems, but is not suitable to show the quantitative occurrence of the problems. To investigate the occurrence, it would be necessary to carry out a survey by means of a questionnaire.

The context in which the farming family acts forms an important basis for generalisation when defining structure hypotheses. According to Hildenbrand (1992a: 107), we must distinguish between four structural levels. First, we must take into account the action and decision-making of the farm families within the context of the general social structure and prevailing value systems as well as the economic and agricultural structures. Second, regional particularities, e.g. the natural environment and the economic area, the local social constitution and traditional patterns, must be taken into account when analysing the actions of farming families. Third, the decisions and actions taken must be brought into context with the structure of the farm. Fourth, they must also be brought into context with the subjective action orientations of the farming family as well as its biography. Only if all these factors are taken into consideration will we be able to determine the actual room for action as well as the objective choices available. It is on the basis of the decisions made that we can determine whether a decision is to be considered the rule or whether it is a choice specific to the family examined. The comparison of possibilities and reality helps us to determine the particularities of a case. Especially, behaviour that is not the rule feeds the case structure and helps to define a case structure hypothesis that can be verified in interviews and differentiated prior to the formulation of a theory. Within the scope of this study, using the case reconstruction method, to date, we have been able to investigate the decision-making history of four farming families (figure 1). The data obtained are based on narrative interviews with the seven farming families. The objective data (e.g. genealogy, data on farm structure) are then compared to the family's subjective perception of these data.

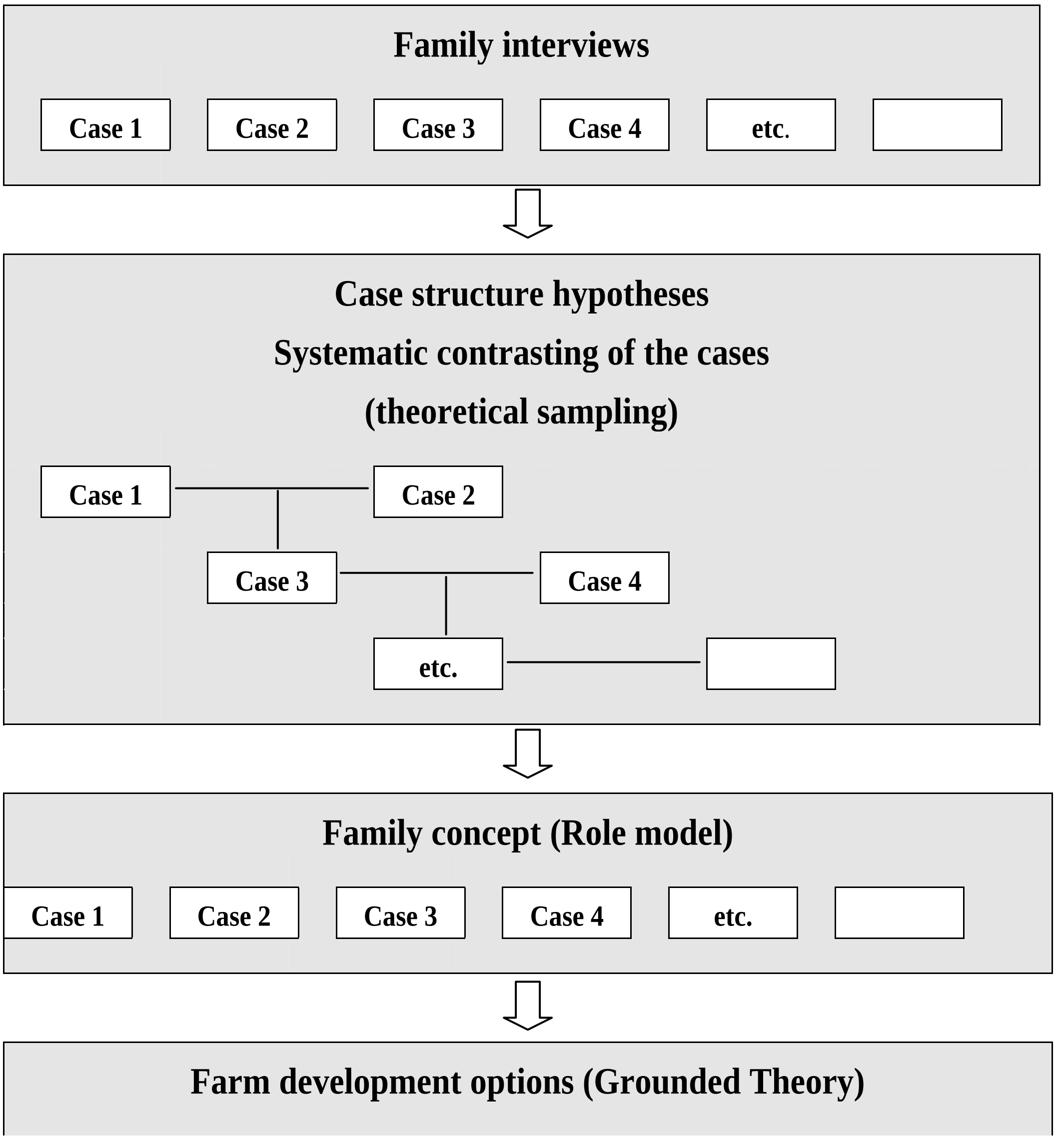

Figure 1: Research design

3. Role models and farm development options

The seven farm families were used to explain the different organisation patterns on family farms and their impact on farm development options. The order of the role models is determined by closeness to or distance from traditional rural role sharing, where the man, the farm manager, is in charge of the farm work and the woman is primarily responsible for housekeeping and child rearing, but helps out on the farm when "need be" (cases 1- 4). In families where only the man, not the woman, comes from a farming background, the woman's flexible involvement in the farm is less usual. The question here is rather one of closeness to or distance from the traditional bourgeois role model, which reduces the woman's role to housekeeping and child rearing (case 5). The couples who have also distanced themselves from the traditional bourgeois model have by mutual agreement developed their own role model to fit the individual needs and interests of man and wife (case 6 and 7).

3.1 The Bieri family (case 1)

Ownership/status on the family farm	Maria Bieri: farmer Franz Bieri: owner and farm manager
Age/marital status:	Maria 39, Franz 50, married for 18 years
Education:	Maria: agricultural graduate (college of agriculture and domestic science) Franz: no vocational education
Children:	4 daughters, 1 son (aged 9 to 16)
Farm:	Mountain region, 12.5 ha (owned) Milk production and stock rearing (cattle, sheep, goats)
Farm labour:	Franz (100 %), Maria (50%), children as required, Franz' brother (20 %)
Living arrangements:	Franz' father (79) lives with the farming family

3.1.1 Role model for the Bieri family

The roles in the Bieri family are clearly fixed. The husband is in charge of running the farm, the wife of the household and family, helping on the farm as required. The woman's farm work is not remunerated. This is the sort of role model that exists in family artisan or commercial firms. As for Mr Bieri's part-time job, here again the family follows the traditional action pattern, since in farming it is mostly the husband and not the wife who does paid work outside agriculture (Rossier 1992: 92). The children find it difficult to see themselves as distinct from family and farm, and the four girls are being given a gender-specific education in typical female occupations to prepare them for their subsequent household roles as wives, mothers and possibly farmers' wives. The weight of family expectation falls on the youngest and only son to carry on the farm.

3.1.2 Development options for the Bieri family

The Bieris seem to have virtually no development options. The family has low educational capital and moves solely in a farming milieu. The development options are also limited by the fact that for the family, the only son alone is considered as a potential farm successor. But this mountain farm family can keep its farm going thanks to direct payments and a modest lifestyle. It would probably only feel the need for action if underlying conditions were to worsen or if there were a family crisis such as death, illness etc. One possibility would be for the family to merge the farm with the brothers' neighbouring farms. In view of the big age gap of eleven years between Mr and Mrs Bieri, though, Mr Bieri will probably lease his farm to Mrs Bieri on reaching the age of 65, to enable the family to continue receiving direct payments. This interim solution could postpone the decision about the unresolved succession issue. Other development options are out of the question. This family's traditional action orientation excludes options such as extensification or specialisation, for example in suckler farming (if farm milk collections were to stop) or a switch to exclusive goat or sheep husbandry with direct sales. Mr Bieri is a passionate goat breeder, but has neither the interest nor the requisite economic or agricultural knowledge to hold his own professionally on the market, although with her farm training his wife has the home economics knowledge needed to process the products. A previous attempt at agrotourism failed. The option of converting to organic farming would not fit the traditional farm family concept. There is no question of Mrs Bieri taking paid non-agricultural work instead of Mr Bieri, because this would assume the redistribution of household and farming roles and would be inconsistent with Mr and Mrs Bieri's traditional understanding of their roles.

3.2 The Eggimann Family (case 2)

Ownership/status on the family farm:	Katharina Eggimann: farmer Arnold Eggimann: owner and farm manager
Age/ marital status:	Katharina 57, Arnold 56, married for 35 years
Education:	Katharina: cook + agricultural graduate (college of agriculture and domestic science) Arnold: farmer (agricultural college)
Children:	2 daughters, 2 sons (aged 24 to 32)
Farm:	Valley region, 33 ha (of which 18.5 ha leased)
	Arable farming, milk production, pig fattening
Farm labour:	Arnold (100 %), 2 sons (70 % each)
Living arrangements:	2 sons (28 and 30) and youngest daughter (24) live at home with their parents

3.2.1 Role model for the Eggimann Family

The Eggimann role model is traditional. Yet Mrs Eggimann has created her own political and honorary sphere of action outside the farm. Mr Eggimann and the two sons thus concentrate on the farm, while Mrs Eggimann is primarily responsible for the household and family. The training of apprentices in farm housekeeping underlines Mrs Eggimann's traditional role as a farmer's wife. Husband and wife therefore fulfil conventional farm role expectations. Their own daughters provide farm labour, but there is no question of them taking over the farm. Their claims to the farm are satisfied by their further education. Yet even the daughters are strongly rooted in the farm milieu. The Eggimanns' relatively high internal educational potential in the succeeding generation is limited almost exclusively to agriculture (one agronomist, two master diplomas and possibly a future farmer's wife). In this family there is also a certain amount of internal family rivalry over farm succession, firstly because there are two in line of succession and secondly because farm transfer traditionally takes place on marriage. Members of the Eggimann family have always married within the farming milieu, and the family's high expectations in this respect may have made it difficult for the sons to find wives. Living together in a multi-generational household also leaves little space for the children to develop their individual talents and see themselves as distinct from farming. The men's and women's role sharing within the family shows little flexibility.

3.2.2 Development options for the Eggimann Family

The Eggimanns have various development options, mainly in the field of agricultural production. A change in the production structure of the farm can be expected once the decision on farm succession has been made or when one of the potential successors to the farm finds a partner and marries. These changes will not, however, depart from the current traditional farm concept unless the future partners of the two potential successors introduce new elements to the farm family and bring about a reorientation, for the interests of both sons lie exclusively in the field of production technology, one being primarily interested in arable farming and working with machines, the other in milk production. In the present generation the female family members' interests in the service field or in animal husbandry schemes have no place in the existing farm concept because succession is patrilinear. However, joint operation of the farm by the brothers is still an option in combination with an additional non-farming income. This farm certainly cannot provide a livelihood for two families. The family constellation and rivalry currently prevent farm development. One option, that of making the eldest daughter heir to the farm, is out of the question. Her education and interests would provide the requisite entrepreneurial know-how and innovative potential to make the farm competitive. She would be most eligible to inherit the farm, especially as her life partner also has an agricultural training. However, the traditional farming role model precludes such development options when sons stand to succeed to the farm. For example, in Norway the Eggimann daughter, as the eldest child, would automatically occupy the role of potential successor (Haugen and Brandth 1994).

3.3 The Schoch family (case 3)

Ownership/status on the family farm	Marianne Schoch: owner, farm manager and farmer Theo Schoch: owner and farm manager
Age/marital status:	Susanne 40, Theo 52, married for 20 years
Education:	Susanne: 1 year apprentice housekeeper, no further education Theo: agricultural graduate (agricultural college)
Children:	1 son (19), 2 daughters (16 and 17)
Farm:	Hill region, 38 ha (of which 14 ha leased) Milk production, stock rearing, some arable and fruit farming
Farm labour:	Theo (100 %), Susanne (50 %), Susanne's father (25 %), daughters as required, son during school holidays
Living arrangements:	Family lives in a new home not on father's or mother's farm

3.3.1 Role model for the Schoch family

Role sharing in the Schoch family conforms to the traditional farming pattern, although the wife's family background would conceivably make for a more individual and flexible allocation of roles in the household and on the farm. Mrs Schoch comes from a family in which women are dominant and succession is matrilinear. As farm successor Mrs Schoch is continuing a family pattern and strengthening it, inasmuch as her mother, the successor to the farm, used to run the farm virtually without her husband, but left the role of official farm manager to him. Mrs Schoch herself did not enter the male domain completely after the farm was transferred, because work sharing followed the traditional pattern of farmer and farmer's wife. Female dominance is also less marked because of the managing couple's age difference and the fact that the family lives neither on the mother's nor the father's family farm (neo-locality). In addition, in all the years following her marriage Mrs Schoch never questioned her role as farmer's wife and accepted her brother as potential successor to the farm. In times of crisis Mr Schoch definitely has the necessary willingness and flexibility to do certain household tasks. Mrs Schoch may lack the agricultural knowledge for production decisions at farm level, but she certainly has decision-making skills for management tasks and financial interests.

The daughters have both adopted professions in male domains, although neither chose an agricultural training. The son is still at school. The farm succession has not yet been clarified, but the management couple do not exclude a daughter taking over. Role sharing within the family is rigidly established, but husband and wife are starting to show changed role understanding, possibly due in part to the competitive situation on the farm. Nevertheless in the educational sphere the children are given their own space, even if this is not fully compatible with the parents' farm role expectations. This is a traditional farming role model, but with an individual approach and a trend towards change and flexibility in the next generation.

3.3.2 Development options for the Schoch family

The farm concept and competitive family relationship severely limit the Schochs' farm development options. The farm, even though it has grown considerably, is still managed along small-farm lines. The livestock side is too much for the couple managing the farm, as evidenced, among other things, by the fact that a lot of money is regularly spent on outside help. The family is very reluctant to innovate, both in mechanising the farm (the last in the region to introduce milking machines) and in production (does not belong to a farm machinery cooperative, changed late to integrated production, only boards horses at customers' request). Options such as switching to organic farming or participating in animal welfare schemes are rejected out of risk considerations. There is a general absence of opt-out opportunities, as the education of the managing couple has been biased towards agriculture and home economics and is not refreshed. Nor are they adequately trained for farm specialisation. Here again, the family constellation and a certain internal family rivalry inhibit reorientation and development commensurate with the size of the farm. The nature of the family restricts development potential, so opportunities to develop the farm remain unexploited. There will probably be no reorientation until the next generation. The farm succession is open. In this family it is not out of the question that one day one of the daughters will take over the farm, as the son shows little interest and is developing his educational potential in other directions. In view of the big age gap of twelve years between Mr and Mrs Schoch, Mr Schoch will very possibly lease his farm to Mrs Schoch on reaching the age of 65, assuming the succession has not been decided by then and the family does not opt to do without direct payments. An improvement in the current competitive situation could bring about the formation of a simple company between spouses. It is not impossible that even a farm of this size could have no future because neither the role model nor the farm concept can keep up with the requirements of the time.

3.4 The Plüss family (case 4)

Ownership/status on the family farm:	Ruth Plüss: owner, farmer and branch manageress Wolfgang Plüss: owner and farm manager
Age/marital status:	Ruth 55, Wolfgang 55, married for 30 years
Education:	Ruth: agricultural graduate (college of agriculture and domestic science) Wolfgang: electrician + master farmer (higher agricultural college)
Children:	2 sons, 2 daughters (aged 22 to 28)
Farm:	Valley region, 31 ha LN (of which 6 ha leased) Milk production, fruit and arable farming, agrotourism and direct marketing
Farm labour:	Ruth, Wolfgang, eldest son, all 100 %, youngest son occasionally, two students doing practical training and one domestic help
Living arrangements:	Sons, students and domestic help live with the parents; Wolfgang's mother has her own home on the farm

3.4.1 Role model for the Plüss family

The Plüss family role model is rooted in rural custom, but at the same time open to change in a business context. Role sharing within the family does not conform to the traditional farming role model inasmuch as the wife has not only introduced a new line of business but also assumed responsibility for it, and the men help out as necessary.

The early death of her mother when she was young gave Mrs Plüss a great sense of responsibility and autonomy of action. Unlike Mrs Schoch (case 3), Mrs Plüss does not aspire to the status and role of farm manageress, and her husband's primary role is as farm manager of the two combined businesses. The role of farmer's wife is extended by that of branch manageress. The business line introduced by Mrs Plüss meant that roles had to be renegotiated among family members. The men's willingness to alternate between the spheres of production and service provision is not the rule in farm families. There are continued expectations of farm continuity. At present the elder son is being groomed for succession. He is employed full-time on the farm, but in view of his parents' age, farm transfer is not yet urgent. The younger son is receiving a technical training closely allied to agriculture. If need be he could also step in as successor to the farm. The daughters would not be considered as successors. Both daughters work in education, are married and live away from home.

3.4.2 Development options for the Plüss family

Family cooperation and flexible role sharing in agrotourism have opened up new development opportunities to family and farm, free from underlying political conditions. The woman has brought the family both a farm and innovative potential. However, traditional patterns still come into play in crisis situations. Family farm continuity was safeguarded by Mr Plüss filling the shoes of his deceased brother. Farm succession is also doubly ensured in the next generation. The family has a strong action rationality. In times of crisis it combines innovation and tradition and is good at making things work in practical life.

However, future farm development also depends on the designated successor finding the right partner with the necessary commitment to and interest in the customer-orientated sale of agricultural products and services. Nor is it so easy to pass agrotourism from one generation to the next, as it is often abandoned when the farm is transferred (Giraud 2001). The flexibility and action orientation which the family has shown thus far, however, would lead to the conclusion that they could even cope with this kind of family crisis, because the family's development potential does not lie solely in agricultural production and individuation potential is being used.

3.5 The Glauser family (case 5)

Ownership/status on the family farm	Marianne Glauser: housewife and mother Christoph Glauser: owner and farm manager
Age/marital status:	Susanne 41, Christoph 47, married for 17 years
Education:	Susanne: hairdresser
	Christoph: agricultural graduate (agricultural college)
Children:	1 daughter, 4 sons (aged 16 to 9)
Farm:	Valley region, 24 ha (of which 1 ha leased) Milk production and arable farming
Farm labour:	Christoph (100 %), 4 sons (regularly) in addition to school and intensive sports training
Living arrangements:	Christoph's mother (78) lives in her own home on the farm

3.5.1 Role model for the Glauser family

Role sharing in the Glauser family is strictly divided between man and wife. Mr Glauser is responsible for agriculture and farm, Mrs Glauser has been nothing but a housewife and mother since the children were old enough to replace her on the farm. This allocation of roles within the family was deliberately fostered by Mrs Glauser. She sees herself as a "born housewife and mother". The wife's family had a business background largely identical to the farming milieu (wife and children help in the business, expectation of business takeover), yet Mrs Glauser's commitment to and interest in agriculture are defined solely by partnership and family. Sport is the family's joint enterprise. Both Mr and Mrs Glauser are involved. The parents support the fact that their sporting achievements distance the children from farming, even though this works against the interests of the farm. Farming is practised according to the "pleasure principle", hence the poor economic state of the farm, which takes second place to the non-farming interests of the current farm manager (in the father's case it used to be livestock dealing). The farm manager eschews business decisions and adopts a wait-and-see attitude. There is an expectation in the air that one of the four boys will take over the farm.

3.5.2 Development options for the Glauser family

The Glausers have little development potential, either inside or outside agriculture. The Glauser family is strongly family-orientated and places the family's sporting interests above those of the farm. Role sharing within the family is rigid. The woman distances herself from the farm family principle of role sharing, i.e. the woman helping on the farm, and restricts her field of activity to household and family. However, this action pattern is not compatible with farming requirements. To maintain this farm, two things are necessary: the farm manager's further business training and the wife's involvement in the farm. It would, if necessary, be conceivable for Mrs Glaser to bring in extra earnings to maintain the status quo. However, the family has virtually no chance of leaving agriculture as Mr Glauser is not qualified in any other field and Mrs Glauser has not practised her trade for so long.

Farm succession is open since none of the four sons has been declared successor. The family places family interests above those of the farm. Nor does the family action pattern match the farm labour requirement. If none of the sons wants to take over, the farm will probably be wound up when the farm manager reaches retirement age. The family's financial situation (farm debt) militates against the option of leaving agriculture early, as loan repayments and capital gains tax have to be taken into account.

3.6 The Burckhardt family (case 6)

Ownership/status on the family farm	Rita Burckhardt: professional woman outside agriculture Hansueli Burckhardt: owner and farm manager
Age/marital status:	Rita 41, Hansueli 44, married for 20 years
Education:	Rita: cook Hansueli: agricultural graduate (agricultural college)
Children:	2 sons (19 and 15), 1 daughter (17)
Farm:	Mountain region, 17.5 ha (of which 10 ha leased) Milk production and calf fattening
Farm labour:	Hansueli (100 %), works with neighbour, Rita (occasionally in summer), children not very much
Living arrangements:	Hansueli's father left the farm following the transfer

3.6.1 Role model for the Burckhardt family

The Burckhardts have an individual role model with flexible role sharing. The socio-cultural gender roles are not simply assigned within the family, they are negotiated individually in line with interest and ability. The couple need a relationship of tolerance and mutual trust if work sharing is to function (husband 100 % on the farm, wife 60 % away from home and household). Although she has absolutely no interest in farming, Mrs Burckhardt is willing to help out with the hay harvest on the farm in summer, but draws the line at working with animals. She limits housework to essentials. Holidays and leisure play a relatively important role. Mrs Burckhardt has the necessary freedom within the family to do her paid job. She makes a substantial contribution to the family income, with the money initially being used on farm buildings and the farmhouse, whereas today it goes towards holidays and leisure or the children's education. Her job often requires Mrs Burckhardt to be away overnight and sometimes for several days. On such occasions Mr Burckhardt takes her place in the household and looks after the children. This role sharing means that both partners have their own spheres of activity consistent with their respective interests and abilities. The Burckhardt partnership is one of solidarity. The farm forms the basis of the family livelihood, but is not the sole focus of action orientation. The couple also make time for themselves and the children.

The women in the Burckhardt family are from other regions and in the last two generations have not come from farming circles. They bring individualisation potential and tend to leave agriculture. Farm continuity is not a priority for the Burckhardts and is not mandatory. It is up to the three children to decide whether they want to work in farming at a later date. All the children are in secondary education, so they may wish to enter a non-agricultural profession. The Burckhardts live for the present generation and farm continuity is secondary.

3.6.2 Development options for the Burckhardt family

The Burckhardts do not have much agricultural development potential. For one thing, the husband's indifference to innovation and the wife's lack of interest in farming prevent farm specialisation. At present the farm is being supported by Mrs Burckhardt's day job, only made possible thanks to flexible role sharing. The family's manpower requirements on the farm, in the household and in paid non-agricultural work are offset by flexible role sharing within the family, thus preventing either of the partners being overburdened with work.

The next generation may possibly give up the Burckhardt family farm. Mr Burckhardt's education means that he does not have many escape options. His sole educational potential is in agriculture, as are his interests. On the other hand, the children's education is clearly designed to get out of farming. There are, therefore, prospects for development within the family. It would be conceivable for one son to carry on the farm part-time at a later date. Other options point to increasing cooperation with the neighbours (e.g. a joint business) or even merging the farm with this neighbouring farm.

3.7 The Meierhofer family (case 7)

Ownership/status on the family farm:	Monika Meierhofer: agricultural employee Rolf Meierhofer: owner and farm manager
Age/marital status:	Monika 40, Rolf 37, married for 4 years
Education:	Monika: physiotherapist Rolf: agronomist
Children:	1 daughter (aged 3)
Farm:	Hilly region, 22 ha LN (of which 9 ha leased) Milk production and pig fattening (organic farming)
Farm labour:	Monika (initially 100 %, following birth of her daughter 60 - 80 %), Rolf (initially 60 %, later 80 %), parents (occasionally)
Living arrangements:	Farming family lives in the new detached house, Rolf's parents live in the old home nearby

3.7.1 Role model for the Meierhofer family

The Meierhofers have an individual role model with flexible role sharing. Roles within the family are negotiated on an interest and ability basis. The role model is able to cover individual as well as family and business needs and adapts to new circumstances. A process of negotiation takes place within the family. After his marriage Mr Meierhofer expected that he would have to stop working away from home, although he valued his second job as a balance to the farm and a source of income, and that Mrs Meierhofer would continue in her profession. But Mrs Meierhofer gave up the work for which she was qualified and worked on the farm full time. She found a new professional challenge in agriculture, was paid for her work and did not have to lose her previous financial and social independence. Mr Meierhofer kept his second job and managed the farm, for which he is ideally qualified. He also works on the farm, but does not do much in the house. The couple could envisage employing someone to do the housework if Mrs Meierhofer were unable to cope with the workload. Under no circumstances will she give up working on the farm. Role sharing which involves the woman taking on the role of farm employee is certainly not the rule, but it opens up new possibilities for the farm and covers the couple's individual interests and abilities. The family lives and plans for its own generation. At present there are no expectations of farm continuity.

3.7.2 Development options for the Meierhofer family

In the Meierhofer family there are favourable development options for both farm and family, as Mr and Mrs Meierhofer have educational qualifications providing a safe way out of agriculture or educational capital for possible specialisation on the farm. There is environmental awareness, as manifested by the switch to organic farming. Farm continuity is not a major issue. Plans are made for the current farming generation. The interests of individual family members and the interests of the farm are well balanced. The family has many routes open because the role model is an individual one and role sharing is flexible. The farm development strategy is expansionary and innovative. One development option could be for the husband to give up his second job if the change to organic farming presents him with enough of a new challenge and he does not need his additional earnings for risk hedging or investment. However, this development option has to be examined from a role model aspect, because it would possibly destroy the balance between the requirements of individuals and farm.

4. Conclusion

The organisation of the family farm according to the principle of flexible role distribution between women and men is not yet a matter of course in farming. Role models in farming are often rigid, based on allocated roles for women and men. This rigid role distribution restricts the necessary flexibility of family farms and limits their options for development (Tab. 1). A "family structural change" of the type described in the case of the Plüss and Meierhofer families (cases 4 and 7) can help farming families more effectively to meet the increased demands made upon agriculture by society. These individual case studies do not provide any information on how widespread flexible role models are in agriculture. The interest of a study of this type is, however, that it allows theses on structural problems in agriculture to be proposed and extrapolated structurally into the future.

Table 1: Role models and development potential for farming families

Farming families	Role model		Development potential	Outlook for the next generation
	Rigid	Flexible		
Case 1: Bieri family	x		Very little	Give up or merge farm with brothers' farms Interim solution: lease farm to wife
Case 2: Eggimann family	x		Exists on the farm Not used by the family	Status quo until decision on succession
Case 3: Schoch family	x		Exists on the farm Not used by the family	Status quo until decision on succession Interim solution: lease farm to wife
Case 4: Plüss family		x	Good, especially in the service sector	Depends on the next generation's interests
Case 5: Glause family	x		Low	Give up at retirement age unless a successor can be found
Case 6: Burckhardt family		x	Low	Give up or second occupation
Case 7: Meierhofer family		x	Good	Open

At individual level, far-reaching individualisation of lifestyles occurs as a result of processes of differentiation in the modern age, associated with mobility and role flexibility (Fliege 1998, 420). This leads to a change in cultural norms and social structures. Relations between the sexes take a different form. Farming families are not exempt from individualisation and social change. Many farming families find it hard to find a direction in such circumstances, as they are no longer able to base their actions and decisions on the experiences of the past. Each farming family therefore has to work out its own role model. Rigid role models, in either the farming or the bourgeois milieu, cannot satisfy either the new challenges in agriculture or the social expectations of women and restrict individual and farm development options.

The changing role of women brings with it changes in the male role. Whether women leave farming or remain in it has consequences for the farm and its development options. Strategies in the service sector, such as direct marketing or agrotourism, are unlikely to succeed without the co-operation of the whole family. Then again, women (and men) who earn additional income from gainful employment outside farming help to hedge against risks at times of crisis and enable women to move into a professional woman's role, with their own social and financial independence.

The size of the farm alone cannot guarantee the family's livelihood or the continuity of the farm. Nor is education by itself a measure of the economic success of a business; today's farming family business has to be innovative and depends on the creativity and motivation of the individual family members. The family farm is a family team, made up of individuals with different traits of character, abilities and interests. The individual roles within the team therefore need to be negotiated as part of a process within the family and the appropriate responsibilities and skills assigned to each. New role models within the family can increase the flexibility of the farming family on the family farm and thus their prospects for the future.

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Social learning and the changed construction of nature conservation

Severine van Bommel*

Summary

Due to political and social changes, traditional expert-based hierarchical coordination mechanisms are under pressure. Expert advice used to explain the outcome of the nature policy process. Now, new stakeholders actively participate in the nature policy process. With increased network coordination and social learning, experts are now just another actor among a number of private and public actors that influence the construction of nature conservation. Furthermore, the value of expert knowledge is put into perspective. This means that the way in which nature conservation is being constructed has changed. This paper addresses this change.

Introduction

In nature conservation all over the world, natural areas are conventionally seen as bio-physical 'hard' systems. Hierarchical co-ordination of human action used to be the conventional policy discourse. Policy implementation was based on expert-informed, hierarchical decision-making (Glück, 2000). Nature conservation started when intellectual figures became concerned about the exploitation and degradation of natural areas. They realised that natural resources would not last forever and they argued that certain natural areas should remain intact (Primack, 1993). Their practical point of view was that in the long term, nature and wildlife would only have a place in protected areas, offering different forms of enforced protection ranging from fencing to patrolling by armed rangers. This is still the way most National Parks are being protected today (Prins and Grootenhuis, 2000).

Due to political and social changes there is much pressure on traditional hierarchical decision-making processes. Nowadays, nature conservation is no longer perceived to be only about biophysical processes and technical intervention. Nature conservation policy and decision making have been strongly influenced by the decentralisation of the government and the changing power relations in (rural) society (see Aarts, 1998). New stakeholders in the rural areas want to participate in decision making on nature management (after Aarts, 1998). Nature policy makers can no longer ignore the opinions of the people interested in and affected by the implementation of nature policy (Van der Windt et.al, 1997). Social learning in communicative or interactive processes of control and forms of self-regulation, is thought to reduce conflict and provide a broad social basis of public support (Aarts, 1998).

This means that the way in which nature conservation is being socially constructed has changed. Nature policy is no longer the expert-informed, hierarchical process that it used to be. There is a shift towards greater involvement of different public and private actors and public-private co-operation activities. With social learning, experts have become part of multi-stakeholder dialogues and platforms, instead of being the main adviser to the policy process (Van Heijst, 2000; Piek, personal communication). This paper explains the changes in the construction of nature conservation in the Netherlands that have occurred as a result of the shift towards increased social learning.

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Some concepts

Policy co-ordination types

The increased interest in social learning processes is part of a broader shift in policy co-ordination. In nature conservation, network co-ordination forms an addition to two classical notions of policy co-ordination in society, namely hierarchies and markets. Hierarchic co-ordination models take the autonomy of the central expert-guided government as a point of departure. Market co-ordination models take the autonomy of local actors as a point of departure (Bruijn et.al., 1993; Teisman, 1995). Network co-ordination models focus on the interaction among the various actors including experts, see table 1.

Table1 Dimensions of three forms of policy co-ordination.

Dimension	Coordination types		
	Hierarchical co-ordination	*Market co-ordination*	*Network co-ordination*
Level of analysis	Relationships that are 'director' controlled	Relationships between 'director' and local actor	Network of actors
Perspective	Central actor	Local actors	Interactions between actors
Relationships	Hierarchical	Autonomous	Interdependent
Interactions	Neutral implementation of fixed goals	Self-steering on the basis of autonomous decisions	Process of active exchange of information, goals and resources
Criteria for success	Realisation of formally set goals	Fulfilment of local needs	Joint solution to problem
Criteria for failure	Vague goals, to many actors, lack of information and control	Lack of resources and policy freedom	Barriers and lack of incentives for co-operation
Recommendations for steering	Co-ordination and centralisation	Strengthening local actors by deregulation, privatisation and decentralisation	Improving conditions for co-operation

Source: De Bruijn et. al., 1993.

The three co-ordination mechanisms do not function in isolation. Network co-ordination functions side by side or perhaps within the limits set by hierarchy and the market (De Bruijn et.al., 1993; Teisman, 1995).

Now that, recently, the value of network co-ordination has been recognised, nature policy makers are more willing to organise the policy process so that it supports such a co-ordination process (see box 1).

Box 1 Network co-ordination in nature conservation in the Netherlands

Over the last two decades network co-ordination has increased in nature conservation in the Netherlands. In Dutch nature conservation various programmes have been formulated by the Ministry of Agriculture, Nature and Food Quality that reflect the increased network co-ordination. The most important one is *Nature for People – People for Nature* which was formulated in 2001. It is currently considered to be the major public policy document on nature conservation in the Netherlands. *Nature for People – People for Nature* replaces the previous Nature Policy Plan, the Landscape Memorandum and the Forest Policy Plan. As compared to earlier nature policy, nature policy in *Nature for People – People for Nature* has broader goals. In addition to ecological aspects related to conservation, restoration and preservation of nature, also social economic aspects of nature are now taken into account. Increased attention is given to network instruments in order to facilitate increasing citizen awareness and involvement (Van der Poll and Glasmeier, 1997). Network instruments include education, research and advice, assisting forest and nature owners and the forest and nature 'sector' at large, public participation and multi-stakeholder platforms for negotiation (Schmidt et. al. forthcomming).

Van Dongen et. al. (1995) distinguishes three forms of networks based on the kind of social organisation:

1. Associations: highly organised networks with formal interaction, that are highly institutionalised e.g. Farmers Unions.
2. Multi Stakeholder Platforms: networks with some formal interaction often among key persons, with various degrees of institutionalisation.
3. Involvement of 'civil society': stakeholders don't interact formally but do have the same stakes e.g. because they are living in the same area.

Network co-ordination includes all three forms of networks. Social learning (in the sense of concerted or collective cognition) is mostly associated with Multi Stakeholder Platforms. Therefore this paper will focus on the Multi Stakeholder Platforms.

Analysis of the relevant literature (Vermunt et.al., 2003; Leeuwis and Van der Ban, 2004; Leeuwis and Pyburn, 2002) suggests the following with regard to Multi Stakeholder Platforms:

- <u>Mutual interdependence:</u> If stakeholders are mutually interdependent they will either engage in co-operation or engage in conflict. On the one hand, the stakeholders will engage in conflict when they individually experience a shortage of available means to co-ordinate action, such as authority, finances, information, support, legitimisation or land, but when they also each have different interests, different ideals or unclear goals, co-operation equals negotiation.
- <u>The stakeholders' ambition:</u> Social learning only emerges when stakeholders are motivated to participate in a platform. The stakeholders' ambition is a result of 1) personal motivation, 2) social pressure, 3) a (rebellious) reaction to governmental rules and laws.
- <u>Trust</u>: The actors' motivation will increase with the amount of trust. Trust provides stakeholders with a certain feeling of security. Stakeholders take a certain risk by trusting each other. The value of trust is the possibility it offers to deal with a certain amount of uncertainty. In a social setting, trust can be encouraged by means of 1) formal agreements such as rules or 2) informal interactions based on personal relationships.
- <u>Power relations</u>: Differences in dependency lead to differences in power. These differences in power are not necessarily a barrier. Power differences are a essential aspect of effective concerted action. All relations are more or less hierarchical because there is always someone who can make demands and make sure that these demands are met. Power relations are never fixed. In each interaction the relations between the stakeholders are redefined. Only when this renewed definition is no longer possible, will differences in power become contra productive. Stakeholders will either become aggressive or fatalistic.

In a policy process nested within a hierarchical co-ordinated setting, the role of experts is formalised in the work of advisors who have a specific (key) position in the political processes. Multi Stakeholder Platforms include various private and public actors in addition to the technical experts themselves. This has changed the role of expert advice in the formulation, implementation, and evaluation of the policy process (Deleon, 1999).

Because the role of experts had changed in the nature policy process, the way in which nature conservation is 'socially constructed' has also changed. The concept of cognition is useful for understanding how this has changed.

The construction of nature conservation

The concept of cognition can shed light on the process in which nature conservation is constructed. The concept of cognition was originally developed in psychology (see e.g. Goleman, 1985). Psychological research suggests that we organise incoming information in their brain with the help of cognitive building blocks (Figure 1). We sort out unprocessed information in order to make sense out of it. We use schemes in which all our knowledge and experience is cumulatively stored. These schemes form a set of rules and categories. They comprise theory and values. Cognition develops itself based on what we have learned during our earlier experiences. Every time we encounter an ambiguous situation, the usefulness of our existing schemes is being tested and our schemes are adapted according to our newly gained experience.

Cognition fundamentally assumes. on the one hand, a tendency towards coherence among values/emotions, perception, theory and action. On the other, it equally requires a tendency towards correspondence between these four elements and the context. The dilemma between correspondence and coherence is the key to the study of learning (Röling, 2002).

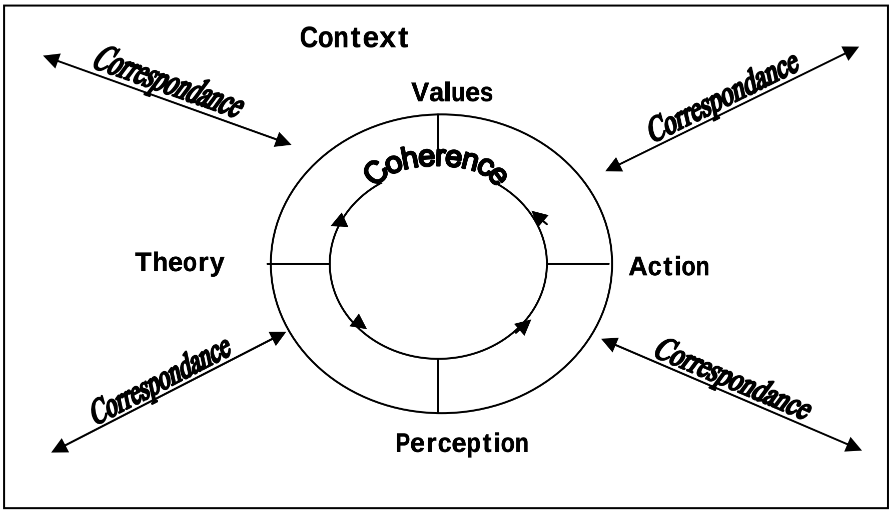

Figure 1 Building blocks of cognition (derived from Leeuwis et al., 2002)

The changing construction of nature conservation when social learning

The traditional expert advice based construction of nature conservation

Introduction

When nature conservation policy is characterised by expert-based hierarchical co-ordination, students are trained as experts, to provide expert advice in the formulation, implementation and evaluation stages of the policy process. Experts construct their advice on the basis of their own cognitive schemes. The expert who perceives the environment through the window of his/her beliefs or theories about it. The experts emotions provide criteria for judgement about the environment and the action that this expert can accept as permissible in this environment.

Expert advice had a direct influence on the policy process (see for example box 2). There was a direct link between the experts' type of nature conservation and the type of nature conservation policies and practices adopted.

Box 2 Ideotypical types of (expert) nature conservation

(Van Bommel and Schanz, forthcomming) distinguish different ideotypical types of (expert) nature conservation.. These are reflected within the various plans and ideas on nature conservation in the Netherlands. The perspectives are not always consistent and are usually some kind of compromise. One way in which nature conservation is negotiated is through definition and adoption of abstract ecological concepts (diversity dynamics, stability, resilience) resulting in various ideotypical types of nature conservation:

- Species-oriented conservation pays special attention to species that are vulnerable to extinction. One of the major issues is isolation. The negative effects of area-loss and isolation are to be compensated for by a network consisting out of core-areas that are connected to each other by means of 'stepping stones'.
- Process-oriented conservation has the goal of maintaining and developing independently functioning ecosystems. Nature is considered as a process that can never be in equilibrium because change and disturbance are normal. The prediction of the course of ecosystem development is not possible. The completeness of an ecosystem and the differentiation in stages of succession can be encouraged by (re) introducing certain species such as large herbivores.
- Gradient-oriented conservation focuses on gradients in and between ecosystems, such as nutrients, light or water. The areas with a lot of gradients are considered the richest and most valuable situations. Spatially, large areas are aimed for not only to develop the diversity in ecosystems but also to develop the coherence among these ecosystems.
- In landscape-oriented conservation, a certain image of nature is pursued and realised. A system can be kept in a earlier state of succession by exposing it to a continuous measured disturbance and 'freeze' nature in a certain state or time. It is as if at a certain moment, a picture was taken and the situation as it was on this 'picture' needs to be restored and protected. Nature conservation often refers to a certain historical perspective, such as 'the situation of 1850' or 'nature as it was before man started interfering'.

The following two cases will illustrate the way in which nature conservation was constructed in in the past when science was used to legitimise policy arguments. Policy makers who want to successfully cope with problems on the political agenda, wanted to base their decisions on the best possible knowledge available. The first case represents an example of species conservation and the second case represents and example ecosystem conservation.

The Cormorant discussion in the Netherlands

The first case study is about cormorant conservation in the Netherlands. As cormorants are fish-eating birds, they are believed by some to be harmful to commercial fisheries (Van Eerden and Van Rijn 1997). Over centuries time and again the cormorants have had to deal with habitat loss and persecution in the Netherlands (Mateijn and Dirksen 1991). To prevent their extinction, the cormorants were assigned the status of a protected bird species in 1966. Protection of breeding sites and the ban on a number of persistent pesticides in the late 1960's and early 1970's made a recovery possible (Veldkamp 1997). In 1978 the cormorant population had recovered and cormorants settled in the Oostvaardersplassen (a protected area) only 10 kilometers from West Europe's largest fishfarm.

The cormorants started feeding on the ponds of the fish-farm and caused major damage (Osieck 1982, Moerbeek 1983) To solve the problem, experts were hired to carry out research in order to find a solution. Experiments were carried out (see Osieck, 1982 and Moerbeek, 1983) which included placing scarecrows, fitting different patterns of nylon ropes above the water surface and light and sound effects. Finally experts tried to chase the cormorants away with trained birds of prey.

When nothing seemed to work, the owner of the fish-farm, the Organisation for the Improvement of Inland Fisheries, wanted to be compensated by the Dutch government for the damage caused by the cormorants (Buissink 2000). After 9 years of legal actions, in 1991 the court decided that their complaints were legitimate. The government had to pay the compensation not only because it owned the nearby protected area but also because it actively encouraged the settlement of cormorants by providing artificial nesting sites in this area (Jongkind 1991).

Nature conservation was clearly constructed in a hierarchical way. When predation occurred, experts were asked to carry out research in order to solve the problem. When this turned out to be insufficient legal steps were taken. There was no attempt to solve the conflict in an interactive or communicative way. The cormorant was an endangered ‘red list’ species and could therefore not be harmed in anyway. Shooting cormorants or managing the population by ‘treating’ the eggs (shaking eggs or treating them with chemicals to prevent hatching) was not considered to be an acceptable nature management option.

The Drentsche Aa

The second case study is on the Drentsche Aa area. The Drentsche Aa represents one of the last relatively unspoilt river systems on the North German Plain. In the sixties, the diversity in terms of landscape and especially flora that traditional farming had generated was threatened by the agricultural modernisation, including heavy use of fertilisers and pesticides, land ‘rationalisation’, drainage, river canalisation and so on. At the time, pioneers in nature conservation effectively fought this destruction in the Drentsche Aa area by beginning to purchase water meadows along the small streams. At the time, purchase of land from farmers was the only option for conservation. The State Forest Service, who already owned some state forests originally meant for wood production, was charged with the management of these lands. In the 1930’s SBB had acquired land by threatening to expropriate land from the farmers who did not want to sell. In 1965 again, farmers were not involved in the decision making about the creation of the reserve areas and they were afraid that the State Forest Service would threaten to expropriate them again. Following this upheaval, the Ministry agreed to make additional funds available that would facilitate the purchase the ancient brook meadows and hay lands in the broad glacial valley bottoms (Bakker and de Vries, 1983; Ernst, 1976). The farmers became devided. Finally, the land was voluntarily sold by some farmers and decisions could be quickly made by the small number of people involved. Many farmers in the area still resented the purchase of farmland for purposes of nature conservation and even considered those who sold out as ‘traitors’ to the farmers’ cause.

In the years that followed, experts carried out a great deal of plant community and hydro-ecological research in the area. They extensively documented the species composition in the area and they studied the effects of management practices on the species composition for maintaining the cultural ‘brook meadow’ landscape. Between 1970 and 1990, numerous studies were carried out in the Drentsche Aa area.

Again nature conservation was constructed in a hierarchical way. The farmers were not involved in the decision making procedure about the conservation of the area. The decision was made by the experts of the State Forest Service and the policy makers together. Farmers were lured into selling their land but, at the same time, farmers perceived a (real or imagined) risk of expropriation if they did not.

Conclusion

Nature conservation in a hierarchical setting was developed and implemented within a 'closed' system (policy makers and experts). People's participation was limited to consultation. After the consultation process, the experts and policy makers could modify their ideas in the light of people’s responses. They were under no obligation to take on board people’s views (See Pretty et.al, 1995). Nature conservation ultimately reflected one (or a mix) of ideotypical expert type of nature conservation.

With increased network co-ordination nature conservation that was developed within the same 'closed' scientic system, however, now needs to be implemented in a complex dynamic (i.e. ‘open’) societal setting (Aarts, 1998).

The changing role of expert advice in social learning processes

The role of experts in nature conservation policy changed as preference shifted to increased network co-ordination (Vermunt et. al., 2003; Neuvel and Aarts, forthcomming; Leeuwis and Van der Ban, 2004).

On the one hand, experts are now often just another actor among the number of private and public actors who influence the outcome of the policy process (see figure 2). Instead of being formalised as advisor with a specific (key) position in the political processes and proceedings, the experts are now all of a sudden confronted with a variety of other organisations and individuals, each with their own stakes and claims. All of a sudden experts have to communicate and negotiate in an entirely different setting, and this requires all kinds of new skills and attitudes.

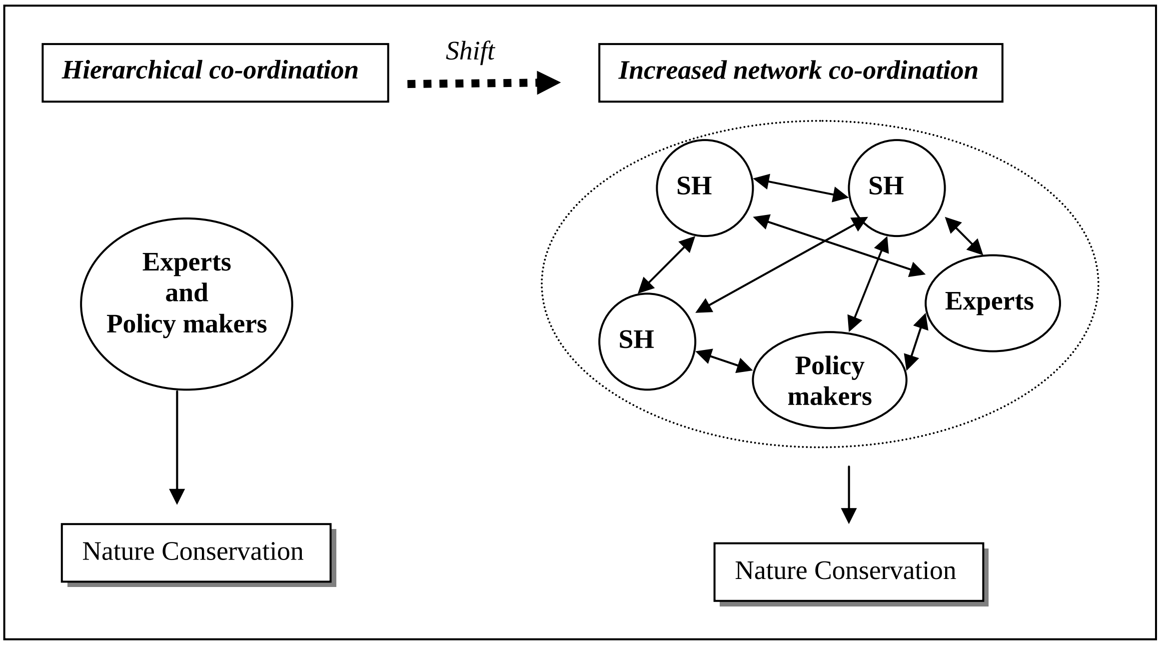

Figure 2 Schematic change from expert driven nature conservation to nature conservation in a network co-ordinated setting in which experts have become a stakeholder among other stakeholders (SH=Stakeholder)

On the other hand, the value of 'scientific' knowledge is put into a different perspective.

Firstly, the confrontation with others highlights that scientists often produce contradictory knowledge about specific issues. Between disciplines, the differences are great, but even within a discipline such as ‘ecology’ there are various ‘schools of thought’, each with its own methods, teachings, institutional traditions and scientific language. The difference in ‘schools of thought’ is related to differences in the way a specific problem is perceived, which in its turn is a result of difference in interest. When different scientists are confronted with a specific problem, they produce a diversity of (sometimes contradictory) knowledge.

The second reason is that other types of knowledge, such as local knowledge, are increasingly valued. When faced with societal problems, the usual response from central actors is a call for more scientific research. However, conclusions from former research often lead to many new questions and an accumulation of facts. In the end, research may easily generate more questions than it solves. It only increases uncertainty. In reaction to this complexity, simplified rules of thumb are formulated. In the long run this leads to further failures because of the biases that are inherent to short-term solutions. It is increasingly recognised that the “societal problems” can only be understood by taking the experiences of local people into account. Nowadays, norms and values within a certain cultural context are perceived to be rational, too. It is recognised that local knowledge has the rationality of praxis. For generations people have accumulated knowledge by experimenting-while-doing. This has yielded them valuable and useful knowledge that cannot be ignored. This means that the strict division between scientific knowledge and local knowledge is no longer valid.

Construction of nature conservation in a social learning process

Introduction

With increased network co-ordination, the stakeholders start building a shared cognitive model that will allow them to function as a Multi Stakeholder group. This requires an agreement on perception, theory, values and action. This is by no means an unproblematic exercise. In both the Drentsche Aa area and in the cormorant discussion the co-ordination shifted from hierarchical co-ordination toward network co-ordination in the 1990's.

The Cormorant discussion

After the predation problems with the fish farm in the 1980's the nature of the cormorant discussion changed in the 1990's. It was now characterized by the concerns of the commercial fishermen. When the decreasing fish yield in Lake IJsselmeer became evident, a new discussion started with different stakeholders. Also, a new approach was taken with regard to solving this conflict.

In order to fight over-exploitation, the commercial fishermen had to reduce their fishing efforts with 50% in 1989 (Jongkind, 1991). This was when they became concerned about the growth of the cormorant population. The commercial fishermen took their complaint to the Ministry of Agriculture, Nature Conservation and Fisheries (Visserijnieuws 1993). The Ministry asked the National Reference Centre for Nature Management to investigate the impact of the cormorants on the commercial fisheries. The National Reference Centre for Nature Management took a network approach and established a platform to which important stakeholders were invited. Reaching a consensus was very important. The stakeholders decided to first concentrate on the possible interaction of cormorants and the commercial inland fisheries, by making an inventory of the available, and/ or missing, information and assessing the state of affairs. Starting point were the complaints of fishermen and fisheries organisations as expressed in a postal questionnaire (Van Dam et al, 1995). In 1995 the results were published in a small book and the democratic conclusion was that the cormorants and the fyke net fisheries together withdraw 96% of the biomass of small perch and the consumption of perch by cormorants equals the by-catch in fyke-net fisheries (Van Dam et al, 1995). The cormorant problem had been officially acknowledged and social learning on a multi stakeholder platform had effectively enabled the stakeholders to learn their way out.

The Drentsche Aa

In the Drentsche Aa area things went differently. In this case too, a multi stakeholder platform was initiated in order to solve a conflict but the negotiation and learning did not immediately solve it.

The unique characteristics of the Drentsche Aa area led the Provincial authorities in Drenthe in 1992 to start a procedure towards declaring the area a National Park (in the sense of the law on National Parks). Hydrological research had shown that the rainwater that infiltrates on the plateau's charges the seepage on which the rare vegetation in the brook meadows depend. This had shown up the interdependencies between nature conservation and farming in the Drentsche Aa.

The plans for a National Park led to strong protests among farmers. As a result, the Province hastily shifted its tactics. Instead of a National Park, it aimed for a National Landscape ('a National Park with extended objectives' that allow multifunctional land use). In 1998 a platform was established to implement the National Landscape. It used the existing landscape as point of departure and aimed at collaboration among involved parties to develop the area on the basis of what has emerged in history. The source of inspiration is cultural history.

However, the learning that has occurred to date does not, on the whole, seem to have led to a collective construction of nature conservation. Instead, what has been learned on the official platform seems only to have reinforced the impasse and most learning seems to have driven the two main stakeholders further away from each other. Stakeholders became entrenched in defending their own interests and the discussion became stuck.

The only bright spots are the small experiments for shared hand-on learning that have been stimulated by the Plot Exchange Committee. In the margins of the official platform, this Committee was created to allowed informal interaction between the State Forest Service and farmers. The Committee was chaired by a volunteer with considerable standing and trust in the area, a retired professional consultant. He was keenly aware of the impasse in the relationships between farmers and SBB and deeply regretted it. One particularly heated exchange between farmers and the State Forest Service led the Chairman of that Committee to start what he calls 'The Pie Bakers' Deliberation'. This informal meeting does not have a regular schedule and the next meeting is agreed at the last. Its purpose is to create trust among the opponents and to agree on small steps forward. At the moment, a number of small-scale initiatives have been rekindled and/or started. On their own initiative, farmers and recreation entrepreneurs are beginning to start 'Environmental Co-operatives', and 'Nature Associations'.

This means that some learning is taking place but it is not necessarily taking place on the officially established platform. Instead it seems to be the informal platform that functions in the margins were the actual breakthroughs are initiated.

Conclusion

For social learning, there needs to be a feeling of interdependence, and trust and that there needs to be a balancing of power. At the start of a social learning process, it can be observed that each stakeholder defines nature conservation according to his or her own cognitive model, restricts himself or herself to this and articulates this view during the discussion. Without interdependence, trust and a balancing of power, the stakeholders are not motivated to move beyond this and come to an agreement. A discussion on values then often has the character of 'my view of nature is not yours, mine is the only correct view and I will prove this to you'. Stakeholders' behaviour becomes strategic and they easily become entrenched in their own views of nature. The discussion gets stuck as each tries to defend his or her own normative view on the basis of his or her ethical and moral arguments. These arguments only impress those who already are in agreement. Others do not consider the arguments relevant or substantial (Aarts, 1998).

Stakeholders can learn to act as a collective cognitive agent when the preconditions of interdependence, trust and power relations with regard to network co-ordination are met. A dialogue around shared action can create room for new perceptions and new knowledge constructions. The process in which the shared norms and theories are defined is dynamic and capricious. Some stakeholders may be in a position to claim that certain ideotypical types of nature conservation are 'right' whereas others are 'wrong'. Stakeholders tend to accept the theories and values of those sources that they trust. Co-researching might raise the level or scope of trust but might in some cases still leave some stakeholders with the feeling that their understanding has been marginalised. Some theories and values will be embraced while others will be left. During the construction of the shared theories and values, relations are being formed and dependencies are being created.

The type of nature conservation will start to become shared through inter-action. An open dialogue around action encourages a shared perception. During the dialogue, power, trust and interdependence are redefined, thus creating space for new perceptions, new theories and new values i.e. cognitive boundaries change (Vermunt et.al, 2003).

Conclusion

This paper set out to address the changes in the construction of nature conservation that have occurred as a result of the shift towards increased network co-ordination.

Increased network co-ordination changes the construction of nature conservation by changing the role of expert advice. In a hierarchical co-ordinated setting, the role of experts is formalised in bureaucratic roles, processes and procedures. With increased network co-ordination, technical experts become just another actor among the number of private and public actors who influence the outcome of the policy process.

As interaction proceeds, the value of expert knowledge is put into question and into a different perspective. Other types of knowledge and objectives, such as the local knowledge of farmer, the objectives of tourists, or members of conservation NGOs, have to be taken into account. Secondly, the expert production of fragmented (and often contradictory) knowledge about specific issues, reduces the credibility of their advice.

The new role of experts requires a different attitude on part of the experts themselves. Instead of producing ‘truth’ and giving advice on the basis of this universalising construction, the experts all of a sudden find themselves stuck in a multi-stakeholder negotiation process. Some nature conservation experts experience this change in expert culture as a minor earthquake. They do not really know what to do anymore and how to handle multi-stakeholder negotiations.

Further research

The shared theories and values that the stakeholders formulate on together in social learning are not necessarily the same as the theories and values of the experts. During an interactive multi-stakeholder dialogue, room can be created for new perceptions and new knowledge constructions. The process in which the shared norms and theories are defined is dynamic and capricious. The outcome is the outcome of a learning and negotiation process. This paper is part of ongoing PhD research at Wageningen Universtity (the Netherlands). The PhD research will now continue by finding out what the consequences of the changed role of expert advice are for nature conservation.

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PLA - a catalyst for good local governance?

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Abstract

PLA stands for "*Participatory Learning and Action*" and is a label for people's participation in community and rural development. The method has been developed in the international development co-operation, and is closely linked to the well-known PRA (Participatory Rural Appraisal). The PRA/PLA approach is being implemented since 15 years and has become very popular. Despite or because of its popularity the shortcomings and limitations need special attention. PRA/PLA has also spread to rural extension organisations in Europe. PLA (a specific procedure) has been tested in several communities in Switzerland. A few experiences have been made in German rural communities, of which one field experience is critically reflected in this paper.

There are several programmes and initiatives in rural areas building on the "„bottom-up“" approach, e.g., LEADER+ and the Local Agenda 21 process. Volunteering through participation in meetings etc. plays an important role in these participatory processes, which are sometimes difficult and time consuming. A PLA in an initial phase might smoothen this process.

PLA aims at supporting a dialogue between stakeholders, creating empowerment and initiating social learning processes. At the end of a PLA exercise a community would have 2 products, which are a situation analysis and an alert community with the desire to create or participate in development initiatives.

In order to fully take advantage of PLA in terms of a social learning process, there is scope for improvement. It is recommended to modify the presentation and feed back methodology and to fully integrate local actors into the PLA team during the analysis phase.

The actual debate on mainstreaming „bottom-up“ approaches in rural development raises another question. One should think about how to scale up the human resources capacities in rural areas, that are able to guide these processes. In the case of PLA, which depends on voluntary work, existing volunteering programmes to further disseminate this methodology could be used.

PLA shouldn't be regarded as a binding principle in „bottom-up“ processes, but one suitable option for analysing the situation of a rural community and/or for evaluating the results of integrated rural development projects.

Introduction

Rural communities in transition from the farming-based village to modern socio-economic structures face many difficulties. The traditional village, where people who live and work nearby would meet and communicate regularly, is rather an exception nowadays. Farmers, traders and craftsmen have been a majority in the community in the past. Today, these classic professions constitute only a small minority among many retired elderly people, families with commuting employees, and in some areas a large

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proportion of unemployed people. Agriculture is not anymore a specialised and dominant sector contributing to employment and the production not more than 25% in any of Europe's regions (van der Ploeg 2003). Farming is rather an integral part of a mixed rural economy.

This socio-economic change has impact on the cultural and natural diversity of the countryside. The post-modern and economical lifestyle of the rural society requires farmers (or other business) and local authorities to safeguard the rural areas "as places with rural character to live in and work and fulfilling recreational and ecological functions" (Federal Ministry of Consumer Protection, Food and Agriculture 2003). Strategies range from marketing concepts for locally produced and supplied goods and services, to (eco)tourism and agro-environmental programmes to preserve the historically grown landscape including agriculture and natural resources.

These strategies are to be developed in a consultation process with local stakeholders ("„bottom-up" approach"). Good local governance is understood as a means for true democracy, and therefore seen as the "golden" way to reach sustainability. In sustainable communities, according to the President of the German City and Community Network, "people together with local government, administration, business and NGO's would plan and manage the future of their community together" (Schäfer 2002).

In this paper the Participatory Learning and Action (PLA) exercise is discussed as planning and analysis tool for developing rural communities in Europe. It starts with a short description of the participatory philosophy of selected initiatives in rural areas. Volunteering issues are briefly reflected, as voluntary work plays a key role in those initiatives. The background and main principles of PRA is discussed and its shortcomings in the international development co-operation reflected. Field observations from a PLA exercise in a rural community in Northern Germany are analysed and lessons learned drawn. It is finally concluded if, when and how PLA could support integrated rural development programmes in Europe.

People's Participation in Rural Development

„Bottom-up" Culture of selected Initiatives and Programmes

LEADER+ is a European Community initiative for assisting rural communities in improving the quality of life and economic prosperity in their local area. Partnerships of local organisations and people (local action groups) receive funds to identify development needs and to test small-scale, innovative pilot projects. One of the four LEADER+ pillars is the "„bottom-up"" approach with new forms of people's participation and decision-making structures. The actual debate emphasises on the full dialogue between rural stakeholders in the drawing up and subsequent implementation, monitoring and evaluation of programmes.[1] Rural development policy should be implemented in partnership between regional public and private organisations and civil society in line with the principle of subsidiarity by building on the lessons learned from the LEADER approach.

The German Federal Ministry of Consumer Protection, Food and Agriculture has launched a pilot programme "**Active regions – Shaping Rural Futures**". This project supports local concepts and strategies, in which the rural area itself acts as driving force through value adding activities. Genuine for all 18 pilot projects is a participatory process with all (local) stakeholders.

Local governments and their communities as key actors have been requested to formulate a local action plan for sustainable development which is being based on the problems and needs of the people of their

[1] During the Second European Conference on Rural Development in Salzburg "Planting seeds for rural futures - building a policy that can deliver our ambitions" (12-14.11.2003) the participants have concluded that the future policy must mainstream the support for rural areas through bottom-up local partnerships.

community (**Local Agenda 21**). In 2003, more than 2,000 or 18% of all German communities have passed resolutions on intent to undertake a Local Agenda 21 process. (Agenda Transfer 2003). In the Local Agenda 21 processes local communities make use of participatory methods in order to improve communication between all stakeholders. User-friendly government administration and services, participatory planning workshops with local people, and participatory budgeting are common initiatives (punkt.um 4/2003).

Some Thoughts about Volunteering and People's Participation

The Local Agenda 21 process depends on volunteer activities, through the participation in conferences, action groups, projects, and round tables (Kaiser 1999). Most of the projects of the "Active regions - Shaping Rural Futures" programme have developed grass-root oriented partnerships. Local partners have made positive experiences with the participatory and transparent decision-making structures (IfLS 2003), but time consuming processes and inappropriate methodologies are major shortcomings so far.

Four kinds of people's participation can be distinguished: a) free elections and freedom of assembly as per constitution, b) public hearings, c) participation under the auspices of a formal organisation (association, political party), and d) informal participation through volunteer work in project-like activities. Participation through a formal organisation is loosing importance (Keupp 2002). In contrast, project-oriented volunteer involvement has gained importance. According to a representative survey of Infratest Burke in 1999 34 % of the Germans are actively involved in volunteer work. Moreover, there seems to be still a "huge sleeping resource" or an unused potential of potentially active volunteering people (von Rosenbladt 2000).

Participatory Approaches

Background

PRA - Participatory Rural Appraisal – and PLA – Participatory Learning and Action - are labels for learning, planning and decision-making methods, which encourage people's participation in community and rural development. They have been developed in the field of the international development co-operation. PRA and PLA are closely linked. RRA has been developed earlier, and is rather an assessment than a participatory tool.

Table 1 Main Features of RRA, PRA and PLA

	RRA	PRA	PLA
Name	*Rapid Rural Appraisal*	*Participatory Rural Appraisal*	*Participatory Learning and Action*
Since	1980	1990	1990
Developed by	Universities, UN	NGO's	NGO's
Aims at	• Quickly acquiring new information about rural life and resources	• Ownership through jointly defining priorities for plans and activities.	• Creating awareness • Supporting a policy dialogue • Empowerment of the civil society.
Used for	• Assessment	• Planning	• Social Learning

Source: Adapted from LBL (2001), Chambers (1997), Pretty et al (1995)

RRA is an exploratory survey, which aims at learning from the local population in order to identify research and development priorities. The RRA toolbox contains a variety of creativity and visualisation tools to facilitate and structure group (and individual) discussions.

10 years later, PRA has been developed by local NGOs in developing countries, of which India and Kenya played a leading role (Schönhuth, Kievelitz 1994). Using the IDS[2] terminology "PRA can be described as a family of approaches, methods and behaviours that enable people to express and analyse the realities of their lives and conditions, to plan themselves what action to take, and to monitor and evaluate the results." The main objective of PRA is to assist communities and planners in formulating local action plans, problem solving and project identification based on a community situational analysis (Leeuwis 2000).

Similar to PRA, PLA typically leads to development change in form of action plans. However, the process of the change is different. PLA emphasises on social learning. In the participation course social learning is referred to "the community members and stakeholders that have generated new knowledge, skills, confidence, resources, insight and perspectives on which action can be based" (Leeuwis 2000).

Principles

The main principles of PRA/PLA are summarised as it follows:

1. **Insiders (community members) are the experts:** Outsiders, i.e. the facilitation and interviewing team ask questions and listen to the community actors. The community members themselves communicate their experiences, needs and knowledge to others. This lays the ground for further action.
2. **Learning in and from the community:** While listening to the perceptions of the community members, the team is expected to be fairly neutral. They neither have the role of an advocate, nor an expert, mediator or extensionists.
3. **Appropriate instruments and degree of precision**: Methods and tools are used flexible in accordance with the actual situation. The team therefore should have strong emphatic abilities. The team should not aim at "absolute accuracy" (Berg et al 1997) or statistically significant data sets. They rather want to understand perceptions, behaviour and communicative mechanisms in the community. Therefore qualitative research methods are the basis of participatory methods.
4. **Triangulation** is a form of cross-checking in order to get a comprehensive insight of the situation. For this purpose, the team composition, the sources of information, and the techniques are varied (Theis/Grady 1991). A multidisciplinary team contributes to this well-balanced approach, as things are approached from different viewpoints.

Critical Reflections

The power and popularity of PRA and its mainstreaming into all programmes has derived in a paradigm shift in international development co-operation thinking. However, the scaling up and mainstreaming created a diversity of meanings and practices. PRA/PLA is not always used as a "true" participatory tool. A Kenyan user describes it with the following words: "everyone is doing something and calling it 'PRA'" (Cornwall 2001).

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[2] IDS is the Institute of Development Studies, University of Sussex, Brighton. The main PRA concepts have been developed by this institute, of which Robert Chambers is one well-known PRA researcher.

The nature of PRA is non-dogmatic, informal, and self-critical. This might explain the intensity of discussions about its practical limitations. Recurring empirical shortcomings have been summarised below.

- **The participation debate is dichotomised into efficiency or empowerment** (Cleaver 2001). One would either consider participation as a means (in order to increase project efficiency) or participation as an end / goal (in order to empower the people). If the efficiency argument dominates the idea of empowerment, the risk of abusing the people is high. This is characteristic for a PRA forum in the beginning of a project (mainly for data extraction purpose) with no PRA follow up process (due to lack of interest or lack of funds).
- The "**tyranny of methods**" (Cleaver 2001), "**fetishism of methods**" (Freyhold 2002) which simply symbolises the very dogmatic and non-reflected application of participatory tools is widely criticised. Often - due to unqualified or inexperienced PRA facilitators - PRA tools are being applied in a text book way. PRA facilitators often tend to perform a messy tool spectacle instead of making use of PRA tools as a means for a genuine dialogue (Chambers 1997).
- "**Dominant and superior behaviour**" (Chambers 1997) of PRA facilitators is the most common fault and one explanation for the abuse of PRA by outsiders. In PRA training, it has not been put enough effort to "attitudes and behaviours". A code of conduct, which can be best described with the attributes "hand over the stick", "sit down, listen, learn, respect", "don't rush", "be nice to people" (Chambers 1997) is required.
- The "**myths of the solidarity in the community**" (Cleaver 2001) ignores conflicts and diverging interests within social or strategic groups, i.e. between individuals. It also does not fully acknowledge the conflicts and diverging interests between so-called strategic groups. Individuals are squeezed into categories, which are sometimes far away from reality.
- **PRA/PLA tries to involve all stakeholders or all strategic groups**. If there are strong conflicts between or within social groups productive decisions and further action are impeded (Leeuwis 2000).
- The conceptual weakness of PRA is **its inadequacy representing positions and actions of individuals**. PRA doesn't tackle the issues of **conflict between individuals and groups**. Leeuwis (2000) suggests to extend the participation concept through the negotiation and conflict approach. This would also require a new definition of the role of the PRA facilitator, who would no longer act as a "fairly neutral figure" (Leeuwis 2000) but may follow an active strategy in order to find agreements and to make contracts. In the French debate, e.g. Olivier de Sardan (1999) has contributed towards the divergence of interest discourse.
- "**Putting the last first?" as a principle hasn't really materialised** after 20 years of participation (Chambers 1997). There is no sincere social change for the most vulnerable strata of the population as a result of PRA. PRA is a good promising thing *per se*, but its outcome is unpredictable and not easily replicable (Cleaver 2001). PRA forums principally aim at involving everybody in the community. In fact, the most vulnerable part of the population are often unable to participate, as they even have no time to participate (Korf 2003).
- It is assumed, that social institutions formalise collective interests and represent the grassroots population (Cleaver 2001). In project practice, however, **social institutions are often accused for fraud** (Freyhold 2002): They use PRA in order to legitimate their own ideas and projects rather than representing the local communities.
- **"Handing over the stick?":** The project practice allows a **decentralisation of power and funds up to a certain degree only**. A decentralised budget is for example often excluded from the

participatory approach. Then, a PRA at local level without decision makers could therefore easily become a farce. PRA facilitators might raise expectations that can not be fulfilled later on (Leeuwis 2000). This is particularly true in very hierarchic environments or bureaucratic governments.

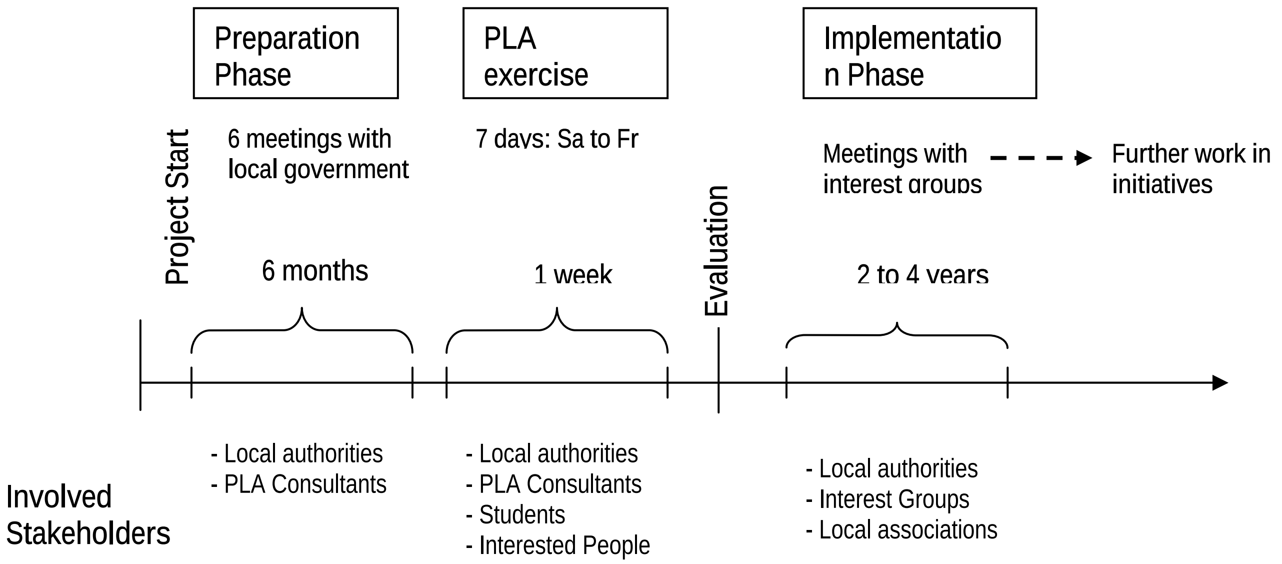
PLA concept in Europe

Process and practice of PLA

The Swiss Center for Agricultural extension (LBL) is applying PLA as participatory method in Swiss rural communities since 1990 (LBL 2001). PLA has been also tested in at least three German federal states: Lower Saxony, Schleswig-Holstein, and Baden-Württemberg (Chamber of Agriculture 2003; Delius and Currle 1998; Friedrich and Kügler 1999; KDA 2003; Korf 2003).

LBL has developed a very much standardised PLA process for rural communities. The process has 3 major steps and is illustrated in Figure 1. PLA consultants typically assist during a preparation phase of 6 months. They also facilitate the 7 days PLA exercise. The PLA exercise is conducted by a voluntary team of students and other interested people. The multidisciplinary team conducts interviews, analyses the generated data and prepares for a final presentation.

After the PLA exercise an evaluation meeting follows. Then the initiative groups, start planning and implementing the projects for a period of 2 to 4 years. During this phase, the rural communities are mainly self-responsible. However, consultants might support the implementation.



Source: LBL (2001)

Figure 1 PLA Process

Objectives of a PLA exercise

Local actors of a community formulate their individual strengths, problems, potentials, and project ideas. This information is analysed and structured and finally leads to a situational analysis. A social learning process takes place, in which information and ideas are shared. Community actors receive feed back from the outsiders (interviewing team) and other actors within the community. Through a communicative action process (by giving feed back and self-disclosure) the arena where action can be based on is opening up.[3] The objectives of a PLA exercise are

- To show development potentials
- To develop realistic project ideas
- To develop a joint vision of the community
- To advocate for active involvement/engagement of people in the community
- To support a dialogue between various interest groups within the community

PLA Tools

In the standardised PLA exercise as described above, only two tools of the RRA/PRA toolbox are applied[4]: The first day starts with a **transect** (village walk). It has the "purpose of becoming acquainted with the community and its people, by way of informal talks, and some information about the situation 'on the ground' " (Berg et al 1997).

Another tool is the **semi-structured interviewing with individuals and groups**. Individual talks are very informal and may take place in the kitchen. Therefore they are called "talks at the kitchen table". The community walk is usually the first activity of a PLA team in a village. For presentation purposes and to structure group discussions, visual sharing in form of maps and diagrams are used.

First-hand experience from a PLA exercise in Northern Germany

Objectives and procedure

The objectives of the PLA exercise in the community Bookholzberg were to motivate the population, to integrate the youth, to network the interests between government and local population, and to request the local government for further action.

To gain partners for an interview, the PLA exercise has been announced in local newspapers and flyers. Multipliers have been recruited on a voluntary basis for all identified interest groups (farmers, traders, elderly people, youth, etc.). Their task was to motivate their "peer" group to enrol for an interview.

Actors and their main interests

Bookholzberg (estimated population of 5.000) belongs to the rural community Ganderkesee which is located between the 2 cities Oldenburg and Bremen in Lower Saxony, Northern Germany. It is a community in transition. It is well connected to cities, where people would work. There are only marginal job opportunities within the community. A small number of full time farmers produce on the agricultural land. Part-time farmers make up a good part of the population and seem to positively influence the rural landscape, e.g. through the planting of hedgerows. Table 2 contains the functions and major interests of the stakeholders involved.

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3 Good interpersonal communication facilitates social learning. In order to illustrate the effects of self-disclosure and feed back to increasing personal and interpersonal awareness the psychologists Joseph Luft and Harry Ingham have devised the Johari Window. The PLA process makes use of the two mechanisms self-disclosure and feed back. In individual talks PLA focus on self-disclosure, while in group presentations it focus on feed back.

4 The RRA/PRA toolbox contains a wide range of facilitation and creativity tools. These have been described in various manuals and training guides (e.g. Theis/Grady 1991; Pretty 1995; Berg et al 1997).

Table 2 Functions and interests of stakeholders in the PLA exercise

Stakeholder	Number of persons involved	Function within PLA exercise	Major interest
Local council Ganderkesee (Mayor)	1	• Donor (50% or 5.500 Euro)	• Feed back from community • Improve local government performance (elections!)
Managing committee of Local Agenda 21 association	3	• Fund raising from local authorities and District government • Commissioning party	• Publicity for Local Agenda 21 initiatives • Guidelines and justification for future activities • Social learning process
Chamber of Agriculture	1	• PLA consultant/trainer • Facilitation of process	• Dissemination of PLA methodology
Multipliers	25	• Gain partners for an interview • Organise accommodation for PLA team	• 200 interview partners • Any other interest?
Interviewing and facilitating team (voluntary work)	15	• Conduct individual and group interviews • Presentation of findings	• In-house training • Training and personal interest
Interviewed individuals and families	100	• Provide information	• Talk about problems / solutions • Any other interest??
Interviewed groups	18	• Provide information	• Talk about problems / solutions • Any other interest??
People in Bookholzberg	~ 5.000	• Invited to interviews and presentation	• ?

The commissioning party (local agenda association) did not fully understand why the participation of some people did not take place (indicated with questions marks in table 2). Some multipliers were not successful enough in stimulating “their” interest group. This was the case for the business-people for instance. It was suspected that there were **too many conflicts within the interest group of business-people.** People are then less interested in participating as they do not expect much of the outcome. The same phenomenon was observed within the group of new citizens and vulnerable groups (e.g. refugees seeking asylum).

Process of the PLA exercise

In 168 hours or a 7-days week a PLA team of 15 persons conducted a situational analysis reflecting the perceptions of the community actors. The exercise started with a 2 days training on people’s participation and interviewing techniques. 3 subsequent days were spent to conduct the interviews. For data analysis and the final presentation the team had another 2 days.

In small teams (2 to 3 persons) 100 individual interviews and 18 group discussions have been conducted. The appointments for the interviews were made by the commissioning party well in advance.

An interview lasted between 20 minutes and 2 hours. The essence of the interview was documented on an appropriate number of cards (maximum 10). Table 3 shows how the documentation was structured.

Table 3 On the Spot Analysis of the Interview

White cards	What works well in the community? **(Strengths)**
Yellow cards	What should be improved? What is a problem? **(Weaknesses)**
Green cards	What do we want? **(Wishes)**
Blue cards	What do we do in the community? **(Project ideas)**
Red Cards	What vision do we have for the future of our community? **(Crazy ideas)**

Source: Chamber of Agriculture Weser Ems (2003)

All cards have been clustered into 6 major fields of interest, which were: a) children and youth, b) infrastructure, c) traffic and transport, d) agriculture, environment and recreation, e) administration and local government, and f) people's co-operation and communication.

Posters have been created for all fields of interest and sketches have been designed to be performed the other day. The final presentation was attended by an audience of 160 people. Besides giving feed back to the community, this event intended to provide a forum for further discussion and the informal meeting of local action groups.

Lessons Learned

In order to fully take advantage of the **social learning process**[5], potential users should be especially aware of:

- **A good PLA wakes up the "big sleeping human resource".** "People in Bookholzberg are braver now" stated the manager of the local agenda committee. They have increased their awareness and understanding of the community, the development options, may even changed their attitudes and became definitely more self-confident. This interest has created the desire to further develop or work in initiatives.
- **Guidance during project planning and implementation is the key factor for success.** Since the exercise, many people have contacted the local agenda committee and talk about initiatives and new grass-root projects. New groups have been formed, some projects and interests have been even materialised or are at a planning stage. It is important that these first initiatives get guidance from an agency (consultant, association or local government) in order to keep motivating the people and to advise in project implementation.
- **The final presentation should be designed as first forum for further action.** The participants were overwhelmed by more than 40 posters and a couple of sketches that gave feed back on the conflicts and interests in a rather entertaining way. A fruitful discussion in front of the boards was more wishful thinking than it really took place. It is essential to further develop a feed back concept that those meetings are used more efficiently in direction action forum. The fairly flexible Open Space methodology, where people would meet and determine themselves, what and how long they want to talk about, might be a suitable alternative taking into consideration the social learning process.
- **Public relations is essential.** Public relation work was well organised through the involvement of newspapers, radio stations, television right from the beginning. The produced video can be used for training purposes as well as interested people from the community in order to further disseminate the results. As the PLA exercise stands rather at the beginning of the social learning process, media are an important tool to raise attention.
- **Individual talks increase people's authenticity, but group processes are essential for social learning progress.** People in individual interviews talk about things they would also tell their neighbours and friends, which gives a very authentic picture of the reality. Group discussions are so effective in terms of social learning, and initiating projects. Therefore, the balance of individual and group discussions is essential for a good PLA.

[5] Suitable indicators for social learning are the level of alert/attention, interest, desire and action (A-I-D-A) in the community, which could be captured in figures (number of people involved, calling, taking part etc. before and after the PLA exercise and or number of initiatives, hearings, meetings, etc.).

- **Interview should deal with as many personal interest and solutions as possible.** The content of the interviews – if not guided well – would focus very much on higher level problems. People tend to complain about general frame conditions and its limitations. To fully take advantage of a social learning process, the interviewers must gear people towards their personal problems, interests, wishes and solutions. It should deal with aspects, that people are able to influence, decide, to create, and to change. Moreover, at least 30% of the time of the interview should deal with the future.
- **A volunteering PLA team is a trust-building measure.** Community members are able to talk frankly to volunteers (as they are usually less superior and less dominant). It might be also a fact, that volunteering has a good reputation in the rural areas.

If the emphasis lies on the key principles of PRA "**Putting the last first**" and "**Handing over the stick**", this would require paying more attention towards a number of issues:

- **Roles and responsibilities must be well defined.** One impression from the exercise was that the role of the Local Agenda team as multiplying agency was not satisfactorily clear. They are responsible for all preparatory and follow up work, but haven't been integrated well into the PLA week. The PLA consultant justified the exclusion of the managing committee by the fact that interviews should be treated anonymously and neutral. Still, during the course of the week many misunderstandings came up and the Local Agenda 21 board felt excluded and could not participate in the process as they wanted to do.
- **Insiders should be involved in data analysis phase**. The Local Agenda 21 association felt excluded from the process itself, and therefore missed some important steps to fully understand the whole process. While the interviewing team, which has increased its understanding of the communication within the community, goes back home, the insiders are left with a bunch of posters. The integration of local people, especially in the data analysis, would be very beneficial for a sound follow up process.
- **Marginal groups must be invited for an interview explicitly.** In general, they would not come voluntarily, if they do not feel part of the community and that their voices count as well. Multipliers for these groups are essential and they even need a special training to motivate those groups to participate.

The PLA methodology has its **limitations**, which are related to its appropriateness as planning and conflict solving tool.

- **PLA is less effective as planning method.** During interviews, people prefer letting off steam than looking for productive solutions. On the other hand, the PLA team was instructed to direct the interview towards ideas and projects. This creates an dilemma which is often difficult to overcome. The instruction on the degree of guidance during the interview must be well communicated in advance. The purpose of the interview must be well explained to the interviewers and the interviewed. This is particularly true if PLA should be used more in the sense of a planning tool. It is then also required to modify the method.
- **PLA is not solving conflicts.** Interest groups which have internal conflicts, e.g. business-people in the case study, were not enrolling for interviews, neither as group nor as individuals. They did not believe, that a situational analysis could be a good start for further action. Conflict assessments in an initial stage would have had helped to better understand the participation behaviour of certain groups. In a conflict situation, complementary conflict management/mediation tools are necessary.

The **costs** of a PLA are rather low.

- **PLA is quick and efficient.** Whether a PLA exercise is cheap or expensive, this question shouldn't be raised here. One thing is assured: A comprehensive situational analysis of a rural community can not be realised with a budget of 11.000 Euro. It must be stated once again, that all 15 interviewers have worked on a voluntary basis. If they had received a daily rate of 150 to 200 Euro, the costs of this exercise would have had been doubled or tripled.

Conclusion

PLA "made in Switzerland" has been tested in a few communities in Germany. The experiences are generally positive, therefore the question of the heading must be answered with yes: PLA is a catalyst for good local governance. An evaluation in Swiss communities gives related answers. It increases subsidiarity and transparency, and offers a new informal way of participation (LBL 2001). PLA helps to initiate a communicative process in the rural areas, and therefore definitely supports decentralisation endeavours.

PLA delivers enough information in a short period of time about the problems and potentials of the local actors and serves as basis for local action plans. It is an appropriate tool for a situational analysis. It would be also suitable for evaluation purposes.

In the same time, it creates a fertile ground and a desire of local actors to further participate and initiate local action plans. However, whether real action materialises would very much depend on a qualified implementation guidance through local institutions or consultants. In order to improve the social learning effect, the full integration/participation of local stakeholders during the exercise would be necessary. Better feed back mechanisms between local people, e.g., during the final workshop are needed.

For researchers, planners and advisors in rural development programmes good facilitation, conflict management and feed back skills are needed more than ever. It is not only the skills, but the attitudes and behaviour, that will make participatory processes successful.

Managing „bottom-up" processes in small programmes like LEADER+, Active Regions (Germany) or Local Agenda 21 initiatives is relatively easy. If „bottom-up" approaches in rural development programmes will mainstream and scale up rapidly, there would be a high danger of abuse. One pitfall would be to tick off the participatory process as necessary evil from the long list of project implementation issues (similar to the experiences in the international development co-operation). A standardised, yet locally adaptable and flexible procedure for mainstream integrated rural development programmes should be further developed.

Volunteering plays a vital role in „bottom-up" planning processes. Adequate promoting structures to further encourage participation would be very beneficial. Existing volunteering programmes such as the Voluntary Ecological Year among others could be further extended/promoted to assist in processes for sustainable rural development.

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Participative Research to Develop a Model for Decision Making in Precision Agriculture

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Abstract

This paper demonstrates the learning process of a University Farm (UF) manager during a systems analysis. The analysis included Human-Activity analysis, Socio-Technical analysis, Information analysis, and Decision Analysis. The Human-Activity analysis described the organizational structure of the UF. The Socio-Technical analysis covered the satisfaction level of the UF employees. The Structured Analysis and Design identified assisted in handling precision agriculture and research trials' data on the UF. The Decision Analysis identified and structured the decisions made for field operations. Having the farm manager participating in the whole process enabled her to see the whole farm in a different perspective, understood employees' skills and needs and learnt more about all levels of farm management decisions.

Keywords
Systems analysis, precision agriculture, participation, learning process

Introduction

Precision Agriculture (PA) can be defined as the management of spatial and temporal variability to improve economic returns and reduce environmental impact. This can be achieved through using appropriate technologies within a coherent management structure. PA technology now has the ability to produce data about soils and crop at sub metre level across the whole field, but the capability to use this data is very limited until suitable information systems and effective decision making procedures are developed (Blackmore, *et al*. 2002). The necessity of management information systems to support decision-making in PA has been also recognised by a number of researchers and producers. Atherton et al. (1999) claimed that the gap between acquiring site-specific information and using it effectively in making agricultural management decisions has widened. They concluded that there is no "cook book" to cover those issues, but that each manager must collect only those data that can be used effectively for management decisions. The U.S. National Research Council (1997) proposed that systems principles are required for decision-making in PA and ways to respond to questions on information needs.

This project was based on the Royal Veterinary and Agricultural University's (KVL) farm. KVL University Farm (UF) has four farms in Taastrup, East to Copenhagen, with a total area of 210 ha, 2000 m^2 glasshouse, 14 growth chambers and several other experimental facilities. The UF is organizing and carrying out research experiments as an internal charged service for researchers at KVL. It is a well-organised section with around 15 employees. The KVL UF faces many difficulties on how to deal with all the spatial and temporal data, gathered with the use of PA as well as the results of the research trials and be ready to adopt new technologies, such as data gathering from autonomous vehicles' operations. As a result, the UF would like to be at the cutting edge of the new technologies for educational, experimental and production purposes. To understand the current situation in the UF, a systems analysis

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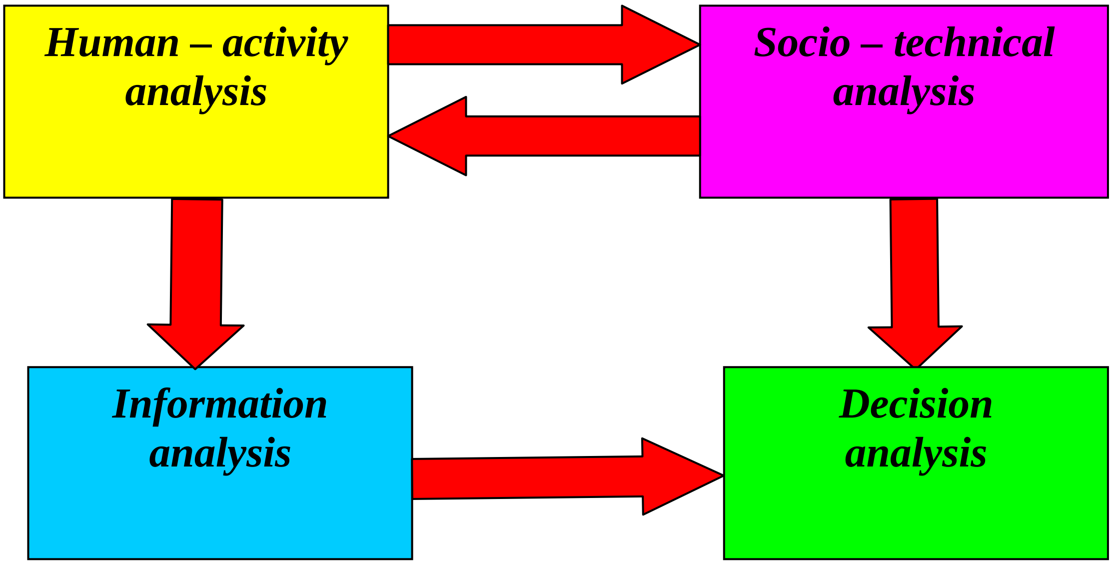
was carried out to identify users requirements, skills and perception of the staff towards the new technologies and problems in information management and decision-making process. Furthermore, an information system was proposed to store, process, visualise and incorporate the data gathered from the use of PA and research trials.

The systems analysis consisted of Human-Activity analysis, Socio-Technical analysis, Information analysis and Decision analysis. This paper demonstrates how the UF manager benefited participating in the whole process, learning new aspects of the UF and understanding more about staff skills.

Methods

The method that found to be more appropriate was the "Multiview". This method combines important aspects of some of the major methods into a more coherent and flexible approach, and thus offers the practitioner a broad understanding of the whole process of systems analysis (Wood-Harper et *al.*, 1985). The applied stages of the "multiview" method were Human-activity analysis, Information analysis, Socio-technical analysis. Additionally to those, a Decision analysis component was added.



At the beginning, the Human-Activity analysis was applied. Intensive interviews with the UF farm manager were carried out trying to identify the scope of the research, trying to outline the people and activities including in the system through the "rich picture" and relevant systems, following the soft systems method. Having identified the customers and the users of the system, personal interviews were carried out with both the customers and the UF staff.

The findings of the interviews from the users and customers at the early stage were used to plan and structure the socio-technical analysis. The "Ethics" method was used to construct a closed-ended questionnaire in order to describe the level of job satisfaction of the users. Additionally, two more sections were added. The one was related to the customers' requirements towards the UF employees-users, derived from the personal interviews and the second section was related to the application of the new technologies. ETHICS (Effective Technical and Human Implementation of Computer-based Systems) was devised by Mumford (1995) based on the participative approach to information systems development. The ETHICS method consisted of five different sections (fits):The <u>knowledge fit</u> examines if the employees believe that their skills are being adequately used and that their knowledge is being developed to make them increasingly competent. The psychological fit examines if a job must fit the employee's status, advancement and work interest. The efficient fit tests the effort-reward bargain, work controls and supervisory controls. The task-structure fit measures the degree to which the employee's tasks are regarded as being demanding and fulfilling. The ethical fit examines the social value fit and measures if the values of the employee match those of the employer organisation.

The results of the Human-activity and Socio-technical analysis were used to develop the diagrams in the information analysis part. The Entity Relations diagram was tried to build parallel to the Data flow diagram for consistency.

The Decision Analysis was carried out using methods taken from Management Information Systems (MIS). A well-structured MIS has to cover a set of questions, which are called "the five W's and an H" (Mitra, 1986; Koory and Medley, 1987). These questions are: What information is needed? When is the information needed? Who needs it? Where is it needed? Why is it needed? and How much does it cost?

Results

Human-activity analysis

The human-activity analysis resulted in a rich picture, relevant systems and conceptual models for the systems that the farm manager was interested in pursuing further. The rich picture of the research farm is shown in figure 1, where in the centre is the farm office with the farm manager. The main activities of the research farm were agricultural field operations, accountancy, public relations and issues related to regulations from the Ministry of Agriculture. The key people involved were the farm manager, the staff of the farm, the researchers-customers (rend subfields for trials) and the specialists researchers (provide advice). The research farm management board, the KVL administration and the Head of Department were decided to be outside of this system. The conflicts and the problems for the farm manager can be seen to be the need for modernization and the conversation from the collected data to useful information. Moreover, the researchers who have used the farm would like to have the staff working closer to them, while the staff faced internal communication problems.

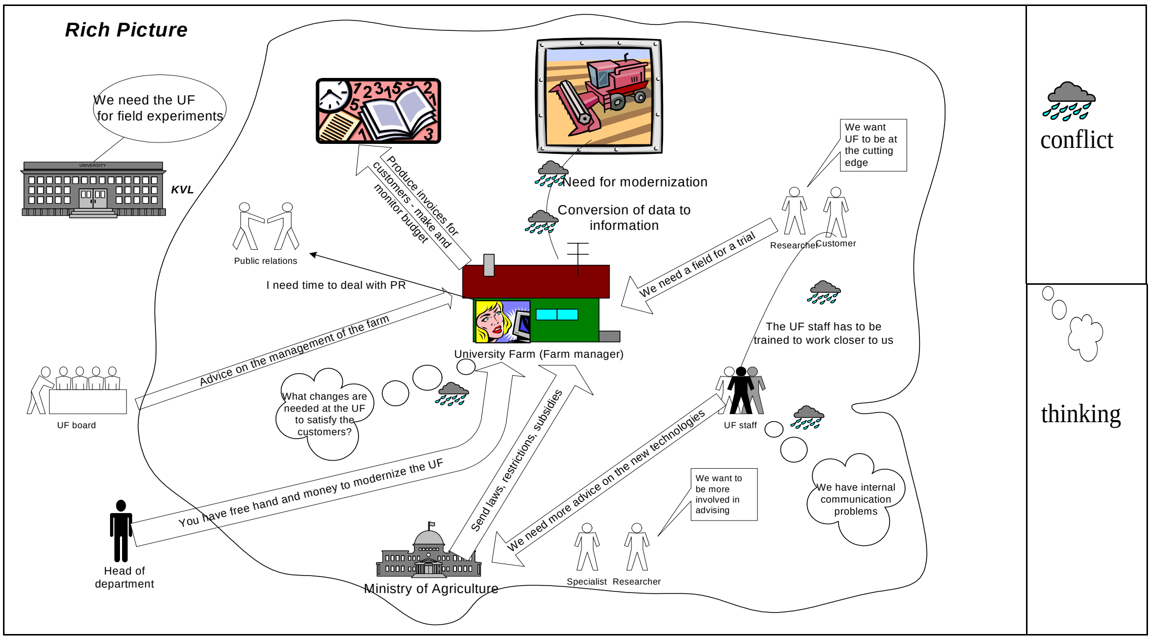


Figure 1. Rich picture

With the completion of the soft systems analysis, data flow diagrams and entity relationship diagrams were developed to describe the proposed system. The root definition of the most relevant system was: "A university owned and operated system to handle spatial data from the fields, by means of precision farming management tools, in conformance with scientific needs, in order to demonstrate the information from the crop production to researchers at KVL. The CATWOE for this root definition was the following:

Customer: Researchers; *Actor*: UF staff; *Transformation*: field trials -> spatial information; *Weltanschauung*: the belief that spatial and historical field data should be easily viewed and utilized by all interested researchers; *Owners*: UF manager; *Environmental constraints*: University expectations

Socio-technical analysis

The findings of the interviews from the users and customers at the early stage were used to implement the ETHICS questionnaire with two more sections. The one was related to the customers' requirements towards the UF employees, derived from the personal interviews and the second section was related to the application of the new technologies with focus on precision agriculture and autonomous vehicles. A questionnaire of 65 questions was distributed among 13 of the UF employees. The questionnaires were divided into two groups: the foremans and the non-foremans (technicians). The main findings on each category are summarised below:

Knowledge fit
In general terms there is a high degree of knowledge fit. The only problem is the non-foremen (technicians), who feel that their knowledge is not utilised fully (~80%)

Psychological fit
The UF staff is friendly and ambitious. These are important factors in order to agree on any kind of modernisation. They would like to carry out more responsibility and that comes along with the customers' requirements. However, they would like to receive more recognition from the management, when they accomplish good job.

Efficiency fit
The efficiency fit has to be further examined. In general terms, the staff was happy with the support and information they need, but not in a high degree. The non-foremen like to carry out the job without management intervention. That implies an improvement in the information and support they need. The time registrations database system (the way UF staff register time consumption) doesn't find all of them to have the same opinion. It is important and has to be further examined. The most important finding is the trust of the management in a very high degree.

Task-structure fit
There was a very distinct view non-foremen would like to work more independently, taking more decisions and be more team players. It seems that there was no certain problem with the foremen, as they feel happy with the existent situation. Therefore, there is a task-structure fit on the foremen, but not so much for the rest of the staff.

Ethical fit
There was not adequate ethical-fit as mainly foremen feel that they do not participate in the overall running and decision-making of the UF. The main problem was the lack of communication, although they felt that their manager cared about them in some extent.

Customers' requests
UF staff would like to have flexible working time. They would like researchers to work closer to them. They believed that they take the initiatives for new technologies in their areas. They also found the explanations of the project from the researchers good enough, but they would like more detailed explanations. They also supported that the UF management had to get new tools for farm management. Finally, they pointed out that UF management decisions are short-term oriented.

Precision agriculture (PA)
UF staff was not so convinced on the benefits of PA. They didn't also know where to seek and access information regarding PA. Half of the staff gets information regarding PA from magazines and exhibitions. They were also very sceptical about the use of driverless machines.

Information Analysis

In this stage, the main activities identified by the conceptual model from the Human-activity analysis stage were decomposed into Data Flow Diagrams (DFD) following the semantics of Structured Analysis and Design. An Entity Relationship diagram was also developed capturing all the data collecting in the UF and their relationships. In this case, the data from the use of PA was combined with the data of the research trials with the an entity called sub-field. Finally, a Data Dictionary was made to show the data attributes for each entity and process.

Decision analysis

Another part of the systems analysis process at the KVL UF was to gain a comprehension of how practitioners of PA organise their data to make decisions in a structured way. The information gathered through interviews with farm manager was used to develop a general model of the decision making information flow in PA. Initially, the farm manager listed the farm operations within a growing season, from field preparation to post harvest. Secondly, the decisions taken for each farm operation were identified and listed in chronological order, as well as the decision category for each decision: strategic, tactical or operational. The third stage, consisted of personal interviews with the farm manager at which all the decisions listed at stage two were analysed, by using the identified set of questions. To present how the decision analysis works, an example analyzing one decision (what is the seeding rate in variable rate seeding applications) is illustrated in Table 1.

Table 1. Analysis of decision "what seeding rate?"

Decision-analysis factors	Answers
Decision context	Variable rate seeding applications
Decision name: (Decision level) Decision outcomes:	What is the seeding rate? (Tactical) Application map; planting date; yield potential
Decision-maker: Participants: Influential people:	Myself My partners Seed dealers
Decision frequency: Decision timing:	Annually January
Decision triggers	Seeding date; It has to be done by April
Decision precedence	- Chemical programs, which we decided at the same time - Selection of seed variety
Management strategy:	Maximize yield
Information needed to help make decision:	Soil type data (1); Yield data (2); Soil moisture data (3); Field records or previous seeding (4); Public and private research information (5); Observation and experience from seed dealers (6); Seed rate recommended (7); Drainage information (8)
Desired-extra information	More information about weather; location to be available electronically and make the analysis from that; real-time sensing of the soil and estimation of weed population; soil moisture sensor data; good remote sensing data
Source of data or information: [Physical location]: {Access cost}:	Paper & spreadsheets [PC], Personal experience (1,2,4); Field samples (3); Remote sensing data [Consultant] {High cost}, Personal experience (3, 8); Published materials, magazines, newsletters [Internet, office] (5); Personal communication with seed dealers (6,7)
Description of information processing:	Make adjustments to the algorithm of the computer and generate the variable rate application map
Tools needed for processing:	- PC - Good GIS package and creation of an output file for the controller - If there is remote sensing data, GIS tools
Resource availability affecting decision:	-
Critical Assumptions:	The whole thing; We assume that maps are correct; Weather is going to be the most critical factor; Is the variety going to respond?

The decision analysis factors were assembled to form a DFD. Figure 2 demonstrates the tactical decision, which was described in table 1, about "what seeding rates" As indicated, soil type data (1), yield data (2), field records (4), drainage (8) are taken from the historical data database. These data are either stored as raw data or they produce papers of spreadsheets. The public and private research information (5) are taken from the "external information" database. The information about seeds were provided by advisors (6,7,8). The decision outcome of this decision fed the decision records database. These data can then be used for the next year's decision.

The Decision analysis method was developed at the KVL UF was further tested on two of Purdue University Farms, five commercial Indiana farms, one US crop consultant and two US extension educators. At the three University Farms (one in Denmark and two in the USA), the farm managers analysed all the decisions for field operations within a growing season. The commercial farmers analysed the decisions they make for one field operation. The analysis of the decisions was based on the decision analysis factors described in table 1.

Table 2. Field operations and decisions identified by the three university farms

University Farms	No of field operations	No. of decisions	Years practising PA	Cultivated crops
KVL Research Farm	29	42	4	Spring cereals
Purdue Ag Center (DAVIS)	23	30	8	Corn/Soybeans
Purdue Ag Center (NEPAC)	12	104	2	Corn/Soybeans

Table 2 shows the number of field operations, decisions, years practising PA, cultivated area and cultivated crops, throughout the analysis of the research farms. It is interesting to see the difference in the number of operations and the number of decisions each farm manager in the universities identified. This is due to the way each farm manager thinks and organizes his or her work and thoughts. It illustrates the learning process farm managers go through analyzing the farm management decisions they make.

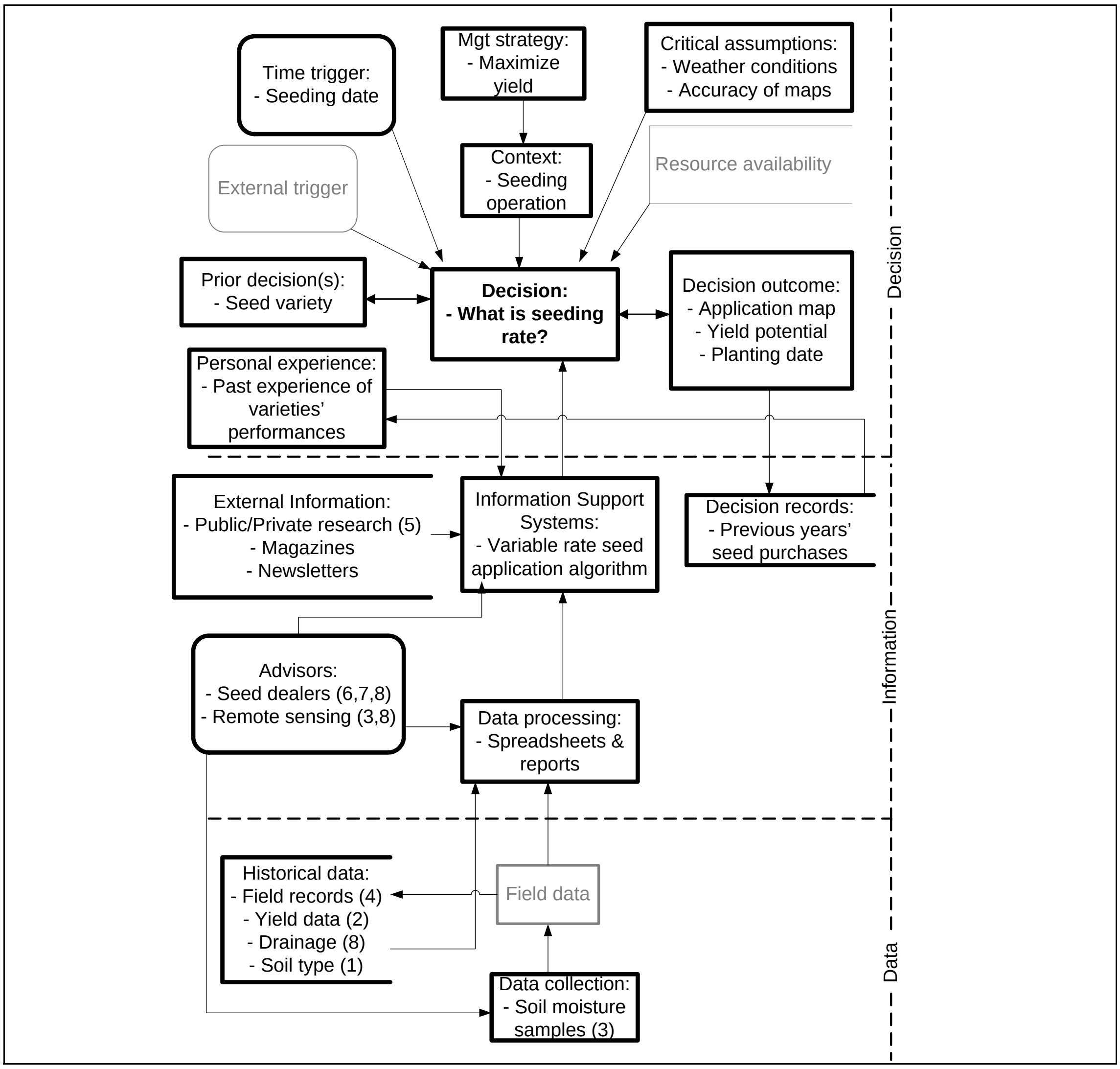
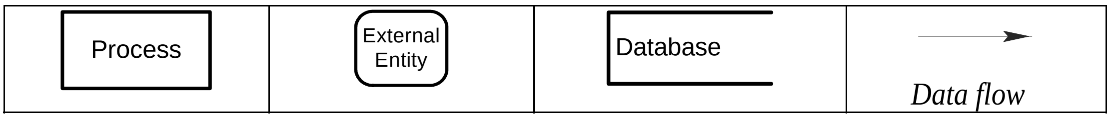


Figure 2. DFD model for the decision "What is the seeding rate?"



Key to figure 2

Discussion

This paper presented the results of the application of a soft systems method in the KVL UF and the development of a decision-making model within PA. This research was a part of a systems analysis research within PA, which also included socio-economic and hard systems analysis. The farm manager at KVL participated throughout the whole process in developing the different components of the soft and hard systems method, socio-technical analysis and decision-making. The farm manager was going through the terminology of the theory of all the different methods, learning by herself the systems analysis techniques and working together with the analysts during the whole period. As a result, she saw the organization (research farm) she manages in a different perspective. Moreover, the whole process helped the farm manager to better understand the role of her staff in different operations within the farm, how to further utilize their skills and their own perception of the farm's future development.

For this experience the farm manager at KVL research farm mentioned: "The whole process was very time consuming and the items and the way of thinking was unusual for a scientifically educated person. In that context the analyst's role was essential as a facilitator of the process. Therefore, as the process proceeded the point became more and more clear and I realized how much I would finally benefit from it. The two main outcomes were: 1. Clarification of the decision-making processes including the several elements of each process and the role of the participants in the different parts of each process, and 2. The data flow analysis and the DFD that now constitutes the basis for the construction of a geodatabase that can handle and present all kinds of data produced and gathered at the research farm. During the evaluation that was done in the following growing season I learned that we had done the analysis very thoroughly since I discovered no needs for iterations."

The learning process between analysts and users is also supported in the bibliography. McCown (2002) mentioned that there should be put emphasis from design to learning, trying to learn what the farmers are learning and learn what this means for conduct of their own future activity ("action research"), which is also the approach taking on this analysis in the decision making process, to understand how actually farmers make decisions.

Furthermore, the farm manager at North East Purdue Ag Centre (NEPAC), who applied the decision making method at his farm mentioned: "the decision-making process has been difficult and incomprehensible to me, especially when trying to organize and classify all the data that I have collected at NEPAC in the past eleven years. My goal has been to have concise and understandable databases (whether on PC or on paper) for NEPAC from which I can easily and quickly extract the data I need for decision making. I think that through this exercise you are helping me to learn how my mind works and I will come much closer to achieving my goal."

The decision analysis model is a systems approach incorporating the information gathered through field operations and analyses into the process of making a decision outcome. It was developed in a research farm in Denmark, but it was proved to be applicable in both research and commercial farms in the USA with different crops. The changes needed from the decision analysis factors or the model that was developed in Europe, were very limited after testing it in the USA. This shows that the general perception and use of the information for making a decision in different agricultural systems is not significantly different. However, the application of the process in the whole range of field operations proved to be very time consuming. The number of operations and decisions identified for the same agricultural systems, such as the two Purdue Ag Centres, shows the different grouping of perception and detail that a farm manager can apply. Moreover, aspects like timing and frequency involves uncertainty and it was not easy from the interviewees to answer. Risk and uncertainties are not referred to this method, as the model only tries to describe the decision environment and the information flow.

Conclusions

The process of systems analysis in a farm can enable farm managers get a more in depth understanding of their business. It can reveal conflicts and opportunities for changes and improvements. The decision-making method that was developed through the process can structure and formalize the farm management decisions.

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Water management and environmental awareness: a case study on nursery gardening in Tuscany, Italy

T. Bozzoli, G. Brunori and M. Rovai*

Abstract

The problem of water use in irrigation and dispersion of fertilizer-derived nutrients is of great concern in Tuscany and, in particular, in the nursery garden sector. IDRI is a research project on the rationalization of the use of water resources and fertilizers in nursery gardening in Tuscany. Through business surveys carried out in farms in the four main nursery gardening zones in the region, it has been possible to analyse the various aspects concerning the importance given by the farmers to the problem of water and the understanding that these farmers have of their own role in the qualitative-quantitative impact on the resource. This paper reports the results of the investigation, and discusses how, with differing amounts of technical understanding, producers can have diverse expectations and perceptions of the technological innovations which save water resources and fertilizers.

Finally the study tries to trace a possible differentiation in the strategies to adopt in regional agro-environmental politics regarding water resources based on the different levels of understanding in the businesses.

Water and fertilizer use in nursery gardening in Tuscany: from understanding to action

Nursery gardening is one of the leading sectors in the Tuscan agricultural economy and is important, in some cases, even at national and international level. Due to the intensiveness of cultivation or "out of soil" cultivation techniques, this sector is one of the most demanding in inputs and particularly in water supply. This makes it particularly sensitive to water shortage and puts it water as the key problems in environmental sustainability.

Nursery businesses are concentrated in a few specialized areas in the region, so that the sector has, on one or two occasions, been the cause of water pollution and the target for suspicions from the general public. The result is a growing conflict between the interested parties of a productive sector essential, in many cases, to the economy of the area, and the legitimate requirement to make this activity environmentally sustainable.

Although the problem greatly worries the institutions, producers seem less concerned, except for the situations of emergency.

Since actions are never unrelated to understanding, the choices made by the farmers regarding environmental aspects derive also from the perception that they have of their own impact on the environment. In presence of an environmental problem, it seems a very useful step to investigate the cognitive aspects of the problem in greater depth, concerning ourselves with *reasons rather than causes* (Röling, 2002).

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Maturana and Varela (1992) report on how diverse phenomena are “filtered” by our understanding and how understanding and actions are inseparable, since knowing does not only means accumulating objective knowledge about the external world, but rather that understanding is the result of effective interaction of one organism with its environment.

Röling and Wagemakers (1998) hold, for example, that, faced with an agro-environmental problem, two of the different possible positions are: one, positivist-realist, the second, constructionist.

According to the first approach, reality exists independently of the human observer and through scientific research we can leave reality for a generalization of principles already present within it. According to this view the aim of research is to increase the understanding of human beings and *to create* innovations to be transferred to users. According to this view, innovation is originates in science is realised through transfer and adoption by farms.

But by now the conviction is ever more widespread that such an approach is not the best, and that in fact innovations occurs as a result of the interaction between different actors. Local knowledge, experimentation by farmers and their inventiveness are just as important as knowledge of the experts. According to constructionism, reality exists not as “fact”, but as a result of the continuing “construction” on the part of people.

This approach implies that, rather than looking for sophisticated technical solutions to environmental problems, it might be more useful to act on the causes of these phenomena, or on the behaviour of farmers. How beneficial would be, in fact, to suggest technological solutions to an environmental problem, if farmers were not aware of its existence or relevance?

In the face of the often irrational use of water resources that occurs in the nursery gardening sector in Tuscany, our research looked at the perception that producers have of the water problem, the motivations that drive farmers to perform in certain ways as regards water use, the obstacles they envisage in order to make more efficient use of the water; it also looked into their understanding of their own performances in terms of consumption of natural resources and consequently generates answers on how to orientate the strategies of intervention.

To investigating the motivation factors that guide *decision making,* the research group could have formulated the study with a “cold” quantitative survey methods such as prepackaged questionnaires.The problem is that “top-down” methods like these do not allow to bring out the complexity of human behaviour, and often do not even reach the objective. For example they overlook the influence of the networks of social relations that exist around the agriculturist.

Individual perception is indeed the result of interaction of the individual with the reality that surrounds him, and above all with his own peers (Retter C., Boland H., 2003). Think of the effects of “social control” arising within a community when everyone becomes aware of an environmental problem (Brunori, Galli, Rossi,2002).

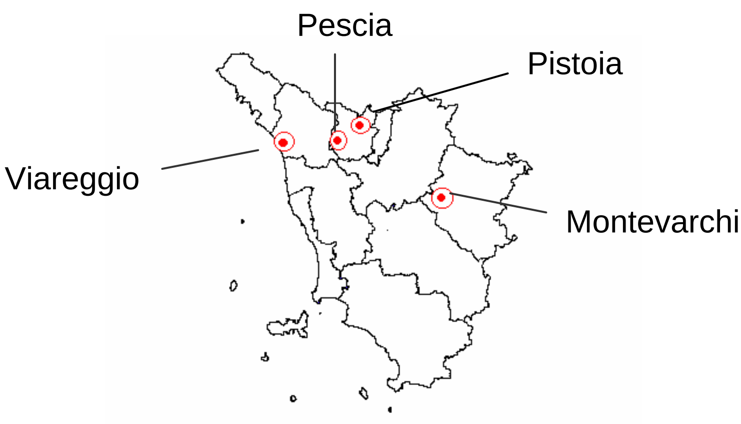
Our research has therefore sought a more qualitative approach for carrying out research into the farms. Thanks to the presence of a few nursery gardeners who joined the research group from the beginning, it was possible to overcome the suspect by farmers over the research goals,. Information obtained from these discussions was subsequently completed with data gathered in a more quantitative investigation carried out through business questionnaires.

Study area

The study area for the project is the region of Tuscany and in particular four localities known for the importance of the nursery gardening sector:

1. The coastal area of Viareggio, well known seaside town with a tradition of flower cultivation and serious problems of saline infiltration into the aquifer;
2. The Pistoia area, the most important district in Italy for nursery gardening and well-known internationally, where cultivation of mainly outdoor ornamental plants takes place, relying therefore principally on sprinkler irrigation; there are numerous farms in this area, some of large size;
3. The area of Valdinievole (Pescia), adjacent to the Pistoia area but traditionally concerned with floriculture and only in more recent times changing direction towards ornamental nursery gardening on commission from big farms of the Pistoia area;
4. The area of Arezzo, Montevarchi to be precise, with its more recent tradition of nursery gardening, producer mainly of seasonal flowering plants with brief cycles.

Map of Tuscany showing the areas mentioned above



Methodology: the focus groups and the questionnaires

The project was carried out by three steps:

- Four focus groups (one in each investigation area) which included 28 nursery gardeners, carried out in the period October to November 2002;
- An in-farm survey with quantitative questionnaires, carried out in a first part of farms in Pistoia, Pescia and Viareggio during the course of 2003, that involved about thirty nursery gardeners;
- An in-farm survey with quantitative questionnaires that will be carry out during 2004 in the second part of farms: some in Montevarchi and others in Pistoia, up to about sixty farms.

The focus group is a discussion on a special theme in a little group with stakeholders, managed by a facilitator. This is a technique used by researchers to facilitate communication among presents and to look at still unexplored aspects of a problem. In each of the four localities investigated, a discussion took place between a group of nursery gardeners. There were different typologies of farmers: young men and elderly, workers and owners, delegates of little farms or very big farms, representatives of the nursery gardeners typology in the area.

The guideline used by the facilitators to manage the discussion is shown in the chart below. The strategy followed in the focus was to introduce the theme in general terms, without anticipate any answer and to come out with the personal thought of the stakeholders. Other external “listeners” recorded and noted what was said.

Guideline for focus groups

1.Do you consider water to be a problem for your company?
2. In what position would you place water amongst the problems of management in the business?
3. Have you recently changed any aspects of organization in the business related to water? (Plant/Equipment/Organization of work….)
4.Do you consider that water consumption in your farm has increased or decreased in the last few years?
5.Does it seem to you that there has been a decrease with time in quality/quantity of water in the area where you operate? If yes, has this decrease brought about/could it bring about any damage to production?
6.What do you understand by efficient irrigation plant? Do you know any types and what do you think about them? What are the limitations that you have heard in adopting these systems?
7. Do you consider water a problem for the community? Are you aware of any changes in the availability of water for domestic use, in the quality of water for drinking….
8. In the area that you come from, how much do you think agriculture and nursery gardening influence total consumption of water? And how much pollution of water sources?
9. Do you consider the level of fertilizer used is sufficient/excessive/too little?
10. Do you believe in the introduction of innovations which could save the environment, do you think that in your area they have/would have positive effects on water quality and saving?

The quantitative questionnaire for in-farm survey, asked nursery gardeners a series of information on company procedures, on types of irrigation plant and on fertilizing techniques. Further, farmers were asked to quantify the average annual consumption of water and fertilizers. To help the farmers with their answers, the questionnaire of the quantitative survey was also “tested” during the focus meetings. Questions was simplified from time to time on the basis of observations made by the producers. Therefore, most of the producers interviewees had also participated in the focus groups for two reasons: firstly, this was optimal to compare the two outcomes and to complete the view of the problem, then, it was simpler to obtain information from farmers that already knew the research project. Like in the focus group, the interviewees were selected for the readiness to cooperate with the research. The farmers interviewees were the most representative of the farm typology and of the area practice.

Some of the questions on the questionnaire

In your farm, what are the main sources of water supply?
In your farm, to which of the following treatments are irrigation waters usually subjected?
In your farm, with what frequency (number of times a year, for example) are complete chemical analyses of the water carried out and, if needed, nutrient solutions used for the culture on substrate or hydroponics?
With what frequency does the farmer see to the registration of water consumption and maintenance of the various tools used for irrigation and fertirrigation (cleaning/filter substitution, calibration of the various instruments such as meters, pH/EC probes, etc.)?
What cultural techniques relating to irrigation are normally or most used in your farm?
In your farm, how much water is consumed annually?
What materials are used for the preparation of the substrates employed in your farm for cultivation in pots and/or hydroponically?
In your farm, what procedures and tools are normally used for the management of manuring (estimate of mineral requirements of the crops)?
In your farm, how much nitrogen is consumed annually? (for the reply use one of the two options)

Results of the investigation

1. The water problem in local relations

The work carried out in the focus groups in the four localities has highlighted, first of all, the overall picture of relations that connect the various actors involved and the dynamics existing around the problem of water in nursery gardening.

Viareggio

At Viareggio there is great difficulty in finding good quality water due to saline infiltration of the groundwater. For some time this condition has been the cause of a series of problems especially for the nursery gardeners who irrigate with well water. This notwithstanding, private wells for irrigation of gardens are, in spite of everything, continually increasing The general public, on the other hand, does not perceive the problem because most water they consume consists of quality near-surface water from the surrounding hills.

Nursery gardeners have tried for some time to overcome or to control these difficulties: they have fought to find alternative solutions to the use of these wells (for example, an agri-industrial mains supply) and they asked the local administration to act to limit civil consumption during summer. The flower growers do not feel they can be accused by the general public, which appears indifferent to the water problem:

> *"…It is a problem not acknowledged at all by the population of the town. In fact the bathing establishments have their own showers using water that is almost drinkable, so…..it doesn't interest anybody. The problem is in fact the inverse, because we have to declare every well, [….] while if a private person digs his own well to water the garden, no one says anything…."*

They do not feel they can even be accused by the environmentalists, because they consider themselves to be one of the categories most careful about limiting consumption, as against the indifference of the other economic sectors. In this sense it is interesting to note how at Viareggio the nursery gardeners say that they have seen their relations with the environmentalists change and they feel themselves "legitimized" in a certain sense in their activities:

> *"….often at the flower market we were insulted, "kicked" by the environmentalists. Then with time they realised that we were very angry about these matters and already they like us better [….] often they thank us because we are the ones who are a bit more careful about the water problem. They also are of the same opinion, they say to us: <<for better or worse you are the lesser of the evils: if there were more agricultural businesses and less inhabitants or fewer swimming pools, perhaps the problem of water would be almost inexistent>>…"*

The relationship between Viareggian flower growers and the institutions who are in charge to manage water resources is rather conflictual: the producers complain about the existence of excessively restrictive constraints, also for the construction of water recuperation plants and about a great diversity of specific regulations by different council administrations. The Viareggian flower growers also express their unease of feeling badly "defended" from the competition of alternative uses of the land and resources and threatened by pressures from other sectors with which they cannot compete, and which often oblige them to forgo their own expansion or, in extreme cases, their own activity.

Pistoia

The situation is different at Pistoia, an area concerned with ornamental nursery gardening. This industry usually uses sprinkler irrigation, resulting in greater consumption compared to microirrigation. All the same the nurserymen do not feel themselves to be in conflict with alternative uses of water and say they have never been accused by the public, which has good quality water available from underground aquifers.

In fact, in this case the statements by the nurserymen seemed "falsified" by a defensive attitude, seeing as the enormous quantities of water necessary for the large farms in this area make drawing up of water from their wells insufficient and the problem of compatibility with alternative water uses often emerges. In this case, contrary to the situation at Viareggio, the water problem arises not so much because of geological characteristics and the difficulty of finding water but because the very high number of farms in continued expansion requires enormous quantities of water, which are too great even for a territory geologically rich in water like the Pistoia area. The preoccupation and tensions between farmers and public opinion are thus in this case due to a problem of excessive growth in the sector that is putting the carrying capacity of the area into danger. The nurserymen however tend to minimize the effects of their industry and deny the existence of conflictual relations regarding water.

Pescia and Montevarchi

Finally, at Pescia and Montevarchi, the areas concerned respectively with flower growing and potted flower cultivation, the nursery gardeners do not perceive the existence of a water problem because the underground water is good quality and sufficient for agricultural and domestic uses. The nurseries are not as numerous and widespread as in the Pistoia area. Given the abundance of water present there is no conflict between domestic and agricultural use and the nursery gardeners feel "authorised" in their behaviour.

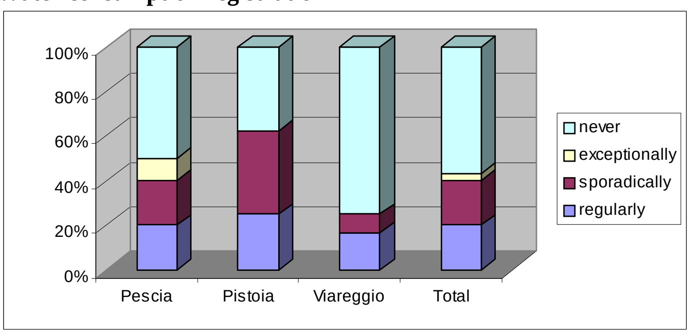
> "….From the point of view of water I believe that no one here has problems, also because there is no shortage."

> "….being an area that is very rich in it….there have never been problems…."

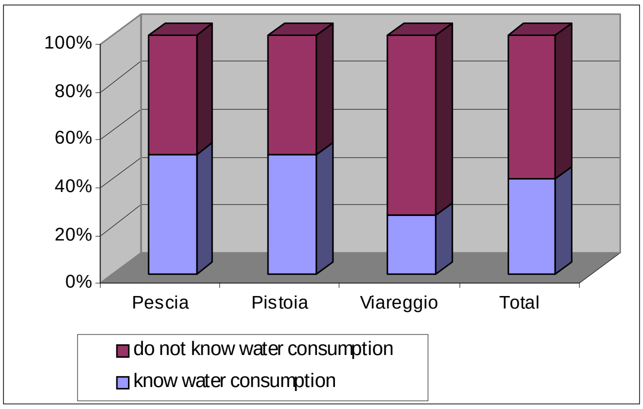
2. The "water" problem seen by the farmers: their understanding and perception

From the answers to the questionnaire it has clearly emerged that, while qualitative aspects of water provide a strategic importance for the quality of the product obtained and are monitored systematically, one cannot say as much for quantitative aspects. Even though water availability worries nursery gardeners, consumption is not controlled with the same precision and constancy. This means that producers do not actually know their own water consumption. In the quantitative survey carried out through questionnaires, it was asked, in fact, what average annual water consumption by the farm was. Almost everybody had difficulty in replying: only twelve firms of the thirty interviewed in the first part of the survey (2003) knew the amount of water consumed and only after having had the time to find the information. In some cases the producers had difficulty even in describing one of the water regimes used in the company (irrigation period, minutes of functioning of the irrigation plant per day, nozzle capacity).

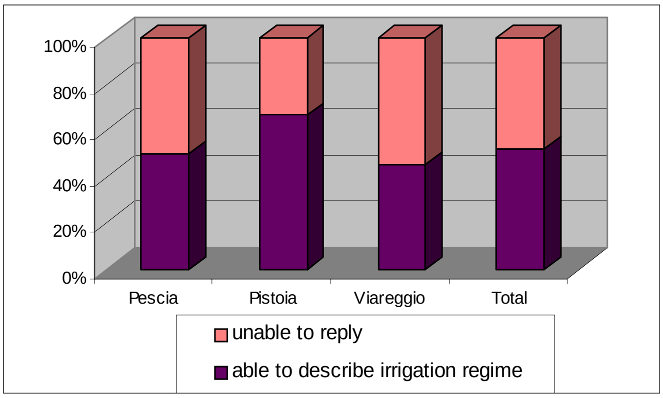
Water consumption registration



Farms that know their water consumption



Farms able to describe their irrigation regime



Recording consumption rates seems to be a very rare practice even in the areas where problems of finding irrigation water exist: no significant differences were encountered in the frequency of recording consumption in the various districts.

In spite of the very small number of producers who were able to state precisely the annual consumption of water and nutrients, most of them were sure of having a high level of efficiency and a low dispersion of water draining into the environment. A nursery gardener producing potted plants using *microirrigation* equipment said, for example, during the focus group meeting:

> "….the percentage lost is low, we give more or less the amount of water that we see is used…."

And another nursery gardener from Pistoia:

> "….with drip irrigation […] we already save 70% of the water, even 80%….With fertirrigation with drip equipment there are water losses of one in a thousand, there isn't any dispersion. Someone also has shower equipment, but most have drip. Drip plant about ten years old…..slowly, one piece at a time, not all the firms have it yet….however…it is a saving of both water and time….the plants grow better, one can target-manure, fertirrigate…."

Some producers of small diameter pots, who practise shower irrigation, realise that they use much more water than the plants require, but clarify how sprinkling is for them the only type of irrigation possible:

> "…we try to recuperate the water because we're making a product…..small pots, and all watered by sprinkling, not drop by drop, so there is an enormous waste of water…"

In many cases the producer's own consumption is seen as a minimum of respect compared to domestic consumption:

> "….it's true that we extract underground water but we return it to the earth….I have seen how much water you need to wash four plates or two peppers or wash a car […], with that water we are making a product and work…"

In general we can state that often, where there are no reliable instruments to measure water consumption, the impression that the nursery gardeners give is of a high level of efficiency and of consuming "right amounts" of water, demonstrating an incoherence between the real performance and the producers' feelings.

3. The relation between technological innovations and perceived constraints.

One of the most cited technologies during the focus group meetings was the recuperation of drainage water through the so-called *closed cycle*[1]. This technology seems to scare the nursery gardeners because of the greater need for monitoring and the possible pathological problems, but above all for the effort due to high initial investment and the difficulty of conversion of farms structurally tied to old plans.

One agriculturist remembered during a focus meeting the numerous structural difficulties:

> "…our establishments aren't to size….there are some who have a piece in one place, another piece further away….it would be impossible…"

Moreover many flower growers have economic ties: the price of the final product does not justify the investments, which according to them would increase only the costs, also because of the greater need for specialized manpower.

> "…Our constraint is having these large quantities of plants….So for us this solution is impossible, above all for a plant that at the end doesn't cost enough to justify such a refined technique…..it is not a plant that goes onto the market at who knows what price, for which you need to make a selection also from an economic point of view….usually the species that produce the largest quantities do not sell at high prices…"

From the focus groups carried out in localities where no real water problem exists, it emerges that many investments for the reduction of consumption and nutrient dispersion into the environment are seen as "dead money", without any economic return and since the farmers never make investments without the certainty of gaining an advantage from them, such solutions seem unproposable.

To conclude, from statements made by the nursery gardeners in the focus groups we can isolate certain phrases that satisfactorily represent the diverse conceptions of efficient irrigation systems.

At Pistoia the nursery gardeners refer to aspects of management and business organization, at Viareggio on the other hand they think of ebb and flow systems, at Montevarchi to recuperation systems of high technological level and finally at Pescia they talk of something very much resembling the present situation (the flower growers of Pescia are already thinking of adopting the best solutions for their productive type). The different positions are summarized in the following table:

Concept of efficient irrigation system/technological innovation

Question	Pistoia	Pescia	Viareggio	Montevarchi
What do you intend by the terms *efficient irrigation systems?*	Having a business with homogeneous distribution of plants and more ordered management (concept of innovation to improve firm management, to increase efficiency and productivity)	Dripsystems are already the best technique (they do not need to introduce different solutions)	Ebb and flow solutions, systems which limit salinity	Recuperation systems that they do not consider suitable for their productive type. Technology in general, technical assistance

[1] "Closed cycle" systems mean that irrigation water or nutritive solution is recycled continuously, reintegrating it periodically to compensate for water and nutrient consumption, but without letting it out into the environment, except for very small quantities at the end of the cultural cycle.

4. Nursery gardeners and the perception of their own level of impact on the environment

From the focus group it emerged that nursery gardeners generally think they make a much smaller impact than that made by the agriculture practised by their own fathers and that by other productive activities. Some producers said during the focus meetings:

> "Compared to twenty years ago we pollute much less….and there are lots of businesses that have given up…."

> "….We don't cause any pollution, because of the type of activity and because numerically there are now very few of us, even if we polluted it wouldn't cause any damage to the environment […]. It would be like putting three drops of acid in ten litres of water…it wouldn't make any difference…"

On the contrary, carrying out daily activities of maintenance and protection of the surrounding land and needing to maintain the natural resources (water and earth first of all) for the sustainability of their own future activity, farmers have a picture of themselves as responsible producers and real "guardians" of rural areas, subject to numerous external pressures from industrial activities or domestic settlements. As a nurseryman from Pistoia underlined during a focus meeting, in order to justify the intensiveness of nursery gardening:

> "…but there's also a greater control of the land because….I mean….those who grow sown crops don't make a sufficient return to be able to maintain the ditches. For us it's a necessity to maintain the ditches, because if they don't flow the plants stand in the damp and suffer…"

On the other hand, the nursery gardeners know that certain agricultural procedures are induced by the market requirement itself, through demand for products of excellent quality at low cost, for which they attribute the blame for agricultural pollution on the whole society, who with their choices of consumption dictate to the agriculturists the ways in which they are to produce:

> "…It's not speculative inspiration to be a pot grower, it's that the market demands plants in pots…."

For the producers the environmental problem exists as external pressure on agricultural activity, from which agriculture has to defend itself to a large part. To protect themselves from the accusations of environmental pollution, the nursery gardeners often present their activity as subjected to the forces of nature, which are only partially controllable. This also "absolves" them from certain responsibilities regarding environmental resources.

Conclusions

From the surveys carried out in the four main nursery gardening areas of Tuscany, it is seen that, although the deficit or the water quality are measurable with indicators of a general value, the reply from the farms to pressures on the environment can be very different. The reply depends very much on the perception of the problem that each particular farmer has and on its social definition.
By expressing their own conception of efficient systems, the nursery gardeners also gave an indication of what they expect from technological innovations or simply from the increase in efficiency of irrigation and fertilizing systems, and what they would like to improve within their own business:

Result expected from innovations

	Pistoia	**Pescia**	**Viareggio**	**Montevarchi**
The result expected from innovations	The nursery gardeners expect an increase in business efficiency, the possibility of expanding further	No result is expected, because they consider that they already have the best solutions as regards irrigation	The nursery gardeners await the resolution of the salinity problem, the possibility of continuing their activity	Some await a general improvement, an increased quality in the work

The surveys give us also a clear indication of the intervention strategies most suitable for the different conditions.

For example, in the case where there is no perception of the environmental problem concerning water, it would probably be a good idea to act on the technical understanding of the agriculturists, putting in instruments for objective evaluation of their consumption level, such as a meter, and identifying indicators relating to the impact on water resources.

The environmental indicators are very useful in preventing producers from assuming defensive attitudes or hiding their environmental performances, as often occurs in the absence of reliable evaluation instruments. Moreover objective indicators of the impact made by the business can be useful also in reconstructing the faith of the public where this has been threatened by some episode of water scarcity or pollution of water supplies.

In the case in which there is also little faith in technological innovations, as was seen in the Pescia area, it becomes important to encourage a "constructionist" approach. With this approach the agriculturists are able to understand that the change in their business behaviour and in the management of the water resources really can influence the impact on the environment.

In the case, on the other hand, where perception of the water problem exists and there are high expectations as regards technological innovations (such as the possibility of limiting the problem of salinity), it would be more useful to try to remove the constraints that the nursery gardeners see, and so help them implement the technical solutions effectively.

The possible intervention strategies

Perception regarding water problem	**Expectations regarding technological innovations**	**Possible solutions**
Absent	High expectations	Act on technical understanding (eg. putting in meter)
Absent	Little confidence	Help to reconquer confidence and have a more "constructionist" approach
Important problem	High expectations	Help to resolve problems connected with water by removing constraints

In a scenario such as this, so differentiated and complex, the role assumed by communication becomes of fundamental importance. Only through a correct communicative process is it possible to change first of all the perception of the agriculturists regarding the environmental emergency and "construct" with them the possible answer – technological or relating to management of the business – to pressures exerted by agriculture on water resources, involving them in the decision process and making them responsible for their different requirements and for their different expectations in the matter.

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Cognitive styles and networks patterns; a combined approach of learning processes in sustainable agriculture

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Abstract

Drawing on different traditions in social sciences and sociology in particularly, this paper analyses two case studies, about rice organic farming and environment-friendly grape production. It leads to the proposition of a combined approach of learning processes in sustainable agriculture based on a typology of learners and professional networks analysis. Beyond the description of social phenomena, this approach aims at the production of both a renewed articulation in social sciences and of relevant information for researchers of other disciplines to engage in partnership with stakeholders, along an interdisciplinary action-research pattern.

Introduction

Sustainable agriculture may be seen as a collective project, an individual endeavour, a public policy or a normative issue. But above all, it presents itself as a new paradigm to which refers a whole range of innovative farming practices, which are evaluated along different and interdependent dimensions such as environmental impacts, social issues and economical profitability (Godard, Hubert, 2002). Agronomists, input suppliers, farmers, downstream agents and other users of the common goods and space are confronted with a cognitive challenge that routine knowledge cannot match. Management studies propose to look at sustainable agriculture as a problem of conception, for both researchers and stakeholders caught in a new "socio-economic order" (Aggeri, Hatchuel, 2003). Collective action is presented as the condition of cross-linked learning processes and intervention-research is the method that is proposed to favour knowledge production. Both to argue and optimise such participating programmes, the challenge may be first to assess the strategies developed by the different stakeholders and specially the farmers to acquire and produce the relevant knowledge when confronted with sustainable projects. In particularly, researchers have to get a clear picture of the role they have or may develop in these strategies. Too many "participating" programmes are still driven in rural settings along diffusionist conceptions of individual or collective development (Chauveau, Lavigne-Delville, 1998). The aim of this paper is to propose a combined approach of farmers' cognitive strategies, associating sociology and ergonomics, in order both to get a better understanding of learning processes underlying complex innovations and relevant information to implement interdisciplinary action-research patterns.

In a first part, an exploration of sociology, enriched by principles from ergonomics, provides the main theoretical elements that frame the assessment of these strategies. Two hypothesises may be argued about the main source of individual apprenticeship, networking vs. experience. Two contrasted local projects, grape environment-friendly production on one hand, rice organic farming on the other, are presented in the second part as exemplary cases to test and refine one kind of hypothesis and method each. They constitute indeed two examples that show the multiplicity of domains of action and reveal

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the different dimensions of such a new paradigm. Results are presented in the third part. Finally, the paper stresses the shortcomings of the two approaches and calls for a renewed and combined analysis of learners and learning styles with a refined investigation of the components of human and social capital of sustainable agriculture farmers. Conclusively, the potential contribution of sociology to cross-disciplinary programmes is discussed.

1. Learning processes as grounded on specific interactions and practices

Sociology and ergonomics as complementary corpus

From an early sociological viewpoint, learning processes have been implicitly reduced to a mimetic mechanism (Tardé, 1901). Later on, diffusionist studies analysed them through adoption rates and it yielded a typology of actors based on their speed to answer to innovative information and adopt the new technological package (Ryan, Gross, 1943). The very mathematical function of this process[1] hinted at the importance of social phenomena, since the number of adopters at a given moment is directly correlated to the number having already adopted a moment before. But knowledge processes started being explicitly pointed out when researchers took a closer look at dialogues. It enabled them to construe the “convergence process” (Rogers, 1962) as a collective construction of meaning to cope with the environment, which enables actors to design their answer to innovative stimuli. Other studies highlighted the role of opinion leaders, as experts in a specific domain and attractive for a specific portion of the social entity to which they belong (Katz, Lazarsfeld, 1955).

Indeed, for many scholars, “communities” are seen to be the space in which learning processes occur, following a hierarchical pattern of socialisation from primary familial internalisation to secondary professional learning (Berger, Luckman, 1967). Communities are also analysed as places where language flows through interactions, building stable networks. Then, the morphology of these networks, linking clusters of peers, facilitates or impedes continuous knowledge production (Darré *et al.*, 1989) that is objectified in common practices. These communities may be identified within geographic boundaries and professional similarity (*ibid.*) or within organisations and enterprises (Wenger, 1998).

Confronted with situations where community or organisation limits are fuzzy or where actors are mobile, belonging to several communities for the sake of various interests, structural interactionnist sociology stresses that the learning processes are outputs of the trajectories of actors (Degenne, 1998) managing forms of social capital through advice-seeking relations notably (Lazega, 2001). For other scholars, the “post-modern” context rather puts in light the basic role, in individual performance, of the human capital, as a product of education, socialisation, experimentation (Becker, 1964), at least because its level determines the relational skills necessary to catch relevant informations from different worlds (Forsé, 1999).

Such contrasted positions open the debate among sociologists about social mechanisms of learning processes. However, few of them consider activities and objects challenged in or by learning processes although they are key elements in the evaluation of the relevance and efficiency of the cognitive investments. In the end, it limits their capacity to assess respective roles of human vs. social capital in diverse contexts of innovation. Eventually, a significant opening has been proposed by sociology of science. By taking into account the objects on which practices are enacted, considering the interaction actor-object, the concept of “socio-technical network” (Callon, 1989) both introduces actions content

[1] Quetelet’s function : $F(t) = 1/(1+ e^{-t})$.

and context and replaces the old concept of community as the relevant space for knowledge production. In this approach, objects are laden with information and given different meanings by the stakeholders related to them. Hence, they mediate human relations and facilitate cooperation and production of knowledge, construed as the result of strategies of enlistment of objects, peers and stakeholders, as carried out by researchers (Vinck, 1999).

If sociologists of science are indeed mainly focused on researchers and scientific knowledge, some of them develop their analysis towards innovation operators, in industrial settings especially (Dodier, 1999). Consequently, they are driven to borrow ergonomics principles to build a relevant frame to assess situated learning processes (Conein, Jacopin, 1994). Developments in ergonomics, attuned with experiential theories of learning (Dewey, 1916), and drawing on interactionnist and constructivist psychology of development (Bruner, 1991) suggest indeed to consider some stages or situations in the production of knowledge through practices and interactions with environment. Complex innovation projects are assessed as an intricacy of different activities, correlated in a moving pattern, each of them enlisting different sets of actors and objects. In such a frame, different natures of skills may be distinguished as diversely needed according to the project whereas knowledge absorption and integration capacities appear as key issues in individual or collective apprenticeships.

Given these theoretical developments both in sociology and ergonomics, the challenge may be to combine them for a better understanding of learning processes developed by farmers in such a complex innovation process as sustainable agriculture.

First set of hypothesis about the sustainable agriculture case

An ergonomic approach of sustainable agriculture will consider each activity in a system, requiring new skills based on farm specific knowledge and new ecological principles. Observation, diagnosis, risk evaluation become decisive (Pastré, 1997) and proceed from much more complex operations than in conventional agriculture. They involve new indicators that have very often still to be designed. Indeed, the previous maximum artificialisation of production has led to a considerable reduction of the scope of these operations, thus specific skills have to be built (or rebuilt, in case of the elders). In that prospect, people acquire information and build sense by acting on objects and through interactions with their environment (Conein, Jacopin, 1994). Moreover, the marketing of sustainable agriculture products needs new economic behaviours to develop specific value chains. Finally, sustainable agriculture very often associates production of goods as well as services (agrotourism) and producers engage in specific crafts wherein interactions with clients are crucial. All that also calls for both knowledge integration capacities and relational skills that come on the top of operational and computational skills.

Thus, when analysing learning processes in sustainable agriculture through activities, tasks and operations, the ergonomic approach leads to focus on specific practices and/or on the nature of skills that are needed. Nevertheless, the social factors and mechanisms that enable or impede actors to develop relevant practices or interactions in order to cope with a new project, are still questioned. It is up to the sociological approaches to investigate the respective impact of experience and social networks of farmers in individual and collective learning processes about sustainable agriculture. It asks social scientists to take in account a dynamic array of activities systems, partly adopting an ergonomic viewpoint. Eventually, such an investigation may also provide pragmatic answers relative to the general theoretical debate between human and social capital as basic sources of learning and performance (Bourdieu, 1986; Forsé, 1999).

Two different cases oriented towards sustainable agriculture have been used for data production in order to progress in that perspective. As contrasted cases, they illustrate different aspects of the new paradigm whereas both are fieldwork places of INRA research-action programmes, hence allowing to address the role of interactions between farmers and researchers.

2. Two contrasted case studies, two kinds of approach

Environment-friendly grape production (EFGP) is a collective project designed and managed by the board members of a co-operative cellar. Economic efficiency of the whole firm is challenged. Technical packages are designed although they require new skills and are not fit with every kind of individually owned production units. A training programme has been implemented to help a small group in a first batch of volunteers to monitor the agricultural practices along the crucial stages of the vine cycle, on which knowledge is focused. EFGP consists essentially in a set of operations and observations to be performed annually. New prescribed products and delicate formulae, control and precise utilisation of sprayers, insects epidemiology, pathological risks and thresholds evaluation, all this contribute to the performance of environmental sustainability. On the economic side of things, sustainability is not that clear. Indeed, adoption of this innovation is costly, individually and at the cellar level. The return on investment is not guaranteed and, given the world competition for their type of wine, better prices are unlikely. This strategy of the cellar is thus presented as a right to enter the market, the future minimum standard to be noticed by buyers. When it comes to social sustainability, this new set of techniques is much more labour and knowledge intensive. Moreover, it bears possibility to prompt new social relations as a “collective fight” against epidemy. Above all, training sessions create many new opportunities for the volunteers to exchange and the managing team trusts these latter to diffuse what they learn out of their group. Finally, EFGP represents a highlighting case to assess the role of networks in both innovation and learning processes and more precisely, to test the diffusionist model assumed by the co-operative managing team.

Following the network approach, both social and socio-technical, we assessed the co-operative membership through complementary entry points:

- technical and social practices implemented by producers on or about the objects of action challenged by the innovative project (vines, pests…) ; for instance, method of spraying… on the one hand, professional readings, commitment to an environmental association… on the other;
- points of view about “what should be done”, with regard to these objects of innovation;
- relations of professional dialogue between members, as highlighted by Darré or Wenger, formed by daily or regular discussions about general topics, exchange of equipment and joint work;
- relations of advice-seeking and advice-giving developed voluntarily by members in different domains linked to their professional activity, as a social capital stressed by scholars such Lazega.

We developed a longitudinal approach, by a close monitoring of the volunteers group from 1999 to 2003, and regular interviews with people not involved in the project. The combination of systematic network analysis[2] with participative observation enabled us to register both qualitative and quantitative data about professional exchanges within the membership and between members and people outside the

[2] Each producer was asked to answer to a set of such kind of questions: “from whom, in this list of colleagues, did you ask an advice in matters of plant pest controls last weeks? From whom else outside the membership? To whom did you give one?, “etc… (technique of “name generator”).

co-operative. The challenge consisted of linking dynamics in social relations and practices to technical changes and learning about specific objects, at both individual and collective levels.

On the opposite, organic rice farming (ORF) in Camargue has been studied to identify the diversity of individual learning strategies and to test the impact of "experience", both due to innate capacities, education, socialisation, experimentation, observation, readings… Indeed, the context is the following: there is a lack of collective or organised actions in the technical domain ; farmers have no proximity, neither geographic nor organisational, that induces an apparent very low density of social networks ; agronomic knowledge and technical advices about organic farming are too general to be of any use in the very specific Camargue (northern limit for rice cultivation, production plots and wild life protected areas tightly intricate) ; agronomic research results produced in conventional rice production for fifteen years in Camargue are not relevant for such new objectives and constraints. ORF is indeed a long-term process, possibly encompassing the whole production system. The drastic reduction of inputs and the prohibition of weedicide ask for a strong cognitive investment in the farm management. Rotations involve different crops, new interannual mechanisms. Organic farming is environment-friendly but its sustainability is not yet settled. Cases of farmers shifting back to conventional farming occur. Others say explicitly that ORF is a moment in the ongoing adaptation of the farm and they consider the possibility to stop it whenever needed. These farmers refer to the economic aspect that is rather attractive. Organic rice is well paid and half the yield of conventional rice may bring double income. However, average production is very low and some farmers may harvest less than 15% of conventional plots.

In this case, following both an ergonomic approach and learning social theories, the principle was to consider different stages or situations in matters of knowledge production, use and/or integration about organic farming within rice producers, and supposed to be linked to their "experience". The challenge was then:

- to identify some cognitive situations within producers, from an open question about the story of the "problems" they faced in matters of organic rice production, thus highlighting tasks that have been emerging as problematic issues or evolving to routines, but also the difficulty they possibly faced in matters of co-ordination of tasks ;
- to consider situations with regard to producers' "experience", from an open question about their sources of solutions, thus revealing the diverse cognitive strategies developed throughout the trajectory, such as experimentation, professional readings or dialogue, but also likely to point out the importance of their initial training, production system (level, date of conversion) and values.

3. Presentation of results

Environment-Friendly Grape Production: complementary networks come to light

As mentioned before, EFGP has been associated in the co-operative cellar with a technical package and first assumed by a small group of volunteers trained by a technical adviser dedicated to the co-operative. However, this group and, at a wider extent, the co-operative membership evaluated diversely this package, as more or less relevant beyond its technical feasibility. That led to define several "strategic positions" with regard to the Boards' project, each position being associated with both specific practices and points of view (Chiffoleau, 2003). Positions could even been evaluated as quite hostile or incompatible between each other, in a first evaluation, thus limiting the adaptation capacity of the firm. But the dynamic of the project opened new perspectives for both research and action by revealing, even exacerbating, the social mechanisms of both innovation and learning in the co-operative. Indeed, the close monitoring, between 1999 and 2003, of the practices and the interactions developed by the volunteers and other producers representing the diverse strategic positions in 1999 led to highlight the contrasted role of two kinds of networks underlying these processes.

The first type of network refers to daily exchanges of dialogue and services (joint work, exchange of equipment) between co-operative members. Relations are based on kinship, friendship of youth or neighbourhood and are quite stable. This network is presented by people themselves as the relevant social space for professional individual and collective identities building, exchanges of individual trials and errors or observations, confirmation of (innovative) past choices and integration in routines, attempts of interpersonal influence from “pioneers”. We call it the “proximity network”. The second type of network is grounded by advice relations, either asked or given, thus assuming the contours of knowledge-based strategies needed by the implementation of new practices requiring more technicality, but also by the development and the management of diverse domains of change. Indeed, advice relations with various interlocutors are asked and/or given by producers around distinct topics, which they link with environment-friendly production, more or less explicitly[3]. Advice relations dynamics thus confirm the different conceptions and implementations of the Boards’ project we first highlighted through “strategic positions”: some producers are in quest of or in position to give advice in order to go deeper in matter of biological fight against pests and diseases, others look for or give advice to implement new collective forms of work and manpower management in order to surmount the extra work or to engage landscaping in perspective of agrotourism. On the one hand, advice relations are much more developed out of the membership and labile than proximity dialogue relations: proximity and advice networks are thus hardly overlapping. On the other hand, when looking at the whole membership level, the advice networks make emerge thematic or pluri-skilled experts as “prestigious” people respectively in one or several network(s).

Finally, these two kinds of networks assume contrasted and complementary roles regarding the collective innovation and learning project: evolution of norms and stabilisation of more suited ones in the proximity network; new knowledge[4] acquisition and individual distinct skills acknowledgement in the advice ones. Moreover, whereas the first network makes emerge some proximity clusters very close to peers’ sub-groups highlighted by Darré or Wenger notably, the second one reveals sets of people as linked to the same portfolio of advisers and improving some domains of action or on the contrary, reluctant to change. Crossing these two kinds of results, four sets of people may be then distinguished in the studied case, some of them constituting also “clusters” in that people of the set share proximity relations:

[3] We thus may distinguish as many networks as there are relevant advice domains according to the membership which is concerned. In the studied case, five domains have been identified: pests and diseases controls, ultra-qualitative practices, work and manpower management, landscaping, grape quality evaluation.

[4] An advice is indeed more than an information and may be construed as one form of knowledge (Cross *et al*., 2001).

Nature of the set	The cluster of vine technicians	The cluster of local development actors	The patrimony guards	The set of marginals
Strategic position	Not really convinced by the Board's project but often volunteer	Active carriers of the project, all volunteer	Reluctant to adopt the project but all the same sometimes volunteer	Mainly not concerned by the project except few volunteer
Advice interlocutors	Estates, public extension services	Technician of the coop, agricultural unions, wine unions, patrimony guards (see next)	Local policy makers, land system managers	Input suppliers technicians and salesmen
Advice networks in which they emerge as prestigious	Pests and diseases controls, very high qualitative practices	Quality grape evaluation compared to cooperative rules, manpower management and recruitment	Landscaping, vine planting	People few solicited as advisers even if sometimes high-skilled in one domain : cases opening perspectives (see below)
Innovative practices implemented	Introduction of auxiliary fauna and organic composts, green harvests	Wine festivities, employers groups, services to tourists, trees and flowers planting, terroir zonage	Digs management, landscape rehabilitation	Many or none
Sociological profile	Ex or current "passionate" part-timers, new rural inhabitants pursuing new "life projects", ex Board members' or extension groups' children just out of agricultural schools	Children of ex Board members or Board members (1st type), young activists of wine cooperation	Notables rich families anchored in the territory for a long time, Board members (2nd type) or close to them	"Frustrated" producers projecting an estate, part-timers or young settlers too busy, not really interested by viticulture or simply shy, aged producers without successor

The development of the EFGP project progressively opens new perspectives regarding collective action, in particularly by giving tools to involve in the dynamics some of the usually excluded actors:

- the formation and animation of training sub-groups of volunteers by the technician both strengthen and enlarge the current clusters by allowing the quick integration of previously isolated people (young settlers, aged people) in daily dialogue and exchange networks,
- the diversity and multiplicity of questions raised by this complex project prompt some "socially integrated" producers to contact neighbouring "frustrated members" observed as going deeper or further to prepare their private cellar project ; in the same time, the new dynamics created in the co-operative are likely to get them less frustrated…

Organic Rice Farming: towards a cognitive styles typology

In the Camargue situation, the prescription is not associated with technical recommendations. Research is to be designed as well as practices. Experimental approaches are trying to build adapted protocols to the new paradigm. Practitioners are individually engaged in experiential learning, which raises new questions. They are implementing a cognitive strategy, which serves their own project, framed by their values.

As mentioned before, a first step of the analysis was to identify, from an open question, the tasks integrated in routines or still questioning farmers about organic rice cultivation, in a dynamic perspective. Discourse analysis has been used to assess their different ways to speak about, to order and to grade these problems, to highlight the specific relations they make between problems and potential solutions. Organic farmers were indeed supposed to present different profiles regarding these questions. On one hand, all of them do not face the same problems (Darré, 1996) and are not concerned by the same questions. On the other hand, for some of them, these questions have been temporarily solved.

Knowledge has been routinised and it does not appear in their discourse as a cognitive aim but rather as a settled explanation. Identified issues address the different levels of farming operations from the crop to the production system. But other non-agricultural activities, like hunting, agro-tourism, have been also underlined by some respondents as domains of preoccupation. Moreover, beyond tasks, some producers referred to systemic issues whereas others focused on specific themes. It is interesting enough to notice that the first ones, those referring to systemic issues, have already found satisfactorily answers to the thematic questions they once faced.

A first aggregation has been built, roughly and quantitatively summing up the number of identified questions and the level of routinisation of its solutions[5], thus contributing to define some “cognitive styles” along two dimensions, content (from thematic to systemic) and intensity (from absence to intense identified learning activity). Farmers’ questions have been then related to their “experience”, first assessed though their initial training, professional trajectory and involvement in organic farming, both practically (production system, date and level of conversion, type of marketing) and ideologically (reasons for converting to organic cultivation). We also sought to correlate questions with their learning strategies, construed as investments in human capital. Different categories of learning practices have been highlighted, however not asked systematically to each interviewee, following the principles of a non-directive interview allowing to highlight his or her priorities (*ibid.*).

Finally, based on a first and rough exploration of data, cognitive styles appear to be strongly correlated to specific learning practices, type of conversion and production system. On the opposite, what may be assessed as “basic” elements of human capital (initial training and professional trajectories) do not explain the diversity. Six types may thus be defined among organic farmers.

	Cognitive style	**Main learning practices**	**Production system**	**Reasons for conversion**
1	Questions focused on one thematic problem (weeds) and one type of solution (rotations) ; no specific learning strategy	Exchange with co-operative technical advisers and/or input suppliers	Cereal or mixed Partial conversion (< 20%)	Opportunity (use of fallows), price oriented
2	Satisfying thematic solutions found in the past, no more or no deeper search	In the past, experience (trial and error processed in routinised knowledge) ; current lack of learning practices	Cereal, ancient and important or total conversion	Price oriented
3	Thematic questions in deepening	Few exchanges with colleagues; many trials and errors ; professional thematic travels	Cereal	Price oriented and moderately ideologically motivated
4	Systemic questions in progression	Exchanges with external organic network, solicitation of INRA, specialised lectures, internet consultation	Cereal Important or total conversion	Strongly ideologically motivated and moderately price oriented
5	Satisfying solutions found in matter of rice production but thematic questions about other activities	Dialogue with colleagues, solicitation of INRA	Extensive bull raising, agro-tourism, important or total conversion	Client oriented (tourists)

The majority of farmers thus appears more focused on quite clearly delineated questions, with a rather intensive cognitive activity. But some stop when satisfying solutions are found whereas others try to go deeper or further. Types 2, 3 and 4, for example, may be illustrated through their specific ways to assess and to manage the problems of weeds, that is confirmed as the main issue in Camargue, alike other organic farming situations (Kopke, 1999): for intensive cereal organic growers (type 2), control consists

[5] This aggregation proceeds from i) the categorisation of interviewees’ point of view regarding eight thematic domains (fertilisation, rice seedling, weeds control…) in four classes (topical, resolved, not relevant, not mentioned), ii) the number of associations made between different domains or practices.

in a tight monitoring of any possible way in for weed seeds and in the eradication of plants at first sight, with a high labour investment. For the type 3, rotations are preferred and different ones are tried, whereas the type 4 associates a strict limitation of rice, a high quantity of manure and several years of alfa-falfa in the rotation cycle in a more systemic approach. Moreover, as highlighted by organic farming scientists (*ibid*.), soil appears a core element in the building of the systemic thinking, characteristic of this type. Some farmers in this type 4 also mention the question of job creation which seems a positive way to loosen current constraints but which is out of their reach because it raises never-ending labour management problems.

Along a professional trajectory perspective, this first step of research leads to a temporary conclusion about the importance of the seniority in conversion, although it seems to play in two contrasted ways : either people stopped searching or they developed the capacity to integrate different topics. A total conversion seems to contribute to the development of systemic issues. At least, two types appear as not very much involved in cognitive strategies about OF. Explanation may be found in a low technical interest and social consideration for organic farming: opportunity that may be given up if too difficult or not profitable for the type 1; mere marketing argument for the type 5.

4. From contrasted cases to a combined approach

Contributions to learning processes understanding

Beyond the illustration of the "distributed cognition" principle modelled in cognitive sciences regarding social settings (Conein, Jacopin, 1994), both cases allow to disrupt with the still classical way to identify or assess innovation leaders and processes in rural settings: people with a high level of agricultural training, pioneers with regard to the prescribed practices, professional leaders are usually supposed to "diffuse" research advice (Darré, 1996).

Each case thus proposes a specific way to question this perspective. On the one hand, the advice relations pattern highlights the "teachers" rather than the "scientists", people's potentials rather than weaknesses or reluctance. Indeed, patrimony guards, for instance, are both Board members and quite reluctant to adopt EFGP (not a priority, too costly). However their expertise is sought by their colleagues to guide terroir zonage and promote territorial assets. Furthermore, ex or current part timers appear as advice experts in matter of pests controls or wine promotion when their previous or actual non agricultural work and networks enable(d) them to practice. Moreover, the network approach leads to distinguish interpersonal relations according to their contrasted impact relative to learning and innovation, thus contributing to refine basic hypothesises about the fundamental role of professional networks proposed by rural sociologists and Darré especially. On the other hand, cognitive styles approach is an attempt to go beyond "pioneers" as first ones to do well defined things. The aim is rather to highlight the dynamics of people deepening, broadening, integrating questions and actions or on the opposite, stopping as soon as satisfying solutions (assessed as a specific and exclusive link between problem and action) are found. Such an approach leads to precise people cognitive activity (what? when? how? about what?) and to enlarge the scope of their cognitive strategies beyond the call to experts, even if it does not pretend to cover all the learning practices that people develop.

Furthermore, beyond their specificity, both cases finally highlight two essential cognitive stages or situations in innovation contexts : acquisition of new knowledge, reasoned by task or theme, through advice-seeking relations and/or personal search (experiments, travels, readings…), that may be assessed as investments in human capital contributing to the building of individual "experience"; translation and integration of new knowledge in individual and/or collective systems of norms and routines through proximity relations and/or possibly call to "systemic" experts, whose role is to confront and confirm individual assessments. In Camargue, where social exchanges are particularly scarce, relations with "peers" seem indeed to distinguish people translating domains of search in new routines, from others still questioning. According to the "peers" considered, routines appear as more or less advanced and/or systemic. The 4th cognitive style producers thus differ from the 5th in that they exchange with other well-advanced organic farmers (even not producing rice) in external networks, whereas the 5th ones exchange locally with people sharing the same project (agrotourism from rice and bull raising). Camargue and viticulture cases thus seem to both confirm how the proximity network, where (innovative) norms are discussed and stabilised, is linked to common values or project. In the co-operative case, where social exchanges are supposed to be frequent and multiplex, only specific relations are indeed presented as those where systems of norms are stabilised: the regular relations with people in the same or a close "strategic position".

Refining the sociological approach

These two approaches thus present strengths, but also weaknesses, that may be linked to their different focus: collective action vs. technical performance. Nevertheless, their combined mobilisation in the perspective of a new form of agriculture, that has to cross these two types of objectives to become "sustainable" (Godard, Hubert, 2002), may then be relevant. However, partly due to the early stage of the work (specially in Camargue), some points have to be developed in each approach.

The network approach has been indeed driven in perspective of collective innovative project management and finally gives tools to facilitate the coordination. But it does not allow to precise the cognitive steps and integrative processes of people when faced with a problem or a project and sometimes with several opposite advice. Proximity clusters, relations with people in the same strategic position, have been mentioned as the social space for the integration of new knowledge, thus confirming Wenger or Darré's theory, but we have to go deeper. Moreover, this approach privileges relational skills for technical learning. But where do come relational skills from? How do people acquire them? The type and level of human capital seems to play a crucial role : part-timers are often the most prompt to ask technical advice outside, that they justify by their low initial professional background but also by their habit then facility to discuss with diverse people, "*contrary to full-time farmers, more closed on themselves*". Producers thus appear as specific and dynamic combination of human and social capitals, that may constitute interdependent factors, partly substituting to each other. Network approach hides however other cognitive strategies developed (voluntarily or not) by isolated people (reading, travelling…) and it does not look at the hierarchical array of topics and learning sources. In addition to that, systematic network analysis is a heavy way of data production that supposes to delineate quite early in the research process both the domains and the set of people concerned by dialogue or advice relations. In that sense, results risk to be biased because researchers may privilege domains of investigation and actors that make sense for them and not for people.

The approach through cognitive styles, more focused on individual technical progression through diverse learning practices constituting investments in human capital, may strengthen both the analytic and intervention capacity, by its specific corpus and posture searching to highlight integration and order aspects in matter of cognition. Still, the analysis has to be carried further. Indeed, even if spontaneous discourse reveals some of the priorities, its superficial analysis falls short from solving the question of the hierarchical aspects of decisions in an innovation process and regarding learning sources. The role of "peers networks" is evoked, as the social space where meanings (then, efficiency? relevance?) are given to individual investments in human capital. The identification of values attached to key objects of action (soil, manpower…) also appear as a key element in the capacity or willingness of people in matter of articulation of action domains, of hierarchy of topics and of integration of different forms or sources of knowledge.

A further articulation of the two approaches, through the lenses of the social / human capital movement, has then to be done to understand more precisely the decision rules of sustainable agriculture farmers. Sustainable agriculture unsettled technical message asks indeed for new and important cognitive investments in different domains which finally appear as competitive when resource is scarce (e.g. time). Investment in human capital, seen as acquisition of individual knowledge, covers various learning practices the output of which is interdependent. The use of printed or internet material is supposed to make the participation in training activities more efficient and finally enables the development of social capital. At least, the social capital is likely to give the meanings, the necessary opportunities or the unavoidable constraints that frame the multiple choices of a learning trajectory that increase human capital. It may finally require thorough discourse analysis but also tools borrowed from ergonomics, to identify and evaluate these elements that characterise the movement between the two forms of capital.

Towards interdisciplinary action-research models

Beyond disciplinary issues raised in sociology by the specificity of sustainable action, the challenge also consists in articulating these two approaches in a pragmatic way that may be useful for different stakeholders, among whom are agronomists or development facilitators. Indeed, sustainable agriculture addresses directly experimental sciences inasmuch as their approach is based on the selection / extraction of what is relevant for them in the real world to test hypothesises about functioning patterns (Stengers, 1998), whereas knowledge about this new paradigm of agriculture has to be integrated. Disciplines traditionally related to some aspects of farming like agronomy, economy, soil sciences or ecophysiology have to develop and tighten their interactions. Other disciplines have to be called in, like ergonomics, sociology, geography (Riba *et al*., 2000).

To build such an interdisciplinarity, the different disciplines have to select cases and situations including the specific research objects of each of them. Actors engaged in these situations carry pieces of an integrative knowledge built in action and may contribute strongly to the dialogue between disciplines by pointing out relations and possible intermediary objects, common to several scientists. In that first respect, actors are key partners in the design of a scientific body of knowledge aiming at the sustainability of agriculture. Sustainability is indeed directed towards an unknown future and presents itself as a project more than as a given state of things and arts. It is a project for a heterogeneous set of actors and therefore, researchers, farmers and other stakeholders have to collectively and permanently imagine the relevant questions to be investigated (Röling, 1994).

Crossing grape environment-friendly and rice organic farming notably, new advanced equipment and local rustic varieties appear for instance as interesting intermediary objects for both learning and innovating, collective and individual performances. A focus on geographically and socially anchored objects around which both advice networking and dynamics of questions are developed may be one of the most relevant ways to organise new interdisciplinary collaborations about sustainable agriculture.

Conclusion

To carry out the analysis of the production of knowledge in any socio-economic order but sustainable agriculture especially, management sciences points out the need for intervention-research. At least cross-disciplinary practices are required to investigate the different objects. We thus propose in this paper a combination of two approaches, drawing on two different traditions in sociology and associated with some framing elements borrowed from ergonomics, to highlight the conditions of production of different kinds of knowledge by farmers and to identify influential individuals. We also design ideotypes of learners or clusters of learners, construed as combination of social and human capital, in a given agronomic innovation process. Therefore, we identify limits of individual rationalities and provide an analytical framework of farmer's decision rules.

Beyond a contribution to learning processes analysis, sociological approaches also provide a picture that helps scientists to assess their own relations with farmers and stakeholders and to build an array of relevant interactions relative to the sustainability of the research outcomes (Chiffoleau *et al*., 2001). Indeed, partnership between researchers and stakeholders may produce a new body of knowledge, promote new types of actors or new roles. However, it may also create new dominating relations or strengthen the exclusion of already outcast categories. Sociologists may also act as loudspeaker for mute entities (Callon, 1999) and push in the game individuals usually discarded or unnoticed. Hence, they enable the facilitation of dialogue between researchers and stakeholders and among stakeholders. Such a combined sociological approach finally contributes to the four research topics delimited in the LEARN NoE programme proposal: capacity building for collective action, cross-scaling in knowing and policy-making, practice of reflexivity and role of knowing in social cohesion.

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WORKSHOP 5

Combined micro-economic and ecological assessment tools for sustainable rural development

Changing views of innovation and the role of science. The 'socio-technical root-system' as a tool for identifying relevant cross-disciplinary research questions

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Abstract

This paper reflects critically on the role that natural and social scientists may play in innovation processes towards sustainable farming systems. The emphasis is not so much on 'assessment tools' for sustainability, but rather on tools for improving cross-disciplinary socio-technical problem analysis in interactive trajectories. This with the purpose of arriving at more relevant and better co-ordinated research agendas across disciplines, enhanced social learning, and adequate diagnosis for policy interventions.

First, the paper discusses several shifts with regard to the conceptual understanding of innovations and innovation processes. Subsequently, it is argued that the processes that need to be supported communicatively in the context of innovation are network building, social learning and conflict management. Thirdly, the paper discusses the implications of this mode of thinking for the role of scientists. It is proposed that a key role of scientists is to explicate implicit assumptions, claims and knowledge gaps in social learning processes, and to engage in collaborative research with societal stakeholders on a coherent set of natural and social science questions. The third part of the paper discusses a specific methodical approach for making a socio-technical problem analysis, aimed at integrating and explicating insights from social scientists, natural scientists and societal stakeholders.

1. Introduction: Evolving thinking about innovation and change

Over the years, ideas about innovation and change have evolved considerably. The original hypothesis that innovations are developed by scientists, disseminated through extension and education and then put into practice by farmers and the public is called the linear innovation model, and has been refuted by many (Kline & Rosenberg, 1986; Röling, 1996; Rip, 1995). When one analyses successful innovation processes in retrospect, it is apparent that many ideas originate from practical experience and that the role of science is often limited. Successful innovations appeared to be based on the effective integration of the problem perceptions, knowledge and experience of scientists, clients, intermediaries and other parties involved.

Not only have the ideas about the origin of innovation changed, but also the ideas about what an innovation actually *is* are susceptible to transformation. It is now recognised that innovations do not just consist of new technical arrangements (e.g. a plough) but also of new social and organisational arrangements, such as new rules, perceptions, agreements and social relationships (see e.g. Van Schoubroeck, 1999). This means that there are always many different stakeholders involved. Innovation is a collective phenomenon in which social dilemmas and tensions are always likely to come to the fore. This means that it is not very useful to look at 'adoption' as something that happens at an individual level (as we thought in the past, see e.g. Rogers, 1962). What is important are the co-ordination and

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interdependencies between people. Thus, an innovation can be defined as 'a new pattern of co-ordination between people, technical devices and natural phenomena' (see also Roep, 2000).

Finally, the thinking about innovation as a *process* has also changed dramatically over the past decades. In former days there was a strong belief in the possibility of planning and predicting change and innovation. In contrast, we now see that change is affected by complex inter-dependencies, fundamental uncertainties, chaos, unintended consequences, conflicts and unpredictable interactions that cannot be understood from a reductionist perspective (Prigogine & Stengers, 1990, Holling, 1995). In connection with this, innovation processes are looked at nowadays from an evolutionary perspective. The idea is essentially that a variety of innovations and innovation processes compete in a dynamic selection environment in which the 'best fitting' survives (Bijker et al., 1987; Rotmans et al., 2001). What can be learned from this, among other things, is that sufficient variety must be created if one wishes to solve problems; it is important to back a number of horses (Van Woerkum & Aarts, 2002).

Implications for the role of communication

Against the background of these conceptual transformations there have been radical changes in ideas regarding the role of communication in innovation processes. The focus has shifted from using communication as a means to transfer and effectuate knowledge, innovations and policies developed from the top down, to the study and organisation of communication and interaction in order to arrive at common starting-points, fitting and acceptable innovations and cogent policies. Thus, ideas about the role of communication have undergone a 180-degree change in direction. Along with this, participation became an ever more important subject in research and in practice (Röling, 1996; Röling & Wagemakers, 1998; Van Woerkum, 1997). Within 'participatory' processes for arriving at 'new pattern of co-ordination between people, technical devices and natural phenomena' (i.e. innovations), three (simultaneous) processes deserve particular attention and communicative support.

(1) network building

The first process is that of the building of *networks*. Innovation requires co-ordinated action within a network of people. Such a network does not just spring into existence; it needs to be 'constructed'. And because renewal and innovation are at issue here, it will be evident that there is often a need for the forging of new relationships, both in terms of the parties involved and in terms of content (Engel, 1995), and for using these to expand windows of opportunity. This may sound simple, but it is often not at all easy because, for instance, existing networks tend to close their doors to 'outsiders', or because certain parties just do not feel that they can be of any use to one another.

(2) social learning

At the same time that the building of a network is taking place, something that can be described as a *social learning process* must also occur. This means that the parties involved slowly develop overlapping -or at least complementary - goals, insights, interests and starting-points (Röling, 2002), and also build mutual trust and feelings of dependence and responsibility. This is not 'learning' in the sense of 'knowledge transfer' or 'teaching'; rather it is about the development of different perspectives on reality through interaction with others. It is not just a question of cognitions about the natural and physical world but also of perceptions regarding one's own aspirations, abilities, responsibilities and space for manoeuvre, and of other people's views of reality (Leeuwis, 2002). Exploration of different perspectives is vital in such a learning process because it is a very important route to 'reframing' (Gray, 1997): learning to look at a situation and one's role in it in a different way.

(2) negotiation

A third process is that of negotiation and conflict management. Innovation implies changes in the status quo, which is always accompanied by friction and tension, especially in the case of innovations that go further than just optimisation within established frameworks and goals. Such innovations, which are characterised by the letting-go of existing starting points, goals and assumptions are also known as 'system innovations' or 'transitions' (Rotmans et al., 2001). This kind of innovation and change brings with it, by definition, conflicts of interest between the parties involved and also with the established social and technological system or 'regime' that in many ways needs to be 'conquered' (Rip, 1995). In order to deal with such tensions, and in order to make new agreements and social arrangements, negotiation is essential. Preferably integrative negotiation based on a social learning process (Aarts & Van Woerkum, 2002).

In view of the above, these three processes should guide and direct communicative intervention aimed at supporting innovation. This means that communications experts must lend their support to a large number of tasks that can be derived from theories about network building, social learning and negotiation. Tasks that are of great importance from the point of view of social learning might be: making the invisible visible, organising comparisons between different contexts, setting up experiments and facilitating exploration. A variety of communicative methods exist to support all this, ranging from dialogue and discussion techniques to model-based explorations (see Leeuwis with Van den Ban, 2004). In addition, negotiation literature emphasises tasks such as the making and keeping procedural agreements, joint research and uncertainty reduction, guiding the give-and-take process, communication with constituencies and monitoring the observance of any agreements reached (Van Meegeren & Leeuwis, 1999). I deliberately do not use the word 'phases' here because we are dealing with issues that remain topical throughout the lifetime of the process. Moreover, in the context of innovation, learning processes happen on a variety of fronts, and negotiation takes place with regard to a range of issues, and at different social levels. In short, we are dealing with complex and capricious series of interrelated events, with inherently unpredictable dynamics and results, the course of which can never be planned or controlled by a communications expert or facilitator. Communications experts can, however, monitor the process and can facilitate progress at certain points. In the next section, then, we reflect on the implications for another important category of relative outsiders: scientists.

2. Knowledge and the role of the scientist in innovation

In innovation processes we are essentially faced with the challenge of linking all kinds of forms, domains, sources, and bearers of both knowledge and ignorance to one another. In connection with this it would be overly simplistic to consider 'knowledge' as being only a mental capacity. Knowledge and action are two sides of the same coin; a lot of knowledge seems to be 'stored' in our bodies and in the things around us, and is expressed through our actions, without our even consciously or actively reflecting on it (Giddens, 1984). Knowledge is therefore often implicit; a large part of what we think, know, feel and are able to do is difficult to put into words. And even when we *are* able to put into words -i.e. if we communicate with others- we are usually more or less strategically selective in the words we use. Knowledge is, in short, an extremely elusive phenomenon. In light of this, how should we define the possible role of science? And what about the relationship between the natural and the social sciences?

Before addressing these questions, it is perhaps important to establish what we understand by the term 'science'. I would characterise scientific research as a subculture in which much importance is given to the development of original, valid and credible conclusions about reality. Within the scientific community, there exist all kinds of epistemological subdivisions because there exist large differences between various groups of scientists regarding the way in which they arrive at their conclusions and the kinds of pronouncements that they make. For this reason I prefer to use the phrase 'scientists' knowledge' rather than 'scientific knowledge'.

Role perception from an innovation perspective

Scientists in the domain of agriculture and natural resource management often have to deal with complex connections between technical, ecological, economic and social systems. There is much unpredictability and uncertainty and there are divergent values and interests at issue. This is precisely the kind of situation in which the philosophers Funtowicz & Ravetz (1993) argue for a post-normal approach to science, instead of a strategy in which science is only applied for the 'solving of puzzles' or the giving of situation-specific advice. With post-normal science, the scientists themselves are intensely involved in societal processes, discussions and innovation. In other words, in processes of network building, social learning and negotiation.

In such contexts, the reaching of an agreement between the parties is often hampered by a lack of insight into certain issues or because there is a high level of uncertainty in technical and/or social areas. It is also possible that the available insights are not sufficiently explicit. All kinds of implicit claims to knowledge, assumptions and knowledge gaps are concealed in any communication between the parties. It can be important to make these explicit and open to discussion in order to assist the advance of an innovation process. This is not at all an easy task and will never be completely successful. Not only process facilitators but also scientists from various disciplines can play an important role in this respect. One may expect scientists to have a certain sensitivity regarding implicit assumptions, claims and knowledge gaps in their own areas of expertise. A serious dialogue between scientists and societal stakeholders, in which the different parties have the opportunity to ask each other difficult questions, can contribute to making explicit previously implicit issues. If knowledge gaps also arise during this dialogue then the presence of researchers will naturally be helpful in developing answers with the aid of research. From the point of view of negotiation, conducting joint research is what most relevant. That is; research in which various stakeholders are involved closely in the refinement of research questions, the choice of methods and the fixing of the research location (a laboratory, an experimental station, a computer model or a field situation). This is because it is important not only to generate answers, but also that the parties involved have confidence in the results. In addition, collaboration in carrying out research can contribute to an improvement in the relationship between the stakeholders involved (Van Meegeren & Leeuwis, 1999).

This does not imply, however, that nothing remains of the individual responsibility and autonomy of the researcher. Here it is relevant to note that a crucial trigger for social learning is feedback. In innovation processes, therefore, both natural and social scientists can stimulate learning processes by providing - more or less confrontational- feedback at their own discretion. They can provide not only insights based on research with reference to that specific situation but also those gleaned elsewhere, or they can make projections about the future or point to radically different technological or social solutions.

The status of knowledge contributed by scientists

Some natural (and also social) scientists may have winced when reading the above. Not so much because I attribute a somewhat modest role to scientific researchers in innovation processes -many natural scientists are far more modest about their role than at times portrayed by social scientists- but because I have given very little attention to the role of scientists as 'referees' in situations where conflicting views on reality are at issue. Is it not the task of science to bring the truth to light? In my experience, many natural scientists feel threatened by the idea that reality is something that is constructed. It could, after all, lead to a situation where the scientist's perspective is pushed aside as being just one of the many equally valid views on reality! This is not what I am advocating. It seems to me that it remains possible and important to differentiate between sense and nonsense, and between more and less well-founded views on reality. In my opinion, the essence of constructivism is not so much that every truth is relative but rather that every truth has its limits and also that in everyday life neutral truths do not exist.

When, for example, a laboratory experiment shows a link to between the presence of the nitrogen fixating bacteria Rhizobium and crop growth, this can lead to a conclusion that is valid within the context of the experiment. That is to say: given a particular type of soil, particular climatic conditions, a particular labour input, a particular form of crop protection, a particular planting date, etc. In other words, the conclusions drawn from the experiment are only valid within the limits of its context. Many of the conditions outside the laboratory and/or experimental station will most probably be quite different. When knowledge that is valid within a certain local context (the laboratory or experimental station in this example) is transplanted directly into a different local context (an agricultural region, for example) there are bound to be problems. To put it bluntly: scientific knowledge too is a form of local knowledge.

One important aspect of such local specificity is connected with my second point; namely, the fact that neutral truths do not exist. This has to do with the fact that a particular research initiative is usually brought about by a particular issue. The question of whether there is a link between the presence of Rhizobium and crop growth is not at all a neutral one, but arises from a certain problem perception and is therefore linked to social aims. It is not a question that is likely to be brought up by the fertiliser industry but it is likely to be asked by organic farmers and development organisations. And if questions are not neutral, then the answers will not be either. Answers are used by people as 'weapons' in a 'struggle' with other interests; so it matters for which questions scientists try to formulate answers, and for which not.

In a nutshell, scientists have to realise that their knowledge has a local character and is not neutral. In connection with this Alrøe & Kristensen (2002) argue for a 'reflexively objective science' in which scientists not only realise this but make it explicit and transparent. In other words, scientists should be expected to open up the hidden dimensions of their own research questions and knowledge to discussion. Such transparency does not mean that scientists will become politicians. The opposite is true, in fact. When scientists are clear about underlying social values and goals it can only become more obvious that conflicts of interest cannot be settled by scientists and that it is up to societal stakeholders, authorities and politicians to judge the value of the different view points and to make decisions.

Working across disciplinary boundaries

The foregoing is also connected with the manner in which co-operation between social and natural scientists can take shape. The essence here, according to me, is that natural and social scientists influence and refine one another's assumptions, research questions and action plans. In other words, it is about putting the most relevant non-neutral questions on the agenda. These can also be very 'fundamental' questions. One example of such mutual influencing can be taken from the 'Convergence of Sciences' project that is being co-ordinated by the entomologist Arnold van Huis, in which nine doctoral students are being guided by both natural and social scientists from Wageningen University and universities in Ghana and Benin.

In an initial investigative stage of this project, the researchers in Ghana came across a complex crop-rotation system in which farmers attributed soil-fertility enhancing properties to a certain variety of cassava. This was interesting, because it ran directly counter to the accepted theory that cassava actually exhausts the soil. Doctoral student Samuel Adjei Nsiah set out to examine this system in greater depth and, where possible, improve it. Spurred on by his interest in the social aspects of this innovation, he eventually discovered that the rotation system is mainly applied by the native population of the area and not by the migrants who come from the north of Ghana. The latter are aware of the system but usually cannot apply it because they own no land and the locals will only agree to short-term leasing contracts. The latter, then, is associated with specific attitudes to money, inflation, the land tenure system, mutual distrust and with the role played by the local authorities (Adjei Nsiah et al., in preparation). This example illustrates once again that diversity within communities is an important subject (Van der Ploeg, 1994). We can also see that -from the point of view of the migrants- there is little advantage to be gained if the natural scientists concentrate solely on the further development of the multi-year rotation system, at least as long as nothing changes regarding the issue of contracts between landowners and tenants. It would, perhaps, be more useful to search with the migrants for single-year intercropping systems that would have an immediate effect on soil fertility. Furthermore, based on the insights gained, social scientific research could be directed towards bringing about a better understanding of the dilemmas faced by the native population and the migrants with reference to land use and leasing contracts, and towards identifying and mobilising bringing actors and institutions that could help to break the deadlock.

Such fine-tuning of natural and social science research questions is far from standard practice. For a broader application, new organisational forms, methods and tools for 'beta/gamma science' (Röling, 2000) are essential. There is still scope for immense progress in this area.

3. The 'socio-technical root system' as a tool for integrating knowledge and formulating research questions

One concrete tool for improving, structuring and visualising discussion between natural and social scientists in an interactive setting is the creation of a 'socio-technical root-system'. It is a way of unravelling the technical and social aspects of a complex problem situation step by step. The technique is inspired by the idea of 'problem trees' (GTZ, 1987; Van Veldhuizen et al., 1997) which served to jointly identify -and graphically connect- a central problem (the stem of the tree), its 'causes' (the roots) and its 'consequences' (the branches and leaves). Thus, a hierarchy of problems was identified in a more or less interactive mode, which could be used for the identification of project goals (GTZ, 1987). In this section, we will present an adapted version of this technique which is especially suited for exploring the relations between the technical and social dimensions of complex problem situations. In terms of the original technique, it focuses especially on the roots of the tree; hence the term 'socio-technical root system'. The idea is to take three basic steps:

1. Identify a *central problem* that participants are willing to take as a starting point for the discussion. The choice of a central problem in itself is rather arbitrary, and different stakeholders may have different initial ideas about what the central problem is. Thus, one may choose to draw several trees, starting from different problem perceptions.

2. Unravel what *specific technical and social practices* -by different stakeholders- contribute to the problem. This can be formulated in terms of what people do, or not do. In problem analysis these are two sides of the same coin. In an intervention context, it is usually easier to make a tree when focussing on alternative practices that are apparently not applied.

3. Identify the *reasons* different stakeholders have or may have for not engaging alternative practices (or for reproducing existing practices). Here the variables of the model for understanding human practices developed by Leeuwis with Van den Ban (2004) can serve as a checklist (see Box 1 for an overview).

Box 1: Overview of different kinds of 'reasons' that may shape human practices.

(1) *BELIEVE TO BE TRUE* about the agro-ecological and social world which includes multiple:
- . beliefs about consequences, including causal attributions;
- . perceptions of (un)certainty, likelyhood and risk

(2) *ASPIRE* to achieve as expressed through (interrelated) aspirations of various kinds, including:
- . technical / economic goals and interests;
- . relational (including 'political') goals and interests;
- . cultural aspirations, including also responsibility considerations;
- . emotional aspirations;

(3) (think they) are *ABLE* to do given their perceived:
- . ability to mobilise resources;
- . availability of skills and competence;
- . trust in the validity of their knowledge;
- . ability to control or accommodate risks;

and given their expectations regarding the:
- . effectiveness of the agro-support network;
- . effectiveness of (inter-)community organisation.

(4) (think they) are *ALLOWED* and/or *EXPECTED* to do in view of the perceived:
- . desires and expectations from others;
- . 'rewards' and 'sanctions' (resources) mobilised by others;
- . importance of -and balance between- rewards and sanctions (vis-à-vis aspirations of various kinds).

An example of the possible results of such an exercise is given in Figure 1.

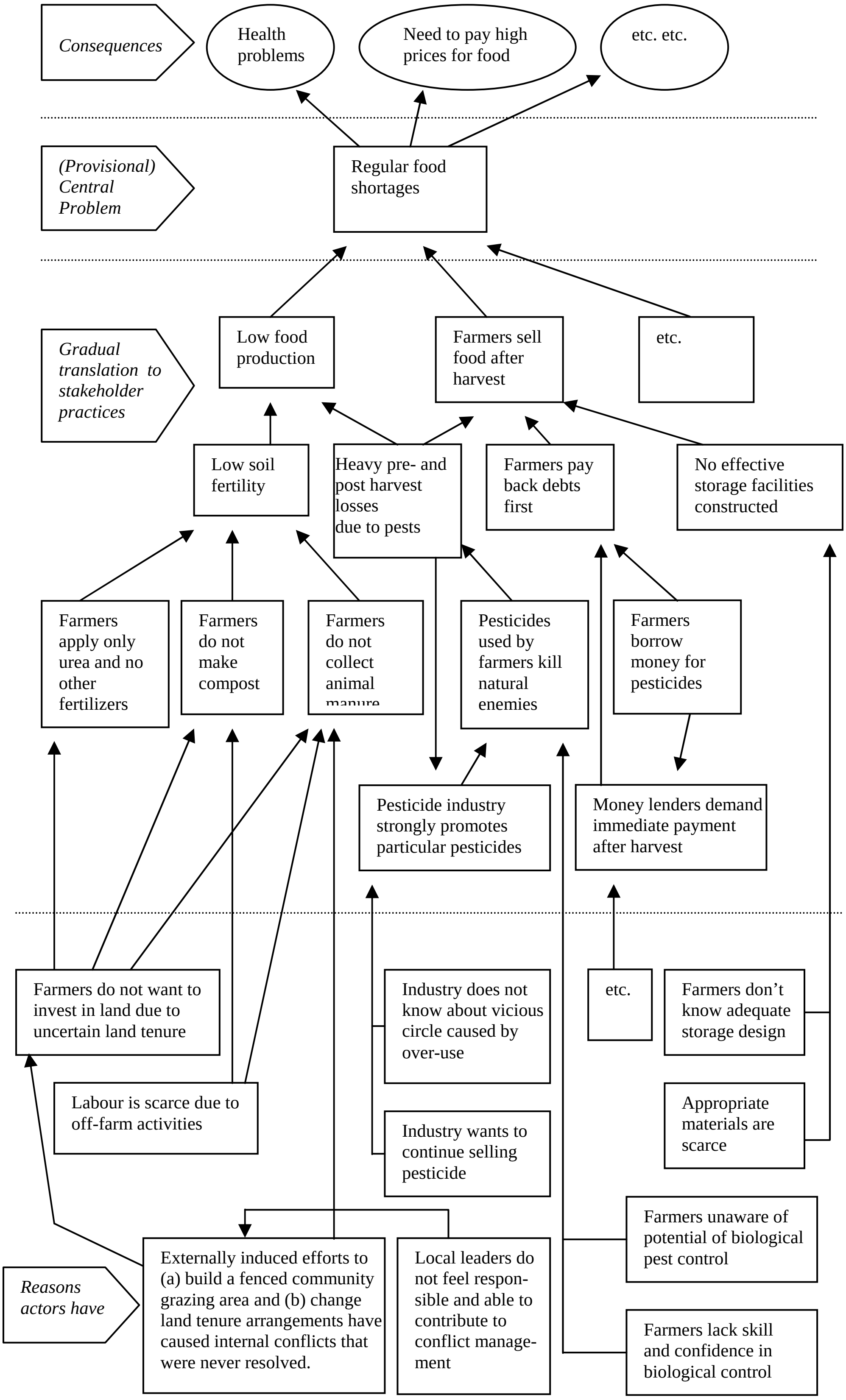

Figure 13.1: Example of an fictitious and partial socio-technical root system.

Clearly, the collection of information relevant to making the root system requires exploratory methods of a different kind, ranging from in-depth interviewing, focus group discussions, mapping, ranking, participant observation, etc. In view of its specific set-up and analytical purpose (i.e. dissecting relevant social and technical issues), this method is not meant to be used during exploratory sessions with societal stakeholders. Rather, it may be used by cross-disciplinary teams and project staff in order to integrate and debate findings arrived at with the help of other exploratory methods. The making of a tree in this manner can leads to the identification of numerous uncertainties and knowledge gaps that complicate problem solving and innovation, some of which may require joint research and investigation as discussed in section 2. In addition, a socio-technical problem root system can be helpful for making intervention decisions. Depending on the analysis of one or more root systems, one may decide on what selection of problems a project may need to focus. Moreover, the identification of reasons behind practices may be very useful for choosing appropriate communication strategies and other policy instruments in relation to problems (see Leeuwis with Van den Ban, 2004).

Some things have to be kept in mind when working on such a root system. It is important to realise that a socio-technical root system is likely to be actor and theory dependent. When man and women are asked to make a separate root system, for example, one can expect rather different trees as aspirations, problems and lifeworlds are likely to differ. Similarly, scientists from different disciplines (e.g. sociology, gender studies, soil science or entomology) and/or scholars with a different theoretical orientation (e.g. a Marxist versus an actor-oriented sociologist), are likely to come up with dissimilar interpretations of reality. Hence, when making a socio-technical root system it is important to select those stakeholders and scientists that are likely to have a relevant background in a given context. Furthermore, although the making of a root system requires valid insights, it would be wrong to approach it as an exercise of establishing scientifically underpinned ‘cause’ and ‘effect’ relations. Apart from practical limitations and the fact that these terms are problematic in the social sciences especially, the purpose of making a root system is different. It is useful first and foremost as a discussion tool, and for organising, visualising and storing (different) thoughts. At the same time it may help to identify knowledge gaps and hypothesis that require further exploration and testing. Thus, making a socio-technical root system can be something that takes place over a period of time.

4. Conclusion

This paper has argued that changing conceptions of innovation urge us to rethink the role of both communicative interventionists and scientists. It is proposed that cross-disciplinary teams of scientists connect themselves with societal processes of network building, social learning and conflict management. Thereby their main roles are to (a) explicate implicit assumptions, claims and knowledge gaps that transpire from stakeholder interactions, (b) to give independent feedback and (c) to engage in joint research with stakeholders on a coherent set of natural and social science questions. It is argued that the ‘socio-technical root system’ tool may help cross-disciplinary teams to more effectively play such roles. The tool builds on three basic components: (a) a variety of exploratory methods in order to increase collective understanding of a complex problematic situation; (b) a stepwise procedure based on a conceptual model aimed at understanding the reasons that underlie human practices; and (c) storage of the analysis in the form of gradually developed visual graphs.

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Environmental and economic assessment of agricultural production practices at a regional level based on uncertain knowledge

Claudia Sattler and Peter Zander*

Abstract

The concept of sustainability and international trade relations require changes in the current agri-environmental policy of the European Community. Therefore, in the future, the EU funded agricultural subsidies will increasingly be linked to the environmental performance of agricultural practices. To develop an effective agro-environmental policy, tools are needed that allow detailed economic and environmental analysis of different policy options. At the same time there is often only limited knowledge about the complex interdependencies between the different forms of agricultural land use and the related effects on the environment and landscape functions.

The aim of this paper is to introduce a fuzzy-logic-based approach, which is tolerant of uncertain knowledge, to evaluate agricultural production practices regarding their effects on different abiotic and biotic environmental indicators on a regional scale refering to a modeled region of 200 km² in the northeast of Germany.

Keywords: *impact assessment, bioeconomic models, agricultural production practices, uncertain knowledge, fuzzy logic*

1 Introduction

Currently the agro-political EU framework is undergoing substantial changes. On the one hand, the globalisation of the agricultural markets forces farmers to produce more efficiently and on the other hand, in the context of the European Model of Agriculture, transfer payments will increasingly be linked to the environmentally friendly performance of agricultural production practices to promote sustainable development (BUCKWELL et al. 1997). Sustainable development[1] has become a major item on the political agenda and efforts have to be undertaken to figure out the guidelines and aims for future development and to determine meaningful indicators to measure the progress towards reaching them which can only be done in a process of societal discourse.

Changes in agricultural land use may thereby influence essential ecological functions of agricultural ecosystems like groundwater recharge or habitats for wild flora and fauna species. Accordingly landscapes are no longer seen as mono-functional, i.e. serving only for food production, but rather multifunctional (EUROPEAN COMMISSION 2000).

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[1] There are a multitude of different definitions for sustainable development. For example the Food and Agriculture Organization of the United Nations (FAO 1989) gives the following: „Sustainable development is the management and conservation of the natural resource base, and the orientation of technological and institutional change, in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development (in the agricultural, fisheries and forestry sectors) conserves land, water, plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable and socially acceptable“.

The concept of multifunctionality of agriculture can be a powerful political tool to organize financial transfers in favour of a sustainable development and in accordance with international trade relations. But it requires knowledge about the complex interdependencies between changes in agricultural production and the effect that these changes might have on the environment and the different landscape functions. This knowledge is often incomplete and insufficient. Although there are many detailed process models concerning specific issues (e.g. nitrate leaching, water erosion), comprehensive and integrated approaches to assess both positive and negative effects of agricultural management systems still need to be developed (CHRISTEN 1999). It is particularly challenging to integrate sources of uncertain knowledge into the development of such approaches due to the lack of meaningful data and often insufficient data quality.

The aim of this paper is to introduce a fuzzy-logic-based Environmental Impact Assessment-Tool (EIA-Tool) to evaluate[2] a multitude of agricultural production practices regarding their effects on different abiotic and biotic environmental indicators on a regional scale. The assessment is integrated into an economic modelling system MODAM (Multi Objective Decision Support Tool for Agroecosystem Management; ZANDER 2003, ZANDER & KÄCHELE 1999) to allow the simultaneous assessment of ecological and economic effects.

The approach is based on the hypothesis that there is always more than one alternative in cultivating a specific agricultural crop depending on the means of production or machinery, which differ in their contribution to environmentally friendly crop production.

2.1 Methods

2.1 Modeled region

The modeled region 'Prenzlau-West' is situated in northeastern Germany (Brandenburg) and encompasses about 200 km². The annual average precipitation amounts to 554 mm. The temperature is 7,8°C on average. The main portion of the region (about 70%) is dominated by agriculture but there is also a significant amount of natural areas (7,3%) which are protected in accordance with the nature protection act (§32, BbgNatSchG). Approximately 3% of the area is covered with water. Sixteen percent is woodland and forest and 11% is allotted to settlements and infrastructure.

2.2 Project

In this region a large interdisciplinary project (GRANO[3]) was implemented which aimed to enhance regional sustainable development of agriculture (MÜLLER et al. 2002). During the project a variaty of data were collected constituting a very valuable source of information for this work. One important achievement of GRANO was the elaboration of a list of meaningful environmental core indicators for the region.

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[2] Every kind of evaluation inherently is subjective or at least contains subjective elements. After GIEGRICH (1997) evaluation is the linkage between the accessible information concerning a certain situation with a personal system of normative values, which leads to a decision about this situation.

[3] GRANO research-program (1998-2002): 'Approaches for Sustainable Agricultural Land Use in the Northern-East of Germany', sponsored by the German Federal Ministry for Education and Research – BMBF .

2.3 Environmental indicators

In the context of the GRANO-project, this list of environmental indictors was produced through an iterative and participatory process. At first a situation-analysis was conducted, which allowed local stakeholders to identify regional problems. For that purpose more than 100 face to face interviews with farm managers, administrators, politicians, NGO[4] representatives, extension workers as well as researchers from numerous disciplines were carried out. Based upon this survey a synopsis was elaborated to delineate all problems related to social, economic or ecological issues stated in the interviews. Subsequently the synopsis served as a guideline for so-called 'regional planning workshops'. In these workshops up to 25 representatives and key actors from all stakeholder groups took part and after three days of discussion agreed on a list of aims with the highest priorities for the region (MÜLLER et al. 2002). To deepen information according the ecological objectives, additional in-depth interviews were conducted to develop a catalogue of environmental quality targets[5] for the region (ARZT et al. 2000). Based on the findings, the following indicators[6] and environmental sub-targets have been chosen for the ecological evaluation of the agricultural production practices for this study (Table 1).

Table 1: Overview of selected indicators

	Environmental media	Environmental quality main targets*	Indicators	Derived environmental quality sub-target
abiotic	Water	'Conservation and protections of ground and surface water** and improvement of the water quality'	• Nitrate (NO^{3-}) entry into groundwater • Nutrient entry (N, P) into ground and surface water • Pesticide entry into ground and surface water • Ground water recharge	• Protection of ground water from nitrate entries • Protection of ground and surface water from nutrient (N, P) entries • Protection of ground and surface waters from pesticide entries • Conservation of ground water recharge
	Soil	'Conservation and Protectio of the soil fertility'	• Water erosion	• Protection of the soil from water erosion
biotic	Habitat & Biodiversity	'Conservation and protection of habitats within agricultural landscapes and improvement of the habitat quality for wild flora and fauna species'	• Habitat quality for skylarks • Habitat quality for field hares • Habitat quality for red belly toads • Habitat quality for hover flies • Habitat quality for fall germinating plant communities	• Protection of skylarks from the decrease of habitat quality • Protection of field hares from the decrease of habitat quality • Protection of red belly toads from the decrease of habitat quality • Protection of hover flies from the decrease of habitat quality • Protection of fall germinating plant communities from the decrease of habitat quality

*after Arzt et al. (2000)
**especially potholes which are very typical for the region

Biotic indicators may be single species (e.g. skylarks) or species communities (e.g. fall germinating plant communities, hover flies). The selected biotic indicators can be seen in some degree as flagship species (e.g., skylarks for field breeding birds or the red belly toad for amphibians, which have to cross

4 NGOs = non-governmental organisations, like nature protection groups, tourism agencies or other interest groups and associations

5 Environmental quality targets are defined as "… a legally, politically or scientifically defined quality of the environment. Environmental quality targets serve as yardsticks (points of reference) for any evaluation steps. Apart from the objectively recorded modifications of the environmental situation it is the target, on which it depends, how a project or a plan is evaluated environmentally. Environmental quality targets can be related to the following strategies: a) retention of the status quo of the environmental quality, b) definition of protection purposes or quality of the environment orientated to the targets for certain spaces or environmental media (e.g. a certain water quality), c) compliance with laws and regulations (critical values), d) political target predicates and assertions of a general and non-committal character, e) environmental precaution (in consideration of the most sensitive areas) or f) orientating on consequences for other environmental areas)"; Springer Environmental Dictionary (HÜBLER & OTTO-ZIMMERMANN 1989).

6 Indicators in general are data, witch can give significant information about the specific state or condition of a system (WALZ et al. 1997)

agricultural fields twice a year when migrating between summer and reproduction habitats and their wintering habitat).

In general it is important to check the selection of indicators very carefully whenever the regional reference changes because addition or replacement of indicators could be necessary. For example in another region, wind erosion may be a problem of serious interest instead of water erosion. Furthermore the priorities of the social community for certain environmental objectives may change over time.

2.4 Modelling system MODAM

MODAM consists of hierarchically linked moduls on three levels (ZANDER 2003). Level one encompasses the databases to descripe the practices of crop, fodder and lifestock production. On the second level the economic and ecological evaluation of the single production practices is conducted. Costs for the economic evaluation are calculated depending on farm machinery, prices, energy consumption, required labour etc. All necessary data are derived from standard data tables. The ecological evaluation benefits from the very detailed description of the single measures per production practice. Level two is where the fuzzy-based environmental impact assessment-tool is embedded into the modelling system. On level three finally the linear programming (LP) farm models are generated for integrated analysis. ‘Farms’ in this context can be real farms or whole regions (‘regional farms’). On the ‘farms’ any kind of crops or type of lifestock can be produced described in the databases of level one. Thereby every production activity refers to a certain site (either a real ‘field’ or a specific ‘field type’, classified by it’s soil quality and sensitivity concerning the environmental issues). To generate the results on farm level the outcomes per field or field type are aggregated in relation to their extent. The basic assumption of the linear programming modul is that the farmers’ decision is always based on economic rationality. Although farmers have obviously other motivations than only profit maximation, these are neglected for reasons of simplicity (SCHULER & KÄCHELE 2003). The modelling system is used to generate two kinds of results: (i) goal driven scenarios, that use the ecological evaluation to impose restrictions on the farm organisation and that result in trade-off functions between the level of ecological achievements and the total gross margin of the farm and (ii) policy driven scenarios that evaluate the impact of certain policy instruments on ecological indicators, based on the ecological evaluation results. In this total gross margin is only one economic indicator, which in critical cases has to be complemented by full costing.

So far MODAM has been used for a number of studies conducted in Germany. The modelling system was also applied to a river catchment area in Ontario, Canada. Before the model can be transfered to a new region the databases concerning grown crops, yields, production practices, machinery etc. as well as the environmental evaluation have to be adapted to the changed conditions. For a complete list of applications see ZANDER (2003).

2.4.1 Agricultural production practices

Agricultural production practices of conventional, integrated and organic farming are described in detail in the modelling system MODAM. At present the database contains more than 1200 different production practices for about 30 agricultural crops valid under the climatic conditions of northeastern Germany. Yield expectations are estimated for four different soil qualities. Per crop there is always defined a ‘standard’ cropping practice and additionally several derivatives differing from the standard in kind and amount of means of production, production techniques and machinery. Every production practice is divided into single operations in sequence of application: tillage, sawing, application of fertilizers, application of plant protection agents, mechanical weeding and harvesting.

2.5 Uncertain knowledge and data quality

As mentioned there is often only limited knowledge[7] about the complex interdependencies between agricultural practices and their effects on the environment that can be elicited from literature or experts[8]. HERZOG (2002) distinguishes three different types of uncertainty: informal (epistemic), linguistic (lexical) and stochastic uncertainty. Informal uncertainty is due to missing, incomplete or inconsistent information. Dealing with linguistic uncertainty the difficulty lies in interpreting linguistic expressions, like “this measure has got a ‘large’ effect”. Regarding stochastic uncertainty, one has to estimate how calculated probabilities can be used to make predictions on future real situations. The kind of uncertainty affects data quality and model development. Data can be available on a quantitative (cardinal) or qualitative (nominal, ordinal) scale.

2.5.1 Fuzzy logic

Fuzzy logic is a concept, which allows to process uncertain knowledge in modelling. The concept is derived from classical set theory and two-valued or binary logic (ZADEH 1994). Two-valued logic always requires a well-defined unambiguous meaning of information. Hence, when such information can not be provided, two-valued logic delivers unsatisfactory conclusions. (CORNELISSEN 2003). In contrast fuzzy or multi-valued logic enables intermediate assessment between the extremes ‘true’ and ‘false’ or ‘yes’ and ‘no’.

Example: The total amount of nitrogen fertilizer is one criterion that influences the habitat quality of agricultural sites for some endangered plant species, which can no longer compete for light, water and nutrients within the crop stand when large amounts of fertilizer are applied. If an assessment has to be generated to classify between those amounts which only have a ‘low’ and those which have a ‘large’ negative impact on the habitat quality for endangered plant species there will be differences in applying binary and fuzzy logic (Figure 1).

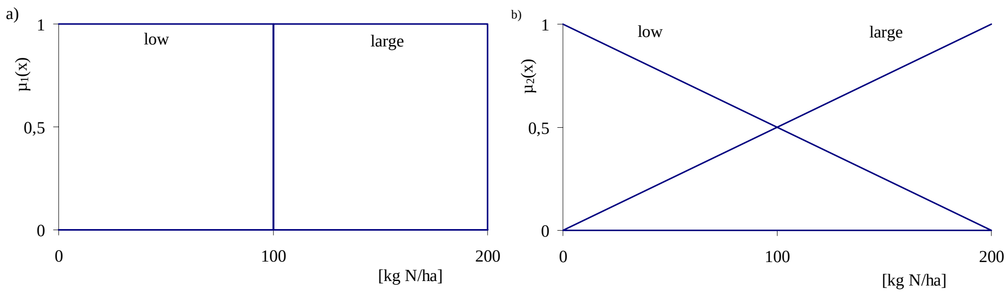

Figure 1: Differences between binary and fuzzy logic – basic definitions. The Figure shows the membership functions *μ(x)* of the two subsets represented through the linguistic expressions ‘low’ and ‘large’ (standing for a ‘low’ or ‘large’ potential for reducing the habitat quality) for the criterion ‘nitrogen fertilizer’. Thereby *x* is the amount of applied fertilizer in kg N/ha within the universe *X* and $\mu_{1/2}(x)$ is the degree of membership to the defined subset within the interval [0, 1]. A membership degree of 1 indicates a full membership, a memberschip degree of 0 a non-membership. a) In binary logic only hard thresholds can be defined: $\mu_1(x)$ is either 1 or 0. Though all production practices with less or more than 100 kg N/ha are classified as those with a low potential in reducing the habitat quality for certain plant species or as those with a large potential, respectively. b) In contrast fuzzy logic allows soft thresholds. Consequently the transition between both subsets is gradual.

7 HERZOG (2002) differs between *data, information* and *knowledge*: *Data* simply are numerical values. Data within a logical and classified structure result in *information.* Aggregated and reliable information which is acquired by intelligence, experience and learning yields in *knowledge*. *Knowledge* is the base for evaluation, decision-making and action.

8 Experts have vast knowledge in a specific domain obtained through a long period of working and experience. This includes the ability to handle uncertain information as well. This specific knowledge generally can’t be found in literature because expert knowledge often is intuitive knowledge (REIF 2000).

The hard threshold in Figure 1a) - binary logic- seems inadequate and unrealistic because there is nearly no difference in applying 99 or 101 kg fertilizer per ha although one is depicted to have a low and the other one to have a large influence on habitat quality. By contrast gradual transition in case of fuzzy logic in Figure 1b) seems more suitable to display the real correlation, that the statement "effect is low" slowly decreases while the statement "effect is large" steadily increases.

Membership functions[9] as shown in Figure 1 are generated for all evaluation criteria that should be considered per indicator. Subsequently single criteria are connected by operators (AND-, OR-, compensatory operator, LUTZ & WENDT 1998). Doing this, one crucial question is, whether better partial results can compensate poorer ones or not. For example many crossovers of agricultural machinery lead to an increase in soil compaction within wheel tracks, which can be a promotional factor for soil erosion, but this process can be partly reversed through tillage (OR-operator). In the case of irreversible effects, e.g. amphibians are very sensitive to the application of mineral fertilizer (particularly ammonium nitrate), which can eliminate considerable parts of the population (OLDHAM et al. 1993) an AND-operator must be chosen because subsequent measures can not mitigate the harm done no matter how good they are assessed.

2.6 Environmental evaluation scheme

The assessment of environmental impact of agricultural production follows a scheme of three steps:

(i) Environmental evaluation of all agricultural production practices in MODAM

(ii) Assessment of the site-specific potential (e.g. for providing habitats for flora and fauna species, contributing to ground water proliferation) or risk potential (e.g. for water erosion, nitrate leaching etc.)

(iii) Evaluation of all possible combinations of sites and management practices.

The result of the evaluation procedure in general is a non-dimensional index of goal achievement (IGA), a value between 0 and 1. An index of 0 indicates a minimum and an index of 1 a maximum suitability to attain a certain environmental target. In some cases, as later shown for the example of water erosion, also quantitative statements can be made.

2.6.1 Expert knowledge

The selection of evaluation criteria is based on literature review and expert questioning (unstructured and semi-structured interviews[10]). The elicited knowledge then has to be structured and formalised to be entered into a rule base for the model development. The procedure follows the method of rapid prototyping - also called incremental development - (GOTTLOB et al. 1990), meaning that a model

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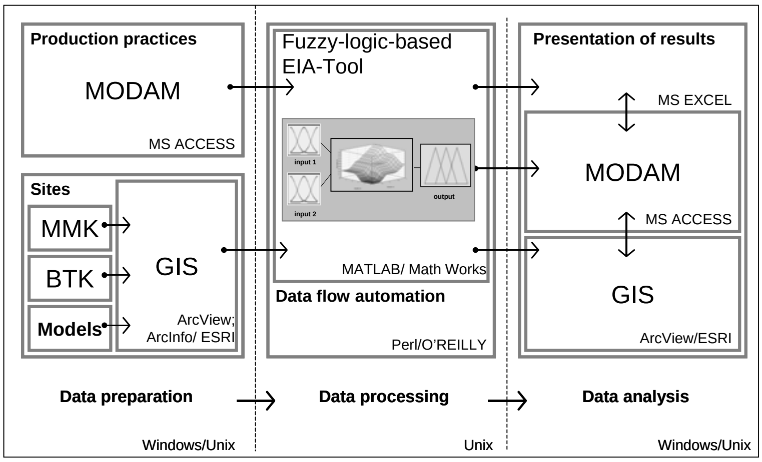
9 In this study only linear membership functions are used because the processing time is considerably lower compared with quadratic or e-functions (LUTZ & WENDT 1998).

10 In those cases where already prototypes could be developed on the base of information gathered from literature sources, a structured interview was conducted. The expert answered on questions or filled in prepared schemes to close gaps in the knowledge base and gave comments on the hitherto proceeding. Only when no prototype could be elaborated unstructured interviews were chosen. In that case only a short introduction was given according intension and aims of the work and the expert stated his opinion which criteria should be selected and what the model structure should look like ('thinking-loud-model' alternatively 'introspection', PUPPE 1988). With the help of this information the prototyping was done and in a second meeting the expert was requested to give feedback on model structure and preliminary results.

prototype is elaborated as quickly as possible. Subsequently the prototype has to be improved through feedback from the experts on preliminary results (REIF 2000).

2.6.2 Model structure

The whole Environmental Impact Assessment-Tool (EIA-Tool) consists of diverse modules: one for each indicator divided again in sub-modules to support transparency. The EIA-Tool is linked with MODAM to enable integrated ecological and economic multi-criteria-analysis.



Fuzzy-logic-modelling is done with fuzzy-supporting software MATLAB (MATH WORKS 1998), automation of data flow is programmed with Perl (O'REILLY) and site potential assessment is done with the help of GIS (ArcView and ArcInfo; ESRI) under operating system UNIX. The modelling system MODAM itself runs under ACCESS, Windows (MICROSOFT).

Figure 2: Structure of the Environmental Impact Assessment-Tool (EIA-Tool). MMK = Meso-scale soil characterisation map (1:25.000), only available for East Germany, BTK = Map of biotope types for Germany, colour infrared air photography (1:10.000); GIS = Geographical Information System.

3 Results

3.1 Environmental evaluation of agricultural production practices – all indicators

For each of the 10 selected indicators, an index was calculated to indicate its suitability to attain the corresponding environmental quality targets (Table 1). Figure 3 shows the results for the standard cropping practices for the region's most important crops. Refering to the evaluation results set aside is determinded to be highly beneficial for the majority of objectives but especially for the biotic indicators. This is due to the very few operations and hence low disturbance potential. Only ground water recharge is an exception because of the vegetation coverage of the soil throughout the whole year. To prevent nitrate leaching into groundwater the most suitable crops are set aside and cereals while the least suitable crop is winter rape with the highest level of nitrogen fertilizer application.

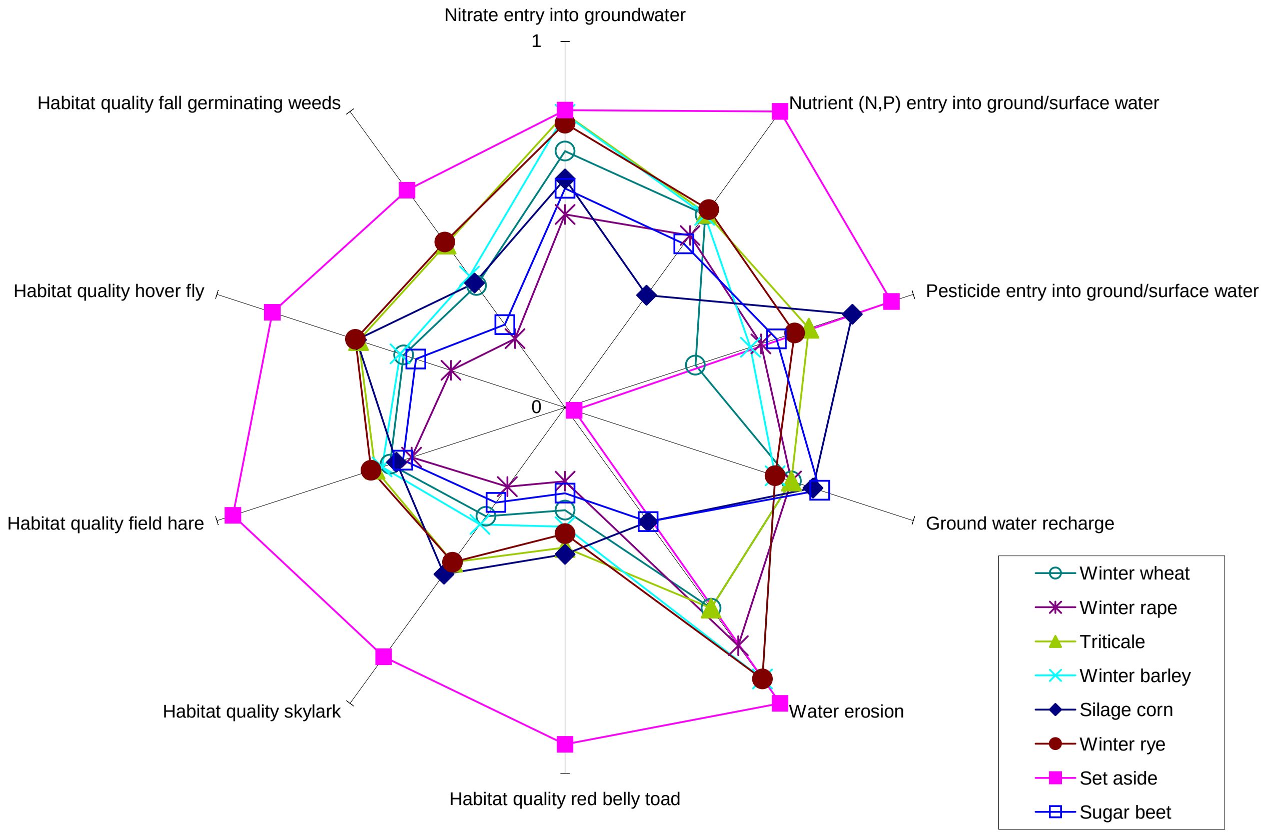


Figure 3: IGA (Index of goal achievement) for the most important crops of the modeled region. Only standard cropping practices are displayed (integrated farming, tillage by plough, no intercrops or companion crops). IGA = 0 is equal to a low contribution of the production practice to attain a defined environmental quality target, IGA = 1 means high contribution, respectively.

Silage corn reaches the lowest IGA to avoid nutrient transfer into water bodies, which is due to the high amounts of nitrogen and phosphorus fertilizers alloted for this production practice. With altogether 4 pesticide applications wheat is the least matching crop concerning pesticide loadings in opposite to silage corn with one and set aside with none application. To support groundwater recharge row crops (sugar beet, silage corn) attain the highest IGAs because there is no vegetation cover in between rows that hinders infiltration of rain water into the ground. Besides set aside, rye and barley score well to prevent water erosion. Both crops are conceded a sufficient soil coverage throughout the year conversely to the two row crops. To diminish the hazard potential for amphibians, rape and sugar beets are at least favourable. This is due to their high disturbance potential within sensitive periods. The best appropriateness for skylarks shows set aside followed by silage corn. Compared to other crops silage corn has a lower disturbance potential and there is no insecticide application (insects are the main diet of the birds during summer). For the protection of field hares in first place again set aside followed by rye, triticale and barley seem most promising as a matter of the disturbance potential through operations. For the same reason the best results concerning hover flys are obtained by set aside and furthermore rye, silage corn and triticale. Rape and sugar beet are by far the least preferable crops for the conservation of fall germinating plant communities because of the number of herbicide applications. Overall, winter rape in six out of 10 cases is the least suitable crop with respect to the defined environmental targets.

As crop production varies considerably depending on the site, the specific farm organisation and farmers objectives, we evaluated not only standard but also several alternative cropping practices. Thus, the result for a specific crop is a range of values (as shown for winter wheat in Figure 4).

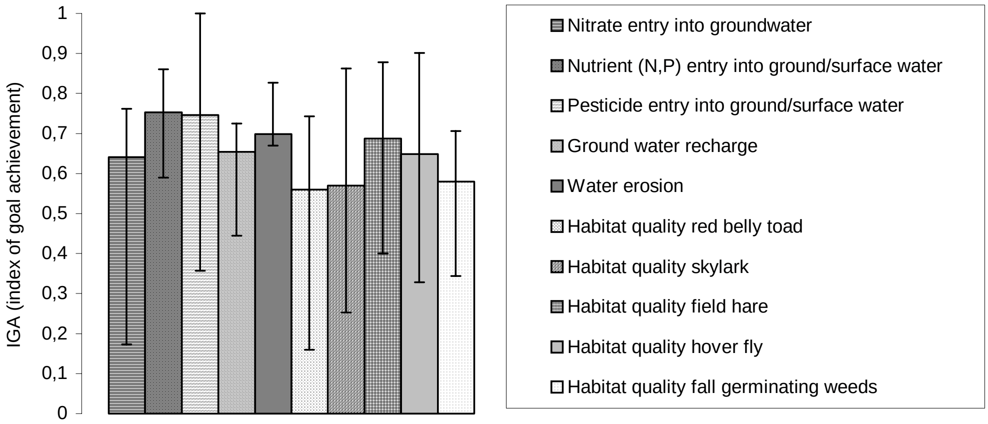


Figure 4: Mean, maximum and minimum value of IGA for winter wheat concerning all indicators. In dependency on the performance (e.g. integration of catchcrops, reduction of fertilizer application, etc.) the IGA per crop can vary significantly.

3.2 Environmental evaluation of site-specific potentials - example water erosion

The site-specific risk potential for water erosion[11] as an example is estimated with the universal soil loss equation (USLE), developed by WISCHMAIER & SMITH (1978), which is designed to predict the long-term average annual soil loss caused by water erosion. The equation is: A = R * K * LS * C * P, where A is the average annual soil loss in t/ha (tons per hectare), R is the rainfall erosivity index, K is the soil erodibility factor, LS is the topographic factor (L is for slope length and S is for slope inclination), C is the cropping factor and P is the conservation practice factor.

Factors were adjusted to the climatic conditions of the modeled region. The site-specific risk for water erosion was calculated under the application of a digital elevation model (DGM 25) by DEUMLICH et al. (2001). For each site the multitude of potential soil losses under different crops can be calculated when different C-factors are inserted into the USLE. For example a C-factor of 1 for dark fallow causes the highest soil losses while winter rye with a relatively low C-factor of 0,036 reduces the potential risk. Grassland is awarded a C-factor close to zero and nullifies the potential risk for soil losses.

3.2.1 Combining the evaluation of sites and production practices

To evaluate every cropping practice for each site, all possible combinations of sites and management practices are composed. Thereby in the fuzzy-model the assessed potential soil losses for different C-factors are related to the standard production practices on every site to calibrate the model. With the calibrated model, the deviations within the scope of alternative performances for each crop can be calculated.

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[11] The site-specific potential risk for water erosion (after the USLE) estimates the average soil loss when weather conditions are like the average of the last twenty years. Actual soil loss may vary due to deviant weather conditions. For instance heavy precipitation can effectuate enormous soil losses within a very short time period. Hence the USLE is unsuitable to predict actual soil losses.

3.3 Combining environmental and economic assessment

The economic effects of the enforcement of higher goal achievements for environmental objectives are analysed on the basis of the farm linear programming model of MODAM. By introduction of environmental restrictions, the farm model is forced to choose production activities, which accomplish these restrictions. The farm level is chosen, because total micro-economic effects can only be calculated by taking compensatory possibilities at the farm level into account. For instance light restrictions on one site can have no effect on the total farm rentability if there are other sites available to cultivate the required crops.

The combined environmental and economic assessment considers the modeled region as a regional farm model. Production factors like manpower or machinery are based on the region's average data. The LP-matrix for MODAM can be formulated for any number of sites and production practices (ZANDER & KÄCHELE 1999). The objective function is the maximisation of the total gross margin while environmental targets can be formulated as additional constraints (goal driven scenarios for different goal attainment levels, SCHULER & KÄCHELE 2003). During the optimisation process, the model has the choice to substitute either the production practices defined for a certain crop or allow a replacement of crop types. Below, we present results related to the indicator 'water erosion'.

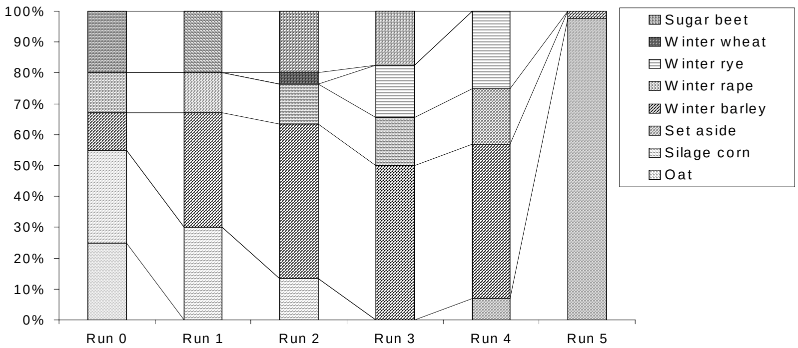
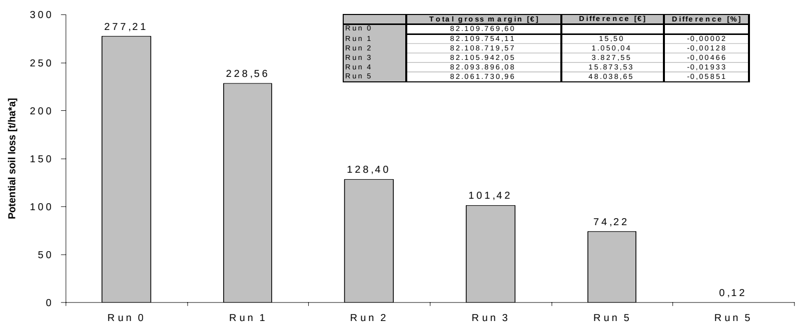


Figure 5: Stepwise reduction of potential soil losses through water erosion on sites assigned to the highest risk class. Run 0 represents the situation when no environmental restriction is defined and the model optimises only the economic output. From step 1 to 5 the environmental restrictions are strengthened constantly.

Figure 5 shows the model results after 5 steps, during which the potential soil loss should be diminished close to zero only on those sites with the highest potential risk for water erosion assumed under dark fallow (soil losses > 8t/ha). Run 0 represents the situation when no additional restrictions are formulated. From run 0 to 4 those cultures with a lesser IGA concerning water erosion prevention like sugar beets and silage corn (both crops with a large row distance and slow growth in vegetation during the year) are stepwise decreased while those with lower likelihood of water erosion are increased (like winter rye and winter barley). To push water erosion risk close to zero (last step from run 4 to 5) the only suitable crop (based on the assessment) is set aside. From run 0 to 5 the annual potential soil loss on sites with the highest risk class decreases from about 277 t/ha to nearly zero (0,12 t/ha). At the same time the total gross margin of the whole farm decreases only slightly about 0,06% (Figure 6).



	Total gross margin [€]	Difference [€]	Difference [%]
Run 0	82.109.769,60		
Run 1	82.109.754,11	15,50	-0,00002
Run 2	82.108.719,57	1.050,04	-0,00128
Run 3	82.105.942,05	3.827,55	-0,00466
Run 4	82.093.896,08	15.873,53	-0,01933
Run 5	82.061.730,96	48.038,65	-0,05851

This can be explained by the replacement of production practices with plough tillage through production practices with reduced tillage. This helps in reducing costs because of the saved expenditures for fuel, machinery and manpower.

Figure 6: Stepwise decrease in the potential soil losses of sites assigned to the highest risk class for water erosion and effect of the environmental optimisation process on the total gross margin. Losings in total gross margin are little, because production practices are substituted by variants with lower costs (reduced tillage).

The example shows that the improvement of the ecological performance must not be combined with high economic losses. As the environmental restrictions are only related to those sites with the highest risk potential for water erosion, the modelling system has enough leeway to put production practices that go potentially with a high level of erosion and a high economic revenue on sites insensitive for water erosion.

For other indicators, particularly the biotic ones, the restraint of high gross margin losses is not always possible. Here mostly production practices with low inputs of fertilizers and pesticides are evaluated as highly suitable which is linked in general with reduced yields. In these cases compensation payment to improve the ecological performance has to be considered.

4 Discussion

4.1 Pros and cons of the approach

The main advantages of this fuzzy-logic-based approach to assess environmental effects of agricultural production practices are the possibilities to access uncertain knowledge and to translate ambiguous linguistic expressions into computational language, which is highly beneficial when precise information is not available. Overall the approach is relatively uncomplicated and can be quickly elaborated for numerous indicators given that enough knowledge is available about how an indicator is affected by agricultural measures.

The most time-consuming part of the model development is the elicitation of knowledge. For example one reason for incomplete knowledge elicitation from experts may be that some information is seen as self-evident and not announced by the experts, pictorial knowledge often is not easily expressed verbally, parts of knowledge can be unconscious and experts may not want to surrender all their knowledge to maintain their 'information headstart' (WIELINGA 1984, cited in PUPPE 1988).

In general the model output is a dimensionless index, but as shown for the example of water erosion also quantitative statements can be derived. Before the approach can be transfered to other regions the definition of regional environmental targets must be reviewed with the participation of local stakeholders. Eventually the elaboration of new assessment procedures is nessecary. Both can be as well a time-consuming process.

A disadvantage of the approach is that validation is extremely difficult. The model development undergoes several cycles of feedback and is assumed to be finished when model outputs satisfy the expectations of experts and are comparable to observed real situations. Although quantitative results are possible in cases where the site potential is assessed quantitatively, they are difficult to provide for every indicator. Especially for biotic indicators quantitative assessments are extremely difficult.

Finally the approach is a static one as combinations of production practices and sites are considered as certain points in time and space. Neither time related changes and interactions nor spatial interdependencies between agricultural fields and neighbouring habitats are considered.

4.2 Other comparable studies

Static approaches to evaluate the performance of agricultural production practices for environmental indicators were also used by Meyer-Aurich (MEYER-AURICH 2001; MEYER-AURICH ET AL. 1998) and STACHOW ET AL. (2003). In the first study all in all seven ecological indicators were evaluated for integrated farming systems. In the latter work only biotic indicators were objekt of the evaluation for both integrated and organic farming. The result of this study was an assessment of the habitat quality of agricultural fields in 5 classes from ‘very low’ to ‘very high’. Both studies were not designed to handle uncertain information but delivered very valuable links for this work.

Fuzzy-logic has been applied in a broad number of studies to assess single indicators in the field of sustainable development; e.g. to assess animal walfare in agricultural production systems (CORNELISSEN 2003), to calculate nitrate leaching (MERTENS & HUWE 2002), to model soil erosion (MITRA et al. 1998) or to conduct an environmental impact assessment of pesticide use (WERF & ZIMMER 1998). Furthermore an overview about 12 different indicator-based evaluation methods (some of them using fuzzy techniques) to address the question of environmental impacts of agriculture is given by WERF & PETIT (2002).

5 Conclusion

The integration of the fuzzy-logic-based Environmental Impact Assessment-Tool (EIA-Tool) for 10 different ecological indicators into the modelling system MODAM enables the evaluation between different alternatives of agricultural land use practices. All in all, the results can provide useful information in the ongoing debate of sustainable development in agriculture. The findings indicate that certain environmental restrictions are not compelled to result in economic losses for the farmer, especially if they are linked only to those sites, which are particularly sensitive regarding the chosen indicator (as shown for water erosion). Other restrictions may cause substantial economic losses, which should be compensated to promote sustainable development of agriculture. In this case the model can give an idea about the appropriate hight of financial incentives.

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The impact of European Agri-environmental Policy on Organic Citrus Growing: A case study of Calabria (Italy), and the Comunidad Valenciana (Spain)

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Summary

The objective of this paper is to consider the adoption of the growing of citrus crop through organic agriculture within the European Union's agri-environmental policy framework. This study addresses two regions that form part of two different European Union (EU) states: Calabria (Italy), and the Comunidad Valenciana (Spain). Citrus cultivation has been selected as the main focus of this paper given the social and economic importance of this sector in both regions.

This study aims to examine how certain decisions, such as the amount of the subsidy that a producer receives or other conditions established within the regional programs, will result in different options even though we set out from the framework of a Common Agricultural Policy (CAP).

1. Introduction.

As we have described in the summary, the objective we want to reach with this paper is to enhance the growing importance of organic farmic within the European Union (Commission des Communautes Europeennes, 1989), mainly as a consequence of the application of the Council Regulation (EEC) no. 2078/92 (European Commission, 1998) and its enclosed subsidy programs. In fact, there has been an evolution of the implementation of organic agriculture during the last ten years, that we can appreciate through different studies (Besson J.M., 1990, Baldock D., Beaufoy G., 1993, Bruckmeier K., Ehlert W., 2002).

This implementation of organic farming has been focused on citrus crop in our case study, so first of all we shall explain the selection of that crop as the central point of the paper while offering an agricultural analysis of both regions. To this end, the following tables (I-II) illustrate the structure of rural property in Calabria and in the Comunidad Valenciana and specify the main crops currently grown there.

Table I. Main crops in surface of calabria and the comunidad valenciana

	Calabria[1]		Comunidad Valenciana[2]	
Crops	**Surface (Ha)**	**% of UAA[4]**	**Surface (Ha)**	**% of UAA[4]**
Olive	166,734	30.0	97,256	11.4
Citrus	*42,282*	*7.6*	*191,085*	*22.4*
Vegetables	16,039	2.9	28,041	3.3
Grapes	14,439	2.6	86,274	10.1
Orchards[3]	8,385	1.5	153,361	18.0
UAA[4]	556,503		852,224	

[1] Data from 1997. [2] Data from 2001. [3] Citrus no included.
[4] **UAA =** Useful Agricultural Area, defined as the area integrated by the total surface of crops, meadows and pastures.

Source: Peris E. (2002).

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The Useful Agricultural Area (UAA) is estimated in Calabria as 36.9% of the regional surface area, while in the Comunidad Valenciana it is 36.7%. As they are both Mediterranean regions, the two regions are cultivated with similar crops: citrus, olive-trees, grapes, fruit orchards and rotating vegetable crops. Calabria's main crop, in terms of surface area, is the olive-tree. Citrus takes third position after durum wheat with a surface area of 7.6% of UAA. On the other hand, in the Comunidad Valenciana, citrus and orchards (persimons, medlars, peach trees, etc.) represent 15% of regional surface area, that is 56.08%[1] of land under cultivation. Citrus cultivation alone is equivalent to 8.2% of the Comunidad Valenciana's regional surface area, equivalent to 22.4% of the UAA. It is clear that citrus growing contributes considerably in economic terms, as it is the basis of the region's agrarian economy.

Table II. Structure of rural property in calabria and in the comunidad valenciana

	Calabria[1]		**Comunidad Valenciana[2]**	
	% holdings	**% UAA[4]**	**% holdings**	**% UAA[4]**
S[3]< 2 Ha	74.9	23.3	57.5	12.6
2 Ha < S[3]< 20 Ha	23.3	33.2	39.7	49.5
20 Ha < S[3] < 100 Ha	1.6	19.1	2.5	21.5
S[3]> 100 Ha	0.2	24.4	0.3	16.4

[1] Data from 2000. [2] Data from 1997. [3] **S =** Surface.
[4]**UAA =** Useful Agricultural Area, defined as the area integrated by the total surface of crops, meadows and pastures

Source: Peris E. (2002).

As for table II, which contains data about the structure of rural property in both regions, it is worth noting that 94.6% of Calabrian holdings are family farms. 74.9% of holdings are less than 2 Ha in surface area, 23.3% vary between 2 and 20 Ha, and only 0.2% are larger than 100 Ha. In the Comunidad Valenciana, 39.7% of farms are included in the second group, that is between 2 and 20 Ha. The surface area difference in the 2-20 Ha segment between both regions goes to the first and last groups in Calabria's case (Surface < 2 Ha and Surface > 100 Ha). With this data we can conclude that there are considerable regional similarities, as in both of the regions the most significant UAA surface is included in the 2-20 Ha segment.

Consequently, the two regions are faced with similar problems related to the structure of rural property: a significant percentage of small farms, the dispersion of property (factors that act together against scale economies), the relative lack of medium sized holdings, aging of population and high levels of unemployment in agricultural zones. Furthermore, we should mention other factors that only concern Calabria, such as a difficult geographical situation, structural backwardness, inefficient trade channels, dispersion of supply and a weak industry.

Regarding the size of organic citrus holdings, we can affirm that in Calabria organic citrus farms tend to be medium and large sized (Gaudio F., 2002), while in the Comunidad Valenciana they are small farms, practically all of them classified on the first surface segment (Peris E., 2002). Two are the main reasons to explain this situation: the amount of subsidies paid to organic citrus producers which act as an important incentive in Calabria, as we will see later, and the natural conditions on where citrus crop is grown, more favourable in Calabria than in the Comunidad Valenciana in order to deal with the conditions imposed by Regulation (EEC) 2092/91. This paper is based on a deeper study (Peris E., 2002), where further information related with the agronomic conditions of both regions for organic citrus crop could be found.

1 **Source:** Ministerio de Agricultura, Pesca y Alimentación (2002). *"Hechos y cifras sobre agricultura 2001 "*. (Data from 1999).

2. European Union subsidies for organic agriculture. Special reference to citrus crop in Calabria and in the Comunidad Valenciana

As with the former agri-environmental programs related to the Regulation of the European Community (EEC) 2078/92 (European Commission, 1998), with the new programs arising from Regulation (EEC) 1257/99 there are specific subsidies aimed at helping farmers who decide to addopt organic agriculture as a production technique for their farms. The exact amount of subsidies is established independently either by each Member State or by each region, but they have to limit their financial expenses to a predetermined amount of money. This budget is distributed in order of the priorities given to the different measures, depending also on the crop to be managed. We may better distinguish these differences if we examine organic citrus cultivation in Calabria and in the Comunidad Valenciana in tables III (former programs 2078/92) and IV (new programs 1257/99).

Table III. Comparison of organic citrus growing subsidies. Former programs (regulation (ec) 2078/92)

Calabria	Introduction of organic agriculture	800 €/Ha
	Practice maintenance	720 €/Ha
Comunidad Valenciana	1st year	360.61 €/Ha
	2nd year	288.50 €/Ha
	3rd year and subsequent	216.36 €/Ha

Source: Peris E. (2002).

Table IV. Comparison of organic citrus growing subsidies. New programs (regulation (ec) 1257/99)

	Calabria		**Comunidad Valenciana**
	Preferential areas	*Non preferential areas*	
1rst & 2nd years	1,000 €/Ha	950 €/Ha	468.79 €/Ha (Surface modulation)
Subsequent	950 €/Ha	900 €/Ha	

Source: Peris E. (2002).

After analyzing tables III and IV, we can affirm that the Calabrian government's decision regarding organic citrus growing has been to subsidize the practise nearly the maximum allowed by Regulation (EC) 2078/92 (established at 1,000 €/Ha), and to the maximum allowed by Regulation (EC) 1257/99 under the new program. By contrast, we can consider the low level of the subsidies given to producers of organic citrus in the Comunidad Valenciana. Both regions present the same conditions regarding the established time periods, a minimum of five years of practice, as specified in the EC Regulations.

Calabria's former program related to Regulation (EC) 2078/92 established two different subsidies: one for introduction of organic agriculture practices, and another for the maintenance in the case the farmer had previously participated in an organic agriculture program. The difference between the two subsidies was about 10%, extended to all regional surface. Under the Comunidad Valenciana's former program, subsidies were modulated by the number of years of practice, so that in the first practise year, the grower received 100% of the premium value, 80% the second year, and 60% from the third to the fifth year.

In terms of new programs, the Calabrian government has introduced changes that distinguish between preferential and non preferential areas (depending on ecological considerations), and has decided to reduce premiums after the second year of practice. This diversification in preferential areas corresponds to Calabria's geophysical conditions, as intensive agricultural practises are only located in coastal plains.

However, in the Comunidad Valenciana, intensive practices are common throughout all the regional area, so other facts have been considered, such as the minimum surface needed to receive a subsidy, that was 1 Ha under the former program and is 0.5 Ha in the current one.

The last change introduced in the new program for the Comunidad Valenciana's is a result of certain modifications approved by the Rural Development Plan for Accompanying Measures in Spain. The change consist in the introduction of a surface modulation. Consequently, holdings with a surface of 40 Ha or less will receive the total subsidy (468.79 €/Ha, see table IV), holdings between 40 and 80 Ha will receive 60% of the subsidy (281.30 €/Ha), and holdings larger than 80 Ha, 30% (140.63 €/Ha). The objective of this new measure is help farmers with smaller holdings to face the higher production costs that occur naturally and to prevent at the same time situations in which farmers with larger holdings are awarded the greater part of European agriculture payments.

In brief, the most significant difference between these two regions is the amount of the premiums. Some of the subsidies in Calabria's former program are valued three times those of the Comunidad Valenciana's, when under the current programs they generally double the Comunidad Valenciana's values. The last changes introduced in the Comunidad Valenciana´s regional policy intend to favour small holdings, mainly considering the great difficulty of the compliance of Regulation (EEC) no. 2092/91 given the following agronomic conditions. While in Calabria organic citrus farms tend to be medium or large sized, located in hills and completely isolated from other farms, with the help of symbiosis with other crops like the olive tree, in the Comunidad Valenciana organic citrus farms are small sized and mixed with intensive citrus crop, without any natural barriers to isolate as citrus crop is completely located in the coastal plains. The results of both subsidy policies are analyzed in the next section.

3. Comparison of the impact of Regulation (EC) 2078/92 regarding organic citrus growing in Calabria (Italy) and the Comunidad Valenciana (Spain)

The European Council Regulation (EEC) 2078/92, of 30 June 1992 on agricultural production methods compatible with the requirements of the protection of the environment and the maintenance of the countryside (currently repealed by Regulation (EC) 1257/99), generated important results relating to environmentally-friendly production methods in Calabria. In fact, Calabria is the second most important region in Italy in terms of organic agriculture landed surface. At the same time, Italy is the first European country in landed organic surface (Juliá J., Server R., 2000). We can also add, as confirmed in the available data, that pesticide use per Ha and year in Calabria is calculated as 50% less than in the rest of Italy (Gaudio F., 2002).

Now we should examine the effects of the application of European Council Regulation (EEC) 2078/92 regarding organic citrus growing. We will first compare figures of organic landed surface and organic citrus landed surface in Calabria and in the Comunidad Valenciana, including as well calculations of the annual variation rate in both concepts (see table V). Available data for establishing comparisons correspond to 1998 and 1999.

First of all, we should consider some general figures. Calabria's UAA (Useful Agricultural Area) is equivalent in percentage to that of the Comunidad Valenciana's, with 36.90% and 36.70% of their regional surface areas respectively. Citrus growing is much more important in the Comunidad Valenciana than in Calabria, as we can deduct from the 1999 figures. While the total citrus surface was equivalent to 22.47% of the UAA in the Comunidad Valenciana, in Calabria it was reduced to 7.68% of the UAA.

By contrast, if we analyze the total organic agriculture surface in both regions compared to the UAA values, organic agricultural practices may be considered as a great success in Calabria, with 10.61% of UAA, while it is only 2.10% in the Comunidad Valenciana. Two reasons may be given for this: the difficulty in establishing organic practices in the Comunidad Valenciana, as it is a coastal plain with a long tradition of intensive agricultural practises, and the larger payments that farmers are awarded in Calabria, which may also act as an incentive.

Nevertheless, Calabria's organic citrus surface compared to total citrus area in 1999 was about 14.2%, a value which is 0.12% in the Comunidad Valenciana. This result is influenced not only by the fact that Calabria has less total citrus surface, but also by the significant quantities of EU payments, as mentioned earlier.

We must also consider the importance of organic citrus growing within the total organic surface. It is higher in Calabria than in the Comunidad Valenciana during both years: 10% for Calabria in 1998 and 1999 as compared to and 1.61% of the total organic surface in 1998 and 1.30% in 1999 in the Comunidad Valenciana.

Between 1998 and 1999 organic citrus surface versus organic total surface has been expanded in Calabria while it has diminished in the Comunidad Valenciana, as evidenced by the annual variation rate calculations. The explanation of this fact is not an actual decrease of organic citrus surface in the latter, but rather a slight growth rate in the organic citrus surface compared with the growth rate of the other organic crops. In fact, an important group of holdings registered in the Comunidad Valenciana joined the agri-environmental program during the period 1998-1999, concretely for the organic production measure. However, most of them were dedicated to dry extensive crops, which tend to be managed organically much more easily than citrus crops.

Table V. Organic agriculture. Total surface and citrus surface variation. Data from 1998 and 1999

Surface (Ha)	**Calabria**	**Comunidad Valenciana**
Total regional S	1,508,000	2,323,700
Regional UAA	556,503	852,224
Regional UAA/ Total regional S	**36.9%**	**36.7%**
Total OA S 98	*45,808.4*	*12,179.2*
Citrus OA S 98	4,569.4	196.4
Citrus OA S/Total OA S 98	**9.9%**	**1.6%**
Total OA S 99	*59,079*	*17,947*
Citrus OA S 99	6,072	234
Citrus OA S/Total OA S 99	**10.3%**	**1.3%**
Citrus total S 99	42,776	191,551
AVR (Citrus OA S/Total OA S) 98-99	***3%***	***-19.2%***
AVR Total OA S 98-99	***29%***	***47.3%***
AVR Citrus OA S 98-99	***33%***	***19.2%***
Citrus OA S 99/Citrus total S 99	***14.2%***	***0.1%***
Total OA S 99/Regional UAA	***10.6%***	***2.1%***
Total citrus S 99/Regional UAA	***7.7%***	***22.5%***

S = Surface, UAA = Useful Agricultural Area, OA = Organic Agriculture, AVR = Annual Variation Rate

Source: Peris E. (2002).

Further, the annual variation rate of organic agriculture surface during the two year period is higher in the Comunidad Valenciana than in Calabria. This indicator shows the importance of the surface area incorporated to the Comunidad Valenciana's program at that time. Nevertheless, the annual variation rate of organic citrus surface is higher in Calabria; thus, this indicator confirms the analysis presented herein.

To end with this section, we illustrate the discussion presented above in the next figure:

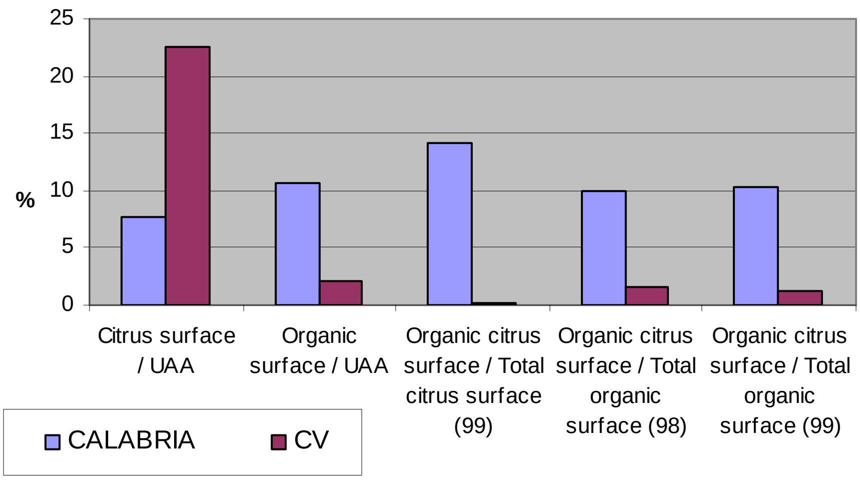

Figure I. Indicators of organic citrus growing in calabria and in the comunidad valenciana. Data from 1998 and 1999

4. Conclusions.

The objective of this paper has been to compare the results of the agri-environmental European policy during recent years as in other studies published before (Bruckmeier K., Ehlert W., 2002), but focused on the organic citrus cultivation in two European regions: Calabria (Italy), and the Comunidad Valenciana (Spain). The most important difference we have found within the two regions is related to the amount of the payments. They themselves are the main reason for the different results obtained, but we also have to consider the structure of property of organic holdings in both regions, and the different geophysical conditions that involve citrus crop.

We have seen the significant expansion of organic citrus growing surface in Calabria, while in the Comunidad Valenciana it has been less pronounced, and much more if we compare it with the total citrus surface. We can name two basic facts in Calabria's case: the considerable amount of premiums, more significant than they seem at first sight if we think about medium and large sized farms, as well as the higher values of organic products within the Italian market. An environment that helps to isolate organic citrus crop naturally also helps to find the conditions marked by Regulation (EEC) 2092/91 in an easier way.

However, the lower growth rate of organic citrus in the Comunidad Valenciana can be explained by three facts, which may be extended to organic agriculture in Spain:

- First of all, in the case of the Comunidad Valenciana, it is difficult for farmers to introduce organic agriculture practices in a coastal plain, considering the region's long history of intensive production methods. This sentence includes different aspects of citriculture in Spain: the high productivity rates of intensive citrus growing, that we have to translate in a high profitability of farms. Also the problem of conducting an organic citrus farm, generally small sized, and without natural barriers to isolate from other intensive citrus farms.

- Second, farmers are not able to obtain appropiate prices for their harvests, which could defray their higher production costs. The reason may be a lack of distribution channels for their products in Spain, that are not valued, at least in the internal market. Nevertheless, a few producers with small farms are not able to produce a consistent harvest to offer to the distribution channels, appart from the lack mentioned before.
- Last but not least, the amount of payments has not served as an incentive for a positive growth surface in the Comunidad Valenciana or in Spain, so we conclude that the Spanish Public Administration should evaluate the application of higher subsidies similar to those of other European countries, namely Italy. We consider that higher subsidies regarding organic agriculture could help Spanish producers to decide to incorporate their farms to the EU programs. The current level of subsidies doesn´t equilibrate the losses a producer can experiment when converting or practising organic farming, mainly considering the high profitability of intensive citrus growing and the difficulties to manage the organic citrus systems in Valencia.

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Towards more ecoefficient food production: MFA approach

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Abstract

The key for sustainable development is dematerialisation and ecoefficiency. Applied to agriculture ecoefficiency means production of nutritionally better food by using less inputs and by reducing environmental burden. In restricting the material throughput it is essential to identify the most voluminous material flows and direct the measures to them. Improving ecoefficiency of the food production requires that the benefits and inputs be quantified in an unambiguous way and that the inputs are estimated for the whole production chain. A comprehensive view of the whole system is necessary.

The food flux comprises four mutually linked loops: 1) plant production 2) livestock husbandry, 3) food processing industry and 4) human consumption. In the present paper MFA approach has been used to describe the system. A general framework and practical solutions for estimating and balancing the materials flow are outlined. The focus in this paper is agriculture,

The holistic MFA approach provides means to evaluate environmental and economic consequences of production and consumption. For decision makers MFA approach is a tool in guiding the development and assessing the progress towards increasing ecoefficiency of food production. The results can be used to develop new sustainability indicators. At the end, some of the possibilities are shortly discussed.

The study is the first step in developing MFA methods to analyse and to monitor the materials flow of the Finnish food flux. It is a part of the project “Materials Flow and Ecoefficiency of Agriculture and Sustainable Compatibility of Food Production” carried out in collaboration between the MTT - Agrifood Research Finland and the Thule Institute at the University of Oulu. The results are used also in compiling the Finnish physical input-output tables. The study, thus, contributes to the overall development of the materials flow accounting statistics.

Key words: agriculture, ecoefficiency, food flux, material flow accounting (MFA).

1 Introduction: sustainable development, ecoefficiency and agriculture

There is a broad consensus that the prerequisite for the sustainable development on the global scale is to half the use of natural resources within the next decades. This requires considerable dematerialisation of the economies, which can be accomplished only through a profound change in the production and consumption patterns. Dematerialisation means decoupling the economic expansion from the materials throughput, and this is, in fact, the guiding principle for environmental policy and societal development (Hinterberger et al. 2000, WRI 2000). On the general level the strivings towards sustainable development have been expressed as the Factor goals. The main responsibility lies upon the industrialised countries, which have to reduce their use of natural resources to one tenth compared to the

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situation today (Factor 10 Club 1997, Lovins et al. 1997). To accomplish this the emphasis has to be shifted from labour productivity to resource productivity and from expanding economies to improving ecoefficiency of production (Lovins et al. 1999).

The ecoefficiency-concept was first introduced by the World Business Council for Sustainable Development in 1992 as a goal to meet the human needs, to improve the quality of life and to adjust the production to the carrying capacity of the Earth (WBCSD 2001). The enterprises quickly assimilated the concept as a means to cost-effectively manage the environment. Now the ecoefficient management strategy has been adopted also as a guideline on nationwide level to encourage more sustainable production patterns and life styles.

Ecoefficiency –thinking is thinking in terms of the whole production chain and it requires comprehensive view on the material throughput from nature to antroposphere and back to nature. The essence of ecoefficiency is to produce more out of less, and the efforts towards increasing ecoefficiency are concretised with the Factor-goals. Ecoefficiency can be expressed with the simple equation: Ecoefficiency = Benefits/Inputs. Thus, improving ecoefficiency by a specific factor implies either increasing the benefits, decreasing the inputs or carrying out both measures simultaneously.

The concepts of sustainability, factor goals and ecoefficiency are relevant also in agriculture. However, the various farming subsidies may blur the profitability of agricultural production and the economic aspect of sustainability. It is also clear, that we cannot eat virtual food and the amount of food to be consumed is rather constant. Therefore, there are rather strict limits to dematerialisation of the food production. On the contrary, it has to increase, at least globally, to meet the demands of the growing world population and to improve the nutritional status of today’s population. Applied to agriculture the ecoefficiency-concept could be defined as production of nutritionally better food by using less inputs and by reducing environmental load.

2 Purpose of the study

Improving ecoefficiency implies that the benefits and the inputs be quantified in an unambiguous way. Therefore consistent and internationally comparable methods of data collection and compiling statistics are needed. The concepts industrial ecology and industrial metabolism have brought the energy and material flows of the societies into the focus. The objective is to adapt the societal metabolism to meet the demands of ecological sustainability and the carrying capacity of the Earth (eg. Ayres 1989, Lowe 1993). This requires knowledge on mobilisation and transformation of various materials between nature and society as well as within the societies, and several methods of analysing the material flows have been developed to describe and to quantify the material turnover.

Presently Eurostat is establishing material flow accounting as an integral part of the standard statistics and is developing common methods to compile national physical input-output tables (PIOTs). In these, the nation-wide materials balances are disaggregated and the inputs are allocated to the various sectors of the economy. Food production is one of these, and compilation of the physical input-output tables requires detailed knowledge on the materials flow even within the food flux.

The main purpose of the present paper is to introduce and to discuss the applicability of the material flow approach to food sector. A general framework and practical solutions for estimating and balancing the materials flow of the food flux are outlined. The focus is agriculture and the specific problems related to quantification of materials use and transformation within animal husbandry. In conclusion it will be shortly discussed, how the results can be used to promote sustainable production and consumption. The results of the study will also complement the economy-wide materials flow balance, and the study thus contributes to the compilation of the physical input-output tables.

3 MFA

The acronym MFA stands both for material flow accounting and material flow analysis. The MFA research is concerned among other things in developing methods to measure and to analyse the use of natural resources within the various sectors. The methods have been developed especially at the Wuppertal institute in Germany and within the EU-funded ConAccount –project (Bringezu et al. 1995, ConAccount 1998). The methods have been applied in producing internationally coherent data sets on the economy-wide materials flow and in comparing the material flows of various nations (Adriaanse et al. 1997, WRI 2000a). A central concept is the total material requirement or TMR. TMR comprises the direct material inputs as well as the so-called hidden flows or the ecological rucksacks.

The TMR approach focuses on the input side of the material throughput, and it is a crude overall measure on the potential environmental impact. This is because the extraction of natural resources directly interferes with the functioning of the ecosystems and because the extracted raw materials are, sooner or later, returned back to nature. By reducing the volume of extracted raw materials, the environmental impact is relieved both at the beginning and at the end of the materials throughput (Schmidt-Bleek 1998). Relating the material flows with specific environmental issues requires allocation of the material to the various sectors. The linking between the material flows and their environmental impact can be examined in more detail by identifying and quantifying the output material flows. A pilot work on this has been compiled by the World Resources Institute (WRI 2000a).

The material flow approach dates back to the late 60'íes (Boulding 1966, Daly 1968, Ayres & Kneese 1969). It is thus a fairly new field of research. The methods have been applied to assess the extent of the natural resource use and the data are needed for monitoring the extent of dematerialisation. The European Environmental Agency has implemented material flows and ecoefficiency within the major environmental signals measuring the progress towards sustainability (EEA 2000). The data can be used also as a tool in making environmental policy decisions (CEC 1999, 2001).

So far there are only few studies explicitly on the food systems. The attempts to harmonise material flow accounting of biological production have been restricted to highly aggregated data of the economy-wide MFA (Adriaanse et al. 1997, Ayres & Ayres 1998, Eurostat 2001). A model for biomass turnover within the global food system has been constructed by Wirsenius (2000). Material, energy and monetary fluxes have been analysed in assessing the resource management within the Swiss food sector (Faist et al. 2001) and in defining the sustainability space of that sector (Binder and Wiek 2001). Combined substance flow models and life cycle assessment methods were applied to evaluate the environmental advantages of the small-scale food supply systems over the large-scale systems (Thomsson 1999). In addition, ecological rucksacks for several single food products have been estimated on the basis of the MIPS (material intensity per unit service) –concept and there is an increasing number of product specific LCA studies also on food products.

In compiling the total material requirement (TMR) for Finland, plant production with the associated hidden flows was accounted for as the input of agriculture to the economy (Mäenpää et al. 2000), and material flows of Finnish agriculture were described in detail (Risku-Norja et al. 2002a). The Finnish TMR data were compared with energy consumption in agriculture and with use of biocides and fertilisers to elucidate the development trends in agricultural production during the past 30 years in Finland. The data show marked improvement in efficiency in using these suggesting development towards more sustainable production (Risku-Norja 1999).

4 The role of agriculture in Finland

As to the basic food products Finland is largely self-sufficient. During the past 30 years the plant production has markedly intensified, the yields per hectare have nearly doubled and also the production per capita has increased by about 25 % (Risku-Norja 1999). At the same time the total energy intake of the population has somewhat decreased from 12.6 to 11.3 MJ per capita per day, but today a greater part of the consumed food is from the animals (MTTL 1976, MMM 1997). The increased plant production is thus used as feed and is processed trough animal husbandry to human food.

Agriculture has experienced a profound structural change during the past few decennia. This is reflected in the number of farmers and farms as well as in the area of cultivated land. Judged from the Finnish TMR and from the national economy the role of agriculture appears to be quite insignificant (Fig. 1a). The share of agriculture from the TMR is only 5 %, and it has not changed markedly during the past 30 years. The share of agriculture from the Finnish GDP has also oscillated around 1 % since the 70´ties, at present it is about 1.2 %. In 2000 the number of people employed in agriculture, inclusive fishery and game husbandry, was almost 121,000 persons, i.e. about 5 % of the employed labour force.

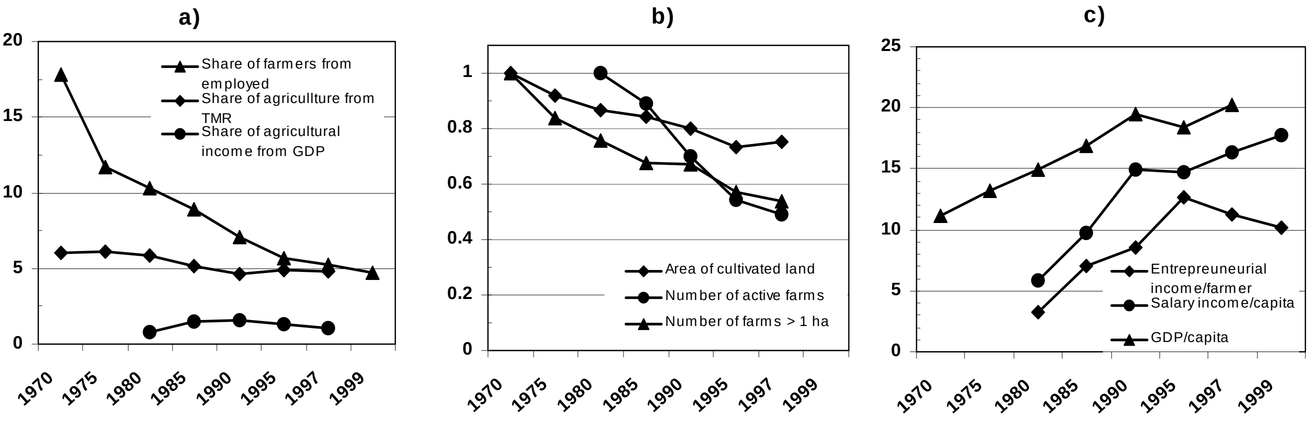

Fig. 1 The role of agriculture in Finland in 1970-2000:
a) Share of agriculture from the Finnish TMR, of agricultural income from the Finnish GDP and of farmers from the employed labour force, %. Source: Mäenpää et al. 2000a, Statistics Finland 2000.
b) Area of cultivated land and number of farms with an area over 1 ha in Finland in 1970-2000, 1970 = 1. Number of active farms in Finland in 1980-2000, 1980 = 1. Source: MTTL 2001.
c) GDP per capita, salary income per capita and entrepreneurial income from agriculture per farmer in 1970-2000 in Finland, 1000 €. Source: Statistics Finland 2001

Compared to the situation in 1970 the number of the farms with an area of over 1 ha has dropped by almost 50 %, the number of active farms is now only little over 40 % from what it was in 1980. The cultivated land area is now slightly under 2 millions hectares, in the 1970 it was 2.6 millions hectares (Fig. 1b). At the same time the average size of the farms has increased from under 10 hectares to little over 28 hectares.

In Fig. 1c the entrepreneurial income from agriculture per farmer has been compared with the GDP and total salary sum per capita. The figure shows that in average the farmers' income is less than the average salary income. There has been a substantial economic growth up to the middle of the 1980'ies, but the gap has not been mitigated. During the 1990'ies the GDP and the total salary income have continued to increase, but the farmers income has turned to decline. The economic development of the agricultural population has been detached from the overall development of the society. At least from the farmers' point of view the data suggest economically unsustainable development.

In spite of the apparently small contribution of the farming to the Finnish economy, environmental impact of agriculture is considerable and extends far beyond agroecosystems. The problems are related to biodiversity, maintenance of soil fertility, eutrophication of the watersheds and to emissions of greenhouse gases. E.g. in Finland agriculture is responsible for about 50 % of the anthropogenic nitrogen and phosphorus loading of the watersheds (Rosenström and Palosaari 2000) and for about 10 % of the atmospheric total greenhouse gas emissions (Pipatti 2001).

It should be also remembered, that food is not a commodity among others, but fundamental for survival. Right to food is expressed also in the United Nations´ declaration on human rights, and food should be treated according to its very special character rather than as commercial merchandise. Food has to be produced also in the future and the production will continue to modify the environment in various ways. However, despite the fact that the food production globally is to be increased to meet the needs of the growing population, the environmental impact of the production has to be radically reduced. MFA methods provide one possibility to assess the progress towards more ecoefficient food production.

5 The materials flow of the food flux

The food flux comprises four mutually linked loops: 1) plant production 2) livestock husbandry, 3) food processing industry and 4) human consumption.

In compilation of the TMR of four nations, the photosynthetic activity responsible for the plant growth is considered as the phenomenon of nature. The system boundary between the economy and nature is defined accordingly: the harvested plants with the associated ancillary biomass are inputs from nature, while the biological metabolism of the livestock and humans occurs within the economy (Adriaanse et al. 1997). However, plant cultivation is economic activity that has marked environmental impact. A comprehensive view of the food production requires that it be included within the system. On the other hand, the ancillary biomass has been excluded in this work, because it is returned to the soil on harvesting and it never enters the economy.

The PIOT data must be consistent with the economy-wide MFA data. Applying the MFA approach to the animal husbandry encounters problems, which are related to transformation of the materials by the animal metabolism. This is because water and air are usually taken as free goods and are not accounted for in assessing the material flows. However, the feed as well as the various animal products contain variable amounts of water. Transforming the vegetable feed stuffs to food for humans also requires oxygen and liberates carbon dioxide and water vapour. Ignoring these would result in a considerable material imbalance and, as e.g. in case of milk production the outputs would greatly exceed the inputs, which obviously is an oxymoron.

To overcome these problems, the system boundaries between the economy and nature have been here redefined. The system is outlined and the material flows are summarised in fig. 2. In addition to solar energy, the inputs from nature comprise only water, CO_2 and O_2, inputs from the other sectors of economy include fertilisers, biocides and the fuels. Outputs back to nature are the gaseous O_2, CO_2, water, methane (CH_4), ammonia (NH_3) and the emissions from the fossil fuels. Other outputs are the surpluses of nutrients and biocides, sewage as well as the wastes from the products proper, i.e. plant, slaughter and food wastes. The gaseous emissions end up directly into the air and the sewage into the watersheds, whereas others enter the soil, remain there or are subsequently moved into the watersheds or into the air.

The production statistics of agriculture provide the necessary background data. These include the area of cultivated land, volume of the various plant products, the carcass and live weights of the slaughtered animals and the amount of the various animal products. Other data include the sales statistics of the various agrochemicals and the energy consumption.

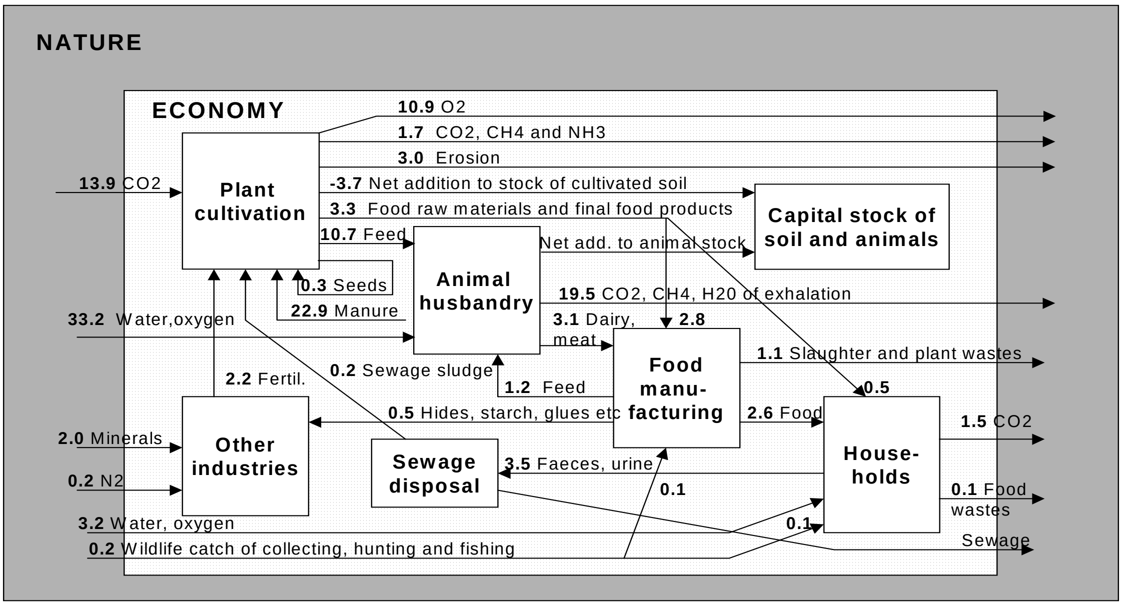

Fig. 2. The system boundaries and summary of the material flows of the food flux in Finland in 1995, thousand metric tons (Risku.Norja et al. 2002)

The direct material outputs (DMO) of the domestic plant cultivation (food and feed) in Finland in 1995 were 15000 metric tons, out of which approximately 2050 metric tons is pasture grass.

The products of the animal husbandry, beef, pork, poultry and eggs together comprise about 535 metric tons and 2565 millions litres milk. Pig, cattle and poultry comprise 96 % of the meat production. The remaining consists of reindeer, sheep, horse and the wild. These have been excluded, although in areal studies their proportion could be significant.

Feed constitutes approximately 75 % of the domestic plant production. Out of this, 7155 tons is hay and silage and 2050 tons pasture grass. About two thirds of the cereal production is feed grain; turnip rape, pulses and potatoes are also used for animal feed. About 2000 tons were used in the food processing and alcohol industry, the residues from which are largely returned to agriculture as animal feed.

Plant cultivation. The primary inputs from nature, water and carbon dioxide, are estimated on the basis of the volume of the harvested products from the equation of the photosynthesis ($6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$). On the basis of molar weights it can be calculated that production of one kilogram glucose, 1.47 kg carbon dioxide and 0.6 kg water is needed, and 1.07 kg oxygen is liberated. The equation calculates the products on dry matter basis, and the weight reported in production statistics have to be converted into dry matter by extracting the water content of the products.

Animal husbandry. The material transformations by the metabolic processes are varied and complicated. The essence of the animal metabolism is to liberate energy from the feedstuffs to be used for growth, production of heat, motion and for maintenance the basic metabolic functions. The feed is broken down and oxidised or burned mainly to water and carbon dioxide within the digestive system of the animal. The process links the gas exchange of breathing intimately with the nutritional cycle; the oxygen necessary for burning is inspired and the carbon dioxide is expired via the lungs. The process is exothermic, and a great deal of energy is liberated.

Quantification of the materials flow of animal husbandry is based on information on animal nutrition. The energy content is the basic unit used in nutritional studies, and a lot of detailed data are available on the energy economy of production animals. Energy approach is practical because in given circumstances the energy requirement is quite constant, although the water content of the feed may vary considerably. The energy content is easily converted to weight units on dry matter basis and the data from various animals are directly comparable. The water content of the feed and of the various output products can then be adjusted for the different animal species and by paying attention to the specific production circumstances.

Data on the gross energy and drinking water requirement, the energy contents of the various animal products as well as that of urine, dung and methane, and on the allocation of the energy to growth and maintenance are needed for each production animal species. Here, material flow balances have been separately calculated for production of milk, eggs, beef, pork and poultry. The data are estimated on the daily basis and they are converted to yearly amounts by taking into account the animal-specific life- and production cycles. The material flows are measured in actual weights, and the weight of the dry matter obtained from the energy approach has to be converted into fresh weights by taking into account the water content of the feed, animal products, dung and urine. Detailed description of the calculation methods is given elsewhere (Risku-Norja et al. 2002a).

The organism cannot utilise all the feed it consumes. The total or gross energy of the feed is divided into digested, metabolisable and net energy (Fig 3). The daily energy balance is exemplified in Fig. 4 with that of a dairy cow. The undigested part forms about one quarter of the total energy intake, and it is expelled as dung. Part of the digested energy is excreted as fermentation gases and with the urine. The rest is metabolisable energy that is used for maintenance and production. Part of the metabolisable energy is lost on building up the various compounds of the milk and tissues from the split molecules of the feed. These transformation losses together with the maintenance produce the heat for the animal.

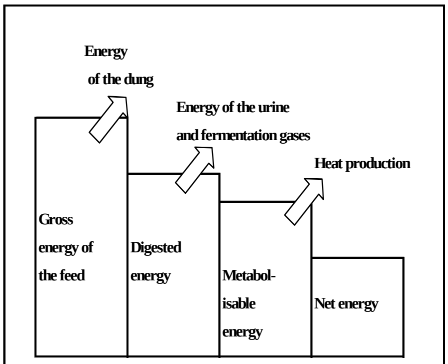

Fig. 3. The division of the gross energy of the feed (MKL 1999).

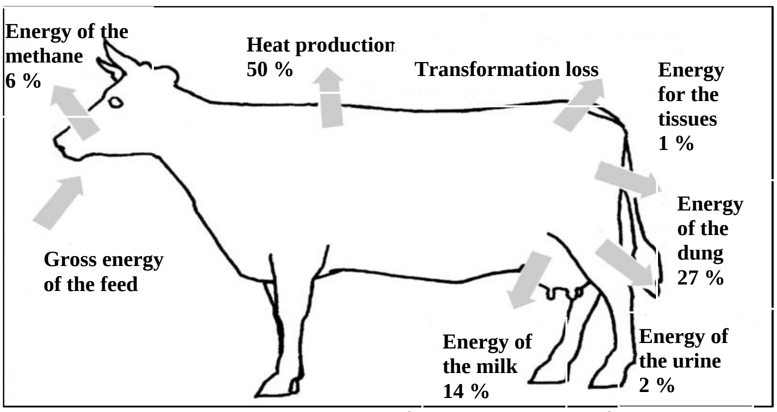

Fig. 4. The average daily energy balance of the dairy cow modified from MKL (1999) by taking into account the production cycle of the cow.

6 Discussion

MFA approach can be carried out at different scales ranging from nation-wide to regional and sector levels. The efforts to improve ecoefficiency of various sectors are concretised by sector-specific factor-goals. The goals must be realistic and obtainable, and for that a realistic picture of the within-sector material throughput is needed. The starting point is the description of the present situation in an accurate and internationally harmonised way. This reveals the hot spots and allows deciphering future development trends, specifying the goals and provides also means to evaluate the progress in reaching the goals. For continuous monitoring MFA is a powerful tool, because the aggregated data provide an overview of the structure of societal metabolism and of its changes over time.

This study is the first step in developing MFA methods to analyse and to monitor the materials flow of Finnish food flux. The data will be used to complement the economy-wide material flow balance, and the study contributes to the compilation of the physical input-output tables.

The focus in this paper is on agriculture. The proposed method to estimate the materials flow within animal husbandry is universal. The material flows are extrapolated from the data concerning one average animal representative of its species. Faulty background data may give totally misleading results when multiplied with the number of individuals of each animal species. Therefore, attention has been paid especially to the reliability of the background data, which have been critically viewed by the specialists of animal nutrition at the MTT. The data applied here refer to the circumstances of conventional farming in Finland. Applying the method to different production circumstances requires that the data be adjusted accordingly.

Combining the material flow data with those on monetary flows the approach allows analyse the effects of changing consumption and production patterns on the material and monetary flows within the agriculture. Integrating the data on agriculture into the national statistics, economic and environmental impact of various options can be analysed on national level as was done by Risku-Norja et al. (2000).

The ultimate purpose in doing this is to adjust the food production to a level complying with the demands of sustainability. Defining the sustainable level requires comprehensive view on the cause and effect relations. Considering the materials flow data together with environmental and socio-economic statistics is a promising source in developing new sustainability indicators. Several European countries work on in linking the existing data into the national accounts (Eurostat 2001). So far the data have been used to describe the development trends in the use of natural resources, the material intensity of the production and the dependence of the TMR on the economic structures (eg. Adriaanse et al. 1997, EEA 2000, Mäenpää et al. 2000).

Improving ecoefficiency means lowering environmental burden without decreasing human welfare or profitability of production. GDP/TMR has been taken as a general expression of ecoefficiency (OECD 1997, KTM 1998). Similar approach can be applied at sector level by weighing the value added against the material inputs within sectors. Other aspects of ecoefficiency can be highlighted in a similar way by relating the volume or value of production to some measurable environmental consequence of production. Dietary choices specifically affect the materials flow of the food flux. From the consumer point of view the energy content or nutritional value of the various food products could be useful. The benefits of various food products or modes of food production could be compared and weighed against their environmental or economic impact. In this way the data can also be used to promote sustainable food consumption.

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Integrating Soil Erosion and Profitability in the Assessment of Silvoarable Agroforestry at the Landscape Scale

J. Palma, A.Graves, A. Bregt, R. Bunce, P. Burgess, M. Garcia, F. Herzog, G. Mohren, G. Moreno and Y. Reisner*

Abstract

Silvoarable Agroforestry (SAF), the deliberate combined use of trees and crops on the same area of land, can potentially improve the environmental performance of agricultural systems in Europe. However, such changes in land use also need to be seen in terms of their economic implications. The present study makes a combined environmental and economic assessment of poplar SAF near Torrijos in Castilla la Mancha in Spain. Six different silvoarable systems were compared with existing arable agriculture. The Revised Universal Soil Loss Equation (RUSLE) was used to predict soil erosion under the different silvoarable and arable systems and an economic model was used to predict their NPV. SAF with contouring decreased predicted soil loss by 80% compared with the existing arable system. Economic analysis showed that the NPV of densely planted, but widely spaced silvoarable systems could be similar to the NPV of existing arable systems. However, current grant schemes were higher for the arable systems and made the silvoarable systems less attractive in terms of cash flow and NPV. It is concluded that where soil erosion is problematic, grant systems should not increase the attractiveness of arable systems at the expense of SAF.

Keywords: Silvoarable agroforestry, soil erosion, economic assessment, landscape modelling, scenario studies

1 Introduction

Silvoarable agroforestry (SAF) involves the deliberate combination of trees and agricultural crops on the same land management unit in some form of spatial arrangement or temporal sequence such that there are significant ecological and economic interactions between trees and agricultural components (Sinclair, 1999). Recent findings indicate that modern SAF production systems (**Figure 1**) are efficient in terms of resource use; therefore they are proposed as innovative agricultural production systems that can be both environmentally friendly and economically profitable. This would improve farming systems' sustainability and diversify farmers' income as well as provide new products to the wood industry, and create novel landscapes of high value. These possibilities are investigated in the EU-funded project "Silvoarable Agroforestry for Europe" (SAFE) (http://www.montpellier.inra.fr/safe/).

Economic and environmental assessments are usually undertaken separately (Adesina et al., 2000; Belaid and Karteris, 1995). The aim of this paper is to combine the environmental and economic assessment of SAF by modelling various scenarios and evaluating their effects on soil erosion and profitability to test three hypotheses:

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H1. SAF systems (a) reduce soil erosion and (b) increase NPV in comparison with existing arable systems;
H2. Increased tree densities in SAF systems (a) reduce soil erosion and (b) increase NPV;
H3. At equivalent tree densities, implementation design (between-row and in-row tree spacing) influences (a) soil erosion and (b) NPV.

The hypotheses are tested in a Landscape Test Site (LTS) of 16 km^2 in Spain (province of Castilla la Mancha), where the existing land use is compared with different implementation designs of SAF.

2 Material and Methods

2.1 Landscape Test Site (LTS)

Based on an Environmental Classification of Europe, which resulted from a statistical analysis of climatic and topographic data (Metzger et al., 2002), three landscape test sites of 4x4 km were selected in the three dominating environmental classes in Spain. The selection was random but was restricted to agricultural areas according to each of the PELCOM land cover classification. Aerial photographs and digital land use were made available through a collaboration with Prof. Ramon Elena Rosello (Universidad Politécnica de Madrid). During a field survey, land-use information was updated and soil maps were produced based on soil samples and topography. Digital elevation models were elaborated by digitizing the contour lines of topographic maps. Monthly averages of rainfall and temperature from the nearest weather stations were compiled. All spatial information was stored and processed in the Geographic Information System (GIS) ArcInfo 8.3. The Torrijos LTS was chosen for this pilot study. The agricultural statistics of Castilla la Mancha were used to compile the relevant agro-economic and forestry data for the Torrijos LTS.

2.2 Hypothetical SAF system

The hypothetical silvoarable systems developed for the Torrijos LTS consisted of poplar for the tree component and existing arable crops for the crop component. Three different tree densities (25, 50 and 100 trees ha-1) were selected. For each density, two different strategies in the layout of the trees in the field were considered (Table 1). The first strategy maximised the row distance and minimised the in-row tree distance (25 trees ha-1: 40 x 10 m; 50 trees ha-1: 40 x 5m; 100 trees ha-1: 20 x 5m). The second strategy minimised the row distance and maximised the in-row tree distance (25 trees ha-1: 20 x 20 m; 50 trees ha-1: 10 x 20m; 100 trees ha-1: 10 x 10m). These six different systems were compared with the current arable system in the Torrijos LTS.

2.3 Scenarios

Scenarios are farm management options, other than field implementation design, that are used to change the existing land use to a new land use. The objective is to reflect farm management reality. For this study only one scenario was used, due to on-going improvements in the assessment process. This scenario models the complete (100%) conversion of the farm arable land area to SAF. In future, these scenarios will include decisions based on different farmer criteria (e.g. economic, biophysical and environmental criteria).

2.4 Soil Erosion

2.4.1 RUSLE for silvoarable agroforestry

The RUSLE (Revised Universal Soil Loss Equation) (Wishmeier and Smith, 1978) was used to predict soil erosion under the existing arable and the six silvoarable systems (Equation 1).

$$E = R * K * LS * C * P \qquad \text{(eq. 1)}$$

E = annual soil loss (tons ha^{-1} $year^{-1}$)
R = rainfall erositivity factor (MJ mm ha^{-1} h^{-1} $year^{-1}$)
K = soil erodibility factor (t ha h ha^{-1} MJ^{-1} mm^{-1})
LS = slope length factor (unitless)
C = cover management factor (unitless)
P = erosion control practice factor (unitless)

The R-factor was calculated according to Renard and Freimund (1994), based on the mean annual precipitation; the K-factor was based on the soil texture components according to Römkens et al. (1986) and Renard et al. (1997), respectively. The AML (Arc Macro Language to run with ArcInfo) developed by Van Remortel et al. (2001) was used to compute the LS-factor.

Because SAF systems have an arable and a forestry component, Equation 2 was derived to calculate the C-factor for a SAF plot.

$$C = [Cov_a * C_a] + [Cov_f * C_f] \qquad \text{(eq. 2)}$$

C = C-factor of a SAF field
Cov_a = land cover fraction of the arable component (crop) (%)
C_a = C-factor for the arable component
Cov_f = land cover fraction of the forestry component (grassland strips under the trees) (%)
C_f = C-factor for the forestry component

Cov_a and Cov_f depend on the distance between the tree rows and the tree row strip width (**Figure 1**). C_f was computed according to Dissmeyer and Foster (1980), based on the trees' canopy diameter and centroid height, which are species specific.

2.4.2 Input parameter for the LTS

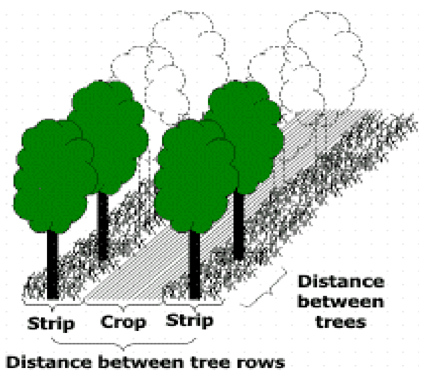


Figure 1: Conceptual design of silvoarable agroforestry (SAF)

The closest climatic station used for the study has a mean annual rainfall of 357 mm. The calculated R-factor is 621 MJ mm ha^{-1} h^{-1} $year^{-1}$. The soil map of the LTS contains seven different soil types with K-values ranging from 0.03854 to 0.04389 t ha h ha^{-1} MJ^{-1} mm^{-1}. The LS-factor values vary from 0 to 11.19 (no unit). A prototype full-grown agroforestry poplar tree of 16 m high with 8 m of canopy diameter was assumed, with the strip being invaded by natural vegetation. The C_a-factor for the study area was assumed to be 0.05, based on a crop rotation with 75% cereals and 25% grassland.

To calculate the P-factor, SAF can be considered as strip cropping. The original contouring value was reduced by 50 % according to Morgan (1995).

2.5 Economic Modelling of hypothetical farms

2.5.1 The economics of silvoarable agroforestry

A computer model (Graves et al. unpublished paper) was developed to compare the effects of silvoarable, forestry and arable enterprises on a farm business. The model assumes that the farm business comprises a series of "enterprises" which generate revenue (*R*) and costs expressed on a per unit area basis. These costs could be both variable costs (*V*), such as the costs of fertilizer, seed and sprays, and assignable fixed costs, such as labour and machinery (*A*).

Whereas an economic comparison of two arable crops can often be undertaken on an annual basis, the economics of a silvoarable system are typically considered over the rotation of the tree crop which lasts many years. As most people have a preference for immediate income, there is therefore a need to 'discount' the value of revenue obtained in the future (most commonly at the opportunity cost of capital), to give the investment a "present" value, termed the "Net Present Value" (NPV) (Pearce, 1971). At a plot- scale, the NPV (€ ha^{-1}) of an arable, forestry or silvoarable enterprises can therefore be expressed as (Equation 3):

$$NPV = \sum_{t=0}^{t=T} \frac{(R_t - V_t - A_t)}{(1+i)^t} \qquad \text{(eq. 3)}$$

NPV = net present value of the arable, forestry or silvoarable enterprise within a unit (€ ha^{-1})
R_t = revenue from the enterprise (including subsidies) in year *t* (€ ha^{-1})
V_t = variable costs in year *t* (€ ha^{-1})
A_t = assignable fixed costs in year *t* (€ ha^{-1})
T = time horizon (years)
I = discount rate

2.5.2 Physical data for the LTS

The Farm Accountancy Data Network (FADN) (European Commission, 2003) for Castilla la Mancha in 2000 indicated that over 50% of the total utilised agricultural area was devoted to "specialist cereal, oilseed and protein crops" farm types. These were dominated by cereal enterprises, comprising 62% of the total utilised agricultural area (66 hectares) of the average farm. It was therefore assumed that a hypothetical arable system would comprise a four-year rotation of wheat, oats, barley and a fallow break. The wheat yield for "specialist cereal, oilseed and protein crops" farms for 2000 was 2.6 t ha^{-1}. Due to limited data, oat and barley yields were derived using the wheat yield as a relative yield indicator. Oat yields on an experimental site in Extremadura were 1.6 times that of wheat grain yields for the same site (SAFE, 2003). Barley yields in a low yielding area in northern Spain were found to be approximately 1.3 times that of wheat yields for the same site (Austin et al., 1998). These relative values for oats and barley suggested that the yields in Castilla La Mancha would be approximately 4.1 t ha^{-1} and 3.2 t ha^{-1} for oats and barley respectively.

Production data for the tree component of the silvoarable systems were derived from yield tables of pure stands of poplars (Christie, 1994). In the absence of other information, a yield class of 10 (i.e. the maximum mean annual increment of the stand is assumed to be 10 m^3 ha^{-1} a^{-1}) was taken to be representative of the growth of poplar on the site. Tree mortality of 5% was assumed. Consequently, these trees were replanted in year 2. No thinning was assumed, but pruning of the poplar was assumed to occur in years 4 and 7. Clear felling occurred in year 15, as per the usual practice with poplar in the area. Production data for the crop and tree component of the silvoarable system were developed using a shading model developed from POPMOD (Burgess et al., 2003).

2.5.3 Economic data for the LTS

Most of the economic data were derived from a variety of statistical sources (e.g. MAPYA, 2000a; 2000b; 2001) and electronic databases (European Commission, 2003) and redeveloped for use in the economic analysis.

A significant difficulty lies in assigning a correct value to harvested timber. The value of timber is often dependent on the size of each individual piece of timber. For example, one cubic meter of wood as a single piece of timber is worth more than one cubic metre of wood comprised of many small pieces of timber. The changing volume to price relationship is represented by timber price-size curves. Here, price-size curves (€ m^3) were derived for Spain from Antonanzas et al. (1992) and Molowni (1998) (**Figure 2**).

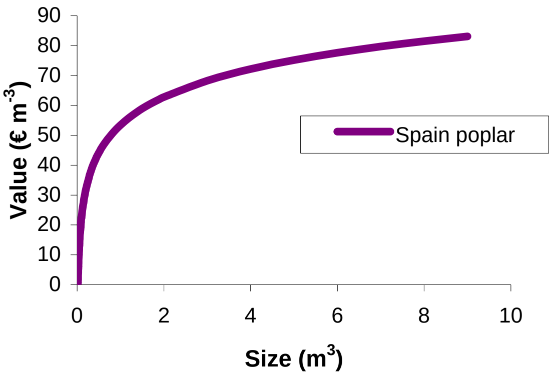


Figure 2: The value of poplar in Spain, developed from Antonanzas et al. (1992) and Molowni (1998)

A further difficulty lies in modelling the area payments available on silvoarable systems. Although there are extensive grants systems available for the establishment of forestry enterprises in Spain, these are forfeited when crops are grown under the tree canopy, as in silvoarable systems. However, the area payment is still available on crops grown in alleys, but these are reduced by twice the canopy area of the trees and may theoretically be assessed every year. In order to model the predicted grant revenue it was therefore necessary to predict the canopy development of the silvoarable systems. Here, the shading model developed from POPMOD (Burgess et al., 2003) was used to predict canopy evolution over time.

3 Results and discussion

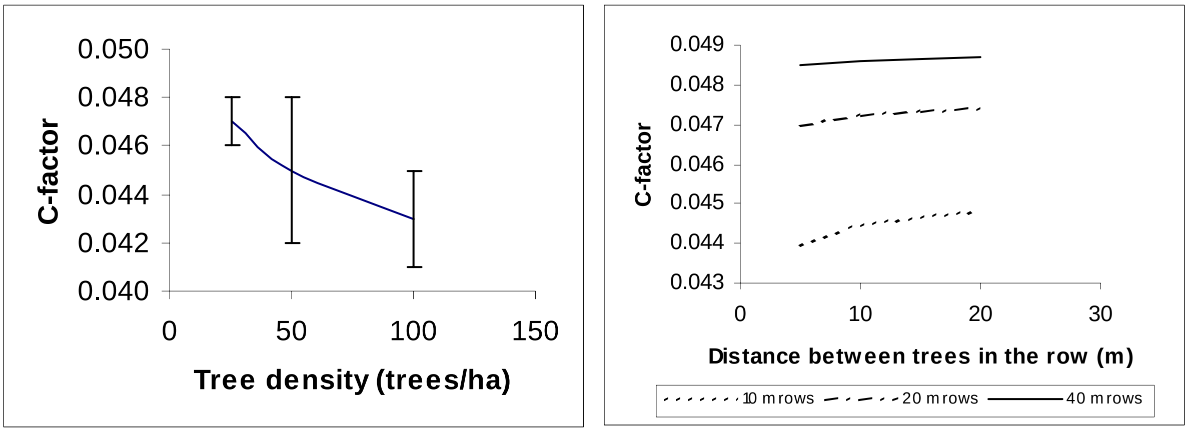
3.1 Soil erosion

3.1.1 The C-factor as an indicator of soil erosion

Because the C-factor captures the impact of land use in the RUSLE, the effect of SAF implementation designs on soil erosion can be explored through the C-factor. The C-factors of different SAF implementation designs are shown in **Table 1**. A lower C-factor value corresponds to a lower soil loss. Increasing the tree density does not result in a linear decrease of soil erosion (**Figure 3a**). In the Torrijos LTS, SAF systems with 25 trees ha^{-1} can have almost the same erosion as 100 trees ha^{-1} system if the distance between the rows is maximised. The distance between tree rows is more important than the distance of the trees in the row (**Figure 3b**).

Table 1: C-factors for six different implementation designs of SAF.

Tree density (trees ha^{-1})	Distance between tree rows (m)	Distance between trees in the row (m)	Cov_a	Cov_f	C_a	C_f	C
0	-	-	1	0	0.05	0	0.05
25	20	20	0.90	0.10	0.05	0.008	0.046
25	40	10	0.95	0.05	0.05	0.006	0.048
50	10	20	0.80	0.20	0.05	0.008	0.042
50	40	5	0.95	0.05	0.05	0.002	0.048
100	10	10	0.80	0.20	0.05	0.006	0.041
100	20	5	0.90	0.10	0.05	0.002	0.045



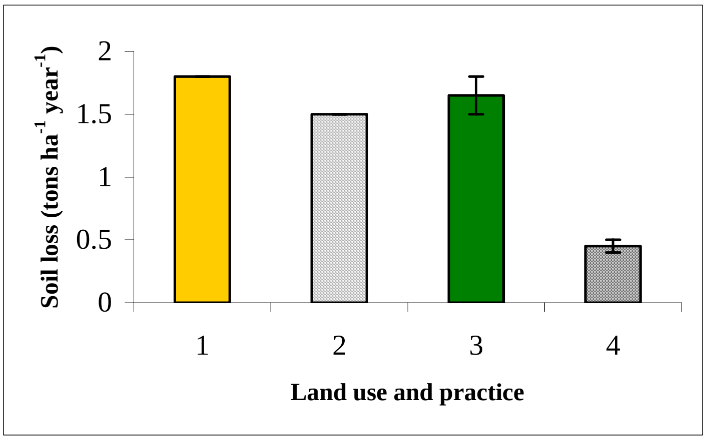
(a) **(b)**

Figure 3: The (a) relationship between tree density and the C-factor in a SAF system and (b) the influence of different between- and within-row tree spacing. Error bars (a) indicate the range of the C-factor due to different implementation designs (Table 1). The lower limit applies for minimum, the upper limit for maximum row distance

3.1.2 Soil loss in the LTS

Sixty-nine percent of the LTS is arable land from which the average potential soil erosion is 37 tons ha^{-1} $year^{-1}$. The actual soil erosion based on the C- and P-factors is on average 1.8 tons ha^{-1} $year^{-1}$ for non contouring practices and 1.5 tons ha^{-1} $year^{-1}$ if contouring practices are applied. By implementing SAF, the same area can have soil erosion rates varying from 0.4 to 1.8 tons ha^{-1} $year^{-1}$ depending on the design (**Table 1**) and on the contouring practices (**Figure 4**).

Changing the arable system to SAF without contouring or introducing contouring practices without SAF lead only to minimum reduction of soil erosion. But when SAF is combined with contouring practices, erosion is reduced by approximately 80%.



1 Traditional arable cropping, no contouring
2 Traditional arable cropping, contouring
3 SAF, no contouring
4 SAF, contouring

Figure 4: The average soil loss from arable land on the Torrijos LTS, as affected by land use (C-factor) and practice (P-factor). Error bars indicate the range of soil erosion due to different implementation designs (Table 1). The lower limit applies to minimum row distance, the upper limit to maximum row distance

3.2 Economic results

The NPV of the arable system was higher than for the silvoarable systems at all discount rates, except at 0% where the 20 m x 5 m system (€3675 ha^{-1}) gave a higher value than the arable system (€3535 ha^{-1}) (**Table 2**). However, in Europe, discount rates of between 2.5% and 5% are commonly used and the existing arable system was more profitable than all the silvoarable systems at these discount rates.

Table 2: The predicted revenue, grants and costs associated with the arable and silvoarable systems and the net present value at each of five discount rates

Tree spacing	Arable system	Silvoarable 25 trees ha^{-1} (20 x 20 m)	25 trees ha^{-1} (40 x 10 m)	50 trees ha^{-1} (10 x 20 m)	50 trees ha^{-1} (40 x 5 m)	100 trees ha^{-1} (10 x 10 m)	100 trees ha^{-1} (20 x 5 m)
Crop income (€ ha^{-1})	4622	3961	4181	3344	4048	2991	3510
Crop grants (€ ha^{-1})	1222	1088	1088	953	1002	710	781
Crop costs (€ ha^{-1})	5602	1687	1780	1499	1780	1499	1687
Tree income (€ ha^{-1})		571	571	1142	1142	2284	2284
Tree grants (€ ha^{-1})		0	0	0	0	0	0
Tree costs (€ ha^{-1})		418	418	552	552	822	822
Net present value, including grants at discount rate of:							
0.0%	3535	3124	3229	3040	3446	3317	3675
2.5%	2994	2591	2680	2469	2804	2602	2888
5.0%	2576	2188	2266	2046	2327	2087	2319
7.5%	2250	1879	1948	1728	1968	1710	1902
10.0%	1992	1640	1701	1486	1694	1430	1592
Net present value, excluding grants, at discount rate of:							
0.0%	2313	2140	2140	2087	2444	2607	2894
2.5%	1959	1658	1748	1640	1939	1960	2194
5.0%	1686	1454	1454	1315	1570	1502	1696
7.5%	1473	1232	1232	1076	1296	1172	1336
10.0%	1304	1062	1062	897	1091	932	1073

The relatively high NPV of the arable system in comparison with the silvoarable systems was largely due to the higher availability of grants. The tree component of the silvoarable system received no grant revenue at all. The predicted area payments made on the silvoarable systems decreased over time and the area payments in the most densely planted systems were the most heavily reduced. At densities of 50 and 100 trees ha^{-1}, the predicted area payments were lower where the trees were planted less densely along the rows (and therefore in more rows per hectare), due to greater predicted canopy coverage of the alley crops by the tree component. Thus, under the current grant system, a farmer might consider it worthwhile planting fewer rows with more trees in them to maximize the payments made on the alley crop.

Without grants, some of the more densely planted silvoarable systems have higher NPV than the arable system at a 2.5% discount rate (10 m x 10 m and 20 m x 5 m systems) and a 5% discount rate (20 m x 5 m system). In silvoarable systems planted at the same density, it is those systems with fewer tree rows (and more trees on each row) that have higher NPVs, largely because the alley crop area is increased and shading of the crop reduced, so that income from the crop component is increased.

It is worth noting at this point that farmers may not choose to view the NPV of competing enterprises as the sole criterion of choice. The short term cash-flow of an enterprise is especially important if farmers require immediate returns to survive. The cumulative cash flows of the arable and silvoarable enterprises (0% discount rate) show that for most of the rotation the arable enterprise provides higher cash flows than the silvoarable enterprise (**Figure 5**).

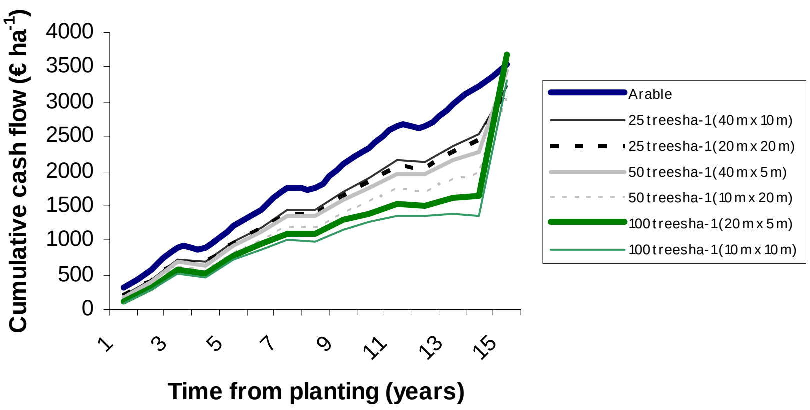


Figure 5: The predicted cumulative cash flow (€ ha^{-1}) for an arable system and each of six silvoarable systems (discount rate = 0%)

Given the current grant scenario and commonly used discount rates, the 40 m x 5 m system and the 40 m x 10 m system are the main alternatives to the arable system, but would not be selected on the basis of NPV alone. However, if competing with the same grant payments as the arable system, silvoarable systems with wide alleys and closely planted tree rows could provide a viable alternative to arable systems at the discount rates commonly used in Europe, provided that farmers are willing to view the investment over a time horizon of 15 years.

3.3 Integrated assessment

Silvoarable systems can reduce soil erosion compared with the existing arable systems, especially, if combined with contouring practices or, in the case of no contouring and in systems of equal density, when between-row distance is minimized. However, silvoarable systems are less profitable than the existing arable system (assumed discount rate 5%), and at equivalent densities, minimizing between-row tree distance also reduces profitability. This ‘conflict of interests’ between environmental and economic goals is illustrated in **Figure 6**. **H1** as a combined hypothesis must therefore be rejected, because although soil erosion is reduced under silvoarable systems (**H1$_a$** is confirmed), profitability is also reduced at the assumed discount rate of 5% (**H1$_b$** is thus rejected).

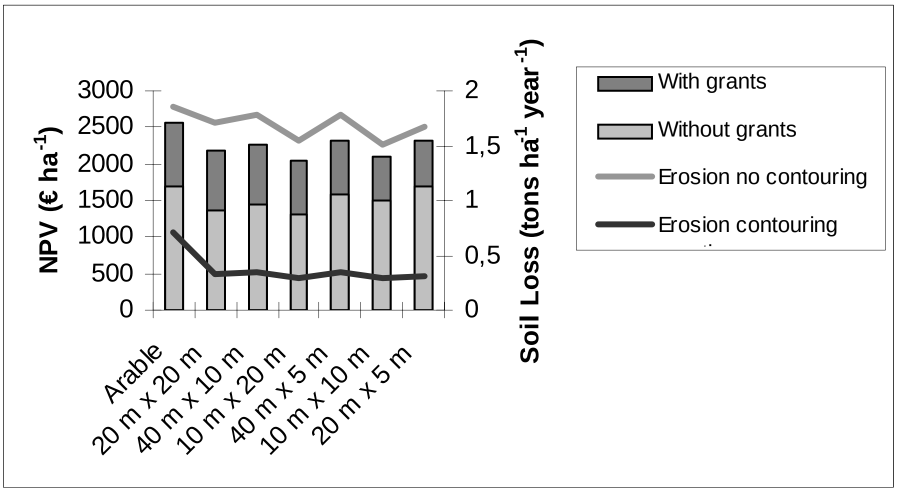


Figure 6: Common assessment of NPV (at 5% discount rate) and soil erosion in the Torrijos LTS

Under different tree densities, soil erosion under silvoarable systems when contouring is used, are similar; without contouring, however, a slight decrease in soil erosion with increased tree density can be observed, especially in closely spaced tree-row systems. No generalisation can be made concerning the relationship between tree density and NPV (assumed discount rate 5%). As a combined statement, **H2** can therefore be rejected, because NPV does not increase with tree density (**H2$_b$** is rejected). Also, soil erosion in the contoured system shows negligible reduction with increased tree density (**H2$_a$** is rejected), although soil erosion is decreased slightly with increasing tree density in non-contoured systems and **H2$_a$** can therefore be confirmed for this specific situation.

At equal tree densities, soil erosion is influenced by implementation design in non-contoured systems - widely spaced tree-row systems result in greater soil erosion than closely spaced tree row systems. In contoured systems, implementation design has little effect on soil erosion. Profitability is also influenced by implementation design, and widely spaced tree row systems give higher NPVs than closely spaced tree row systems. This is because wider rows allow more land to be put under the alley crop and tree shading is also reduced. Additionally as grants payable on silvoarable systems are inversely related to tree canopy area, wider row spacing increases area payments made on the alley crop. This potentially reduces the effectiveness of silvoarable systems for erosion control, as farmers may be tempted to establish silvoarable systems with wider row spacing to maximise revenue. As a combined statement, **H3** can be confirmed in the case of non-contoured systems, because at equal tree densities, wide tree rows are observed to increase predicted soil erosion (**H3$_a$** is confirmed) and NPV also increases in wide tree row systems (**H3$_b$** is confirmed). However, in contoured systems, different implementation designs have negligible effect on soil erosion (**H3$_a$** is rejected) and **H3** would therefore have to be rejected as a combined statement.

In summary, erosion is always better controlled under SAF, compared with existing arable agriculture, especially when contouring is used. In SAF, increased tree density has minimal effect on soil erosion in contoured systems, but more effect in non-contoured systems. Under current grant schemes, profitability is reduced in silvoarable systems, compared with the existing silvoarable system. Increasing tree density does not increase NPV, but at equal densities, widely spaced tree rows give greater NPVs than closely spaced tree-rows.

4 Conclusions and outlook

The results of this study have shown that **H1$_a$** can be confirmed if SAF is implemented with contours in the Torrijos LTS (**Figure 4**). **H1$_a$** is also confirmed under non-contouring, when tree row distance is minimized in SAF systems. **H1$_a$** must be rejected when the current arable system takes contouring practices into account and the SAF system is implemented without contouring (**Figure 4**). Under current circumstances farmers are unlikely to adopt silvoarable systems due to lower cash flows and NPVs than when compared with existing arable systems. Thus, the hypothesis **H1$_b$** of this paper is not confirmed.

However, in the absence of grant payments, widely spaced and densely planted silvoarable systems have similar NPVs to the arable systems at discount rates of between 2.5% and 5%. The present grant system, however, distorts this balance in favour of arable crops. To date, no special grants for SAF exist and this may be a major reason for the low uptake of silvoarable systems. The results suggest that minor modifications of the grant system would make SAF a viable alternative for farmers, leading to reduced soil erosion and increased profitability, in comparison with existing arable systems (i.e. a possible positive interpretation for **H1**). The modifications to the grant schemes could be justified by improved soil erosion control and other environmental benefits accruing as a result, under silvoarable systems, as demonstrated in this case study. In the Torrijos LTS, assuming equivalent grant payments for arable and silvoarable systems, the most suitable alternative of the modelled SAF systems, given the combined objectives of reduced soil reduction and maximized NPV, would be those that: (1) include contouring; (2) have relatively high planting densities, and; (3) have relatively wide between-row spacing.

The results presented here are a pilot study for an integrated assessment which will be extended to other test regions in Spain, France and The Netherlands and in which other tree species will be taken into account. Furthermore, the environmental assessment will be extended to water recharge, nutrient leaching, landscape and biodiversity issues. In the economic assessment, the main criteria will be cash flow and the NPV. The integrated environmental and economic assessment will then be conducted using multicriteria analysis.

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The LEADER and PRODER Programmes: A Real Contribution to Rural Development? The Galician Case[1]

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Abstract

This paper presents an overview of the results of an assessment of the implementation of the LEADER II Community Initiative and the PRODER I Programme (Operational Programme for the Development and Economic Diversification of Rural Areas) in Galicia. Both are public programmes with a local initiative perspective centring rural areas as their field of intervention with the set aim of fully developing such areas.

Both programmes were up and running in Galicia over the period 1994-1999, involving a total of 2,582 projects spread out over 26 different boroughs. Based on an initial study of secondary sources designed to determine the main socioeconomic variables detected in the 26 areas covered, an analysis of each of the different projects implemented was carried out before going on to establish an overall assessment of the effects produced by both programmes.

The aim of this paper is to provide elements for discussion regarding the applicability of such strategies for rural areas which lag far behind European levels and to gauge the true bearing they have on the diversification of activities.

1. Introduction

The LEADER[2] and the PRODER[3] Programmes are both public programmes which adopt on a local initiative approach, targeting rural areas as their field of intervention. The main difference between the two is that LEADER is an E.U. programme, whereas the PRODER I[4] Programme is limited in its scope of action to the 10 Autonomous Communities which make up the Spanish State. However, despite this difference, the following similarities make it possible to deal with the two programmes together:

- Their are both aimed at promoting rural development;
- They are both locally-based with local partners responsible for setting them up and implementing them;
- They both pursue a model of development which is not based exclusively on agricultural activities.

[1] The analysis which served as a basis for the current paper enjoyed the backing of the following research projects: “Cambio estructural y políticas agrarias: el caso de los sistemas agrarios especializados en cultivos herbáceos, olivar y ganadería bovina” [Structural Change and Agricultural Policies: The Case of Agricultural Systems Specialising in Herbaceous Crops, Olives and Beef] (CAMESPA), financed by the Ministry for Science and Technology (ref.: AGL2001-2680-C02-02); and “Cambio estructural e políticas agrarias” [Structural Change and Agricultural Policies], financed by the Galician Government Directorate General for Research and Development (Code: PGIDIT02PXIC24201PN).

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[2] 91/C180/12.

[3] Royal Decree 206/1996 dated 9 February 1996.

[4] PRODER grew up out of the application of the Inter-regional Community Support Framework for Objective 1 Regions within the Spanish State.

According top the approach adopted in both cases, the development of such areas 'has to' be based on the optimal utilization of local resources through the participation of the local population and via the promotion of private initiates with a bottom-up, integrated, multisectorial approach based on innovation. In practice, a bottom-up approach rules out across-the-board solutions because each area has its own set of resources, problems, needs, experiences and other factors which must be taken into account when undertaking any kind of action plan.

One of the main points of debate concerning this kind of approach applied is whether it is suitable for all rural areas across Europe. This approach initially grew up in rural areas with a relatively high population density, modern, capitalised farms and a dense rural network with a high per capita income. However, this situation cannot be applied across the board to the whole of the E.U., particularly to rural areas in the South whose situation is very different.

The study area chosen for the research in hand is very much in line with the situation described, i.e. an area which is considerably underdeveloped as compared with[5] general European levels and where agriculture continues to play an important social and economic role, to which end the authors believe that an analysis of the way these public programmes are applied will help raise a series of interesting points to contribute to the on-going debate.

2. Methodology

To carry out this work all the territories in the autonomous community of Galicia which managed a LEADER II or PRODER I programme, which implied total of 26 different boroughs, comprising an area of 18,000 km^2, and a population of 1.2 million people.

The work was carried out in two well-differentiated phases, requiring the use of various information sources.

1. First of all, a territorial analysis was carried out, allowing us to define the main socio-economic characteristics of the areas. The aim was to obtain on the basis of the big figures of execution of both programmes and of the type of situations found in the territories, an approximation to the actual potentiality of said territories. To establish a classification of the Galician boroughs where these initiatives were applied, we carried out a factor analysis using demographic, employment and income variables[6]. As it is already known a factor analysis summarized in a few factor the information provided by a high number of variables. In the first place, we verified that all the adequate conditions for the application of a factor analysis were complied with, which was verified after carrying out Bartlett's sphericity test (BA=16847, 088) and given that the significance level was p=0.00. The method of main components was used for the extraction of factors. The analysis by clusters allowed us to group boroughs in such a way that, with respect to the variable values, each cluster is the most homogeneous possible and, in relation to the rest, the most heterogeneous possible. With the three factors obtained in the previous factor analysis, a cluster analysis was carried out using the K-means method. We carried out tests for 3, 4, 5 and 6 clusters, then deciding to work with three clusters. The interpretation of the characteristics of the boroughs included in each of the groups was carried out on the basis of the values that the three factors take in the centre of the clusters.

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5 The whole of Galicia is defined as Objective 1.

6 The variables selected where: population density, population evolution, structure by age, education level, sectors of occupation and level and origin of family income.

2. The second part of the work consisted on an analysis of the records of execution of each project provided by AGADER[7]. The information gathered in these records allowed us to create a data base with the following information for each of the 2,582 projects:
   - Volume and source of investment.
   - Intervention mode of funding of the project.
   - Responsible promoter.
   - Productive character or name of project.
   - Productive sector.
   - And finally, in the case of business projects, it was also included the estimates of number of projected jobs[8].

3. The Geographical Scope of the PRODER I and LEADER II Programmes

Before going on to describe the study in detail, it is important to bear in mind that the approach in question was first applied in the Spanish State in the guise of the LEADER I Programme [9] (1991-1994). However, the present paper will refer exclusively to the second phase of this Programme, using the results of the application of LEADER I for comparison only. Two considerations were taken into account when making this decision, namely:

1. The application of the LEADER I Community Initiative had a series of specificities[10] which made it different in its latter phases;
2. The small number of Local Action Groups (LAG) which the Programme generated in its early phase meant that they were not representative at a regional level[11].

The low level of development of the LEADER I Initiative contrasts with the situation which arose over the period 1994-1999, during which a large part of the Galician territory became involved in the management of a LEADER II or a PRODER I programme, with 59.7% of the Galician territory running one of these programmes. Map Nº1 shows how the application of these programmes led to the setting up 26 LAGs, with 13 running a PRODER I and 13 running a LEADER II programme. As far as the different groups are concerned, the situation is far from homogenous, ranging from periurban areas and inland, highly developed mountainous areas, to areas with a large farming potential where the agricultural sector is undergoing a process of modernisation.

To specify these situations we applied the above described cluster analysis. This allowed us to classify Galician boroughs in three big clusters[12]:

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7 Galician Intermediate Organism.

8 Job estimates are obtained through the statement of the responsible person of each group.

9 91/C73/14.

10 For a more detailed analysis of the results of the application of the LEADER I Initiative in Galicia, see Pérez Fra, M. : *A contribuiçom da Iniciativa LEADER ao desenvolvimento de zonas rurais. Análise dos resultados do programa LEADER I em Galiza e o Norte de Portugal [*The Contribution Made by the LEADER Initiative to the Development of Rural Areas in Galicia and Northern Portugal], University of Santiago Press, Santiago, 2003.

11 Four LAGs were up and running during the first phase with a budget of 18.7 million Euros. The actual impact on both the population and the areas involved was predictably negligible, affecting only 3.5% of the Galician population and 6.1% of the territory.

12 The behaviour of the variables differentiating them is the following:
- Cluster 1. These boroughs have an illiteracy rate higher than that of the other clusters, and high in the whole Galician region, as well as an important perceptual weight of workers in the construction and industry sectors.
- Cluster 2. The main employment source in these boroughs is the fishing and services, being of little importance the number of agrarian workers. With respect to the education level, the population with obligatory education is predominant, although also with secondary and university education, being the least important the weight of the

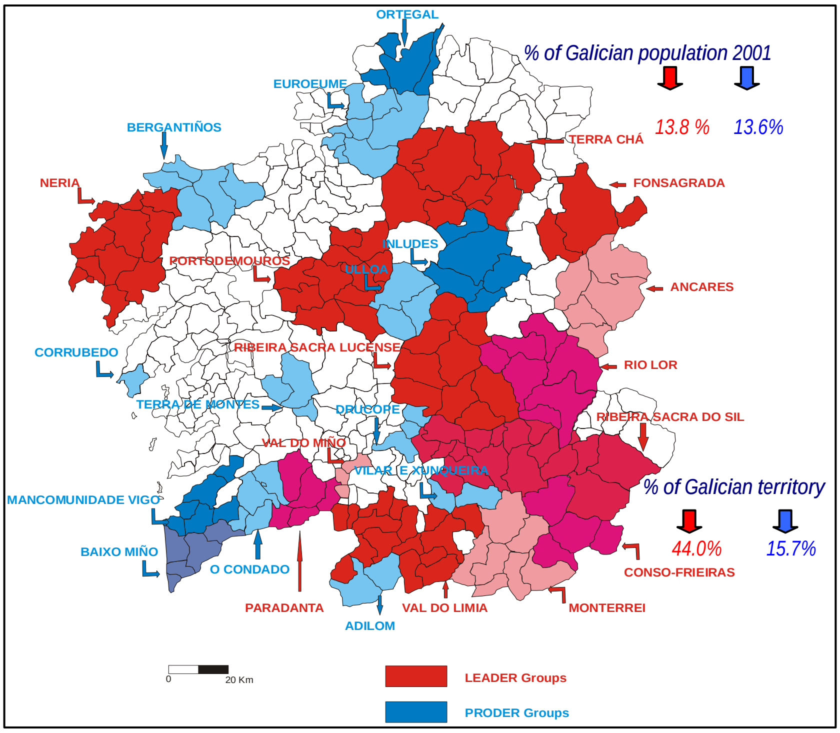
- **Cluster 1**, comprising the 40.9% of Galician boroughs.
- **Cluster 2,** including the 28.1% of boroughs.
- **Cluster 3**, with the 31.0% of boroughs.

The boroughs included in cluster 2 are those of a higher economic dynamism in Galicia. Their economy has an elevated tertiarization level with respect to the average in Galicia, and the agriculture is no longer the main source of jobs. On the other hand, they present the most positive demographic behaviour: lower level of ageing, better education levels, increase in population and high population densities.

Clusters 1 and 2 are located in areas with a higher level of backwardness: boroughs which show a stagnation in the census, or loss of population, and which have, besides, important education deficiencies, high levels of ageing and a still important agrarian population, specially in cluster 3.

As it was expected the distribution of LEADER and PRODER areas is not homogeneous, the 83.4% of the cases are located in clusters 1 and 3. However the presence of boroughs managing a PRODER within the areas with a higher economic dynamism (cluster 2) is over that of the LEADER where we only find an 8.3% of the cases. Later on we will come back to this issue to study the impact on each of the areas of the agrarian adjustment process.

Map Nº 1. Geographic Spread of the Programmes



Source: The authors

population with no studies at all. Besides, the boroughs in this cluster experimented a growth of population in the last two decades and show high population densities. In relation with the age groups, boroughs in this cluster show a significant weight of population younger than 16, and the group of population between 16 and 64 years old, and not the population older than 64. In agreement with these results, the income of wage earners is more relevant than the income of welfare beneficials.

- Cluster 3. Here the agrarian sector is the one providing the most part of employment. In agreement with this result, the income of wage earners is substantially lower than in the rest of clusters. With respect to the education level, the population in these boroughs is typically a population with no studies, but with a reduced illiteracy rate, and the population with secondary and university education is not significant. Besides, boroughs in this cluster suffered a decrease of population during the last decade and show low population densities.

The implementation of the two programmes took up funds in excess of 173,000 million Euros (Table 1), including not only the public funds earmarked for this purpose but also private funding provided by a range of local partners[13].

Table 1. Total Funding and Sources

	Total Funding (millions €)	E.U. (%)	State Admin. %	Galician Govt. (%)	Local Govt. (%)	Private Sector (%)	Nº of Projects
PRODER I	49.83	44.9	1.5	8.7	9.4	35.6	572
LEADER II	123.90	38,2	2.05	13.3	4.4	42.0	2,010
TOTAL	173.73	40.1	1.8	12.0	5.8	40.2	2,582

Source: The authors based on data provided by AGADER

The large differences in the amount of funding available to the different LAG groupings[14] render averages unrepresentative. In overall terms, the LEADER II groups handled larger budgets than the groups involved with the PRODER Programme, with an average budget of 9.5 and 3.8 millions Euros respectively. However, the differences are not so pronounced when we turn to look at the funds available per Km^2 and per capita, with the PRODER Programmes applying 9,300€ per Km^2 on average as opposed to 10,755 € per Km^2 for the LEADER II Programmes, with a per capita ratio of 296 € and 136€ for the LEADER and PRODER programmes respectively.

The figures provided so far clearly indicate that the funds available for either programme fall short of settling the problems which they were supposed to be designed to address. The scale of funding made available are an indication of the way in which this kind of programme will not be able to solve the problems faced by rural areas in Galicia. Even a preliminary overview of such areas provides a good idea of the scale and complexity of the problems they face, i.e. depopulation, aging of the population, a low birth-rate, differences between coastal and inland areas, economic and social marginality, large-scale deficiencies in infrastructures, low level of qualifications, a lack of productive sectors which offer alternatives to the primary sector, the break-up of the traditional farming-based society, etc. These problems are also shared by other areas also classified as Objective 1 located in the South of Europe.

4. Analysis of the Results

The analysis begins with the investment ratios included in Table 2:

Table 2. Breakdown of Capital In-put Sources

	Ratio of private/public capital	Investment per project €	Ratio of outside capital *
PRODER I	0.55	87,112	0.816
LEADER II	0.72	61,644	0.868

*Local capital is the sum of the capital provided by local partners plus that provided by Local Government. Outside capital input is calculated by adding E.U. funding to the capital provided by the State and Galician Governments.

Source: The authors based on data provided by AGADER

13 It is worth pointing out that the LEADER II Initiative has improved as far as capital input provided by the private sector is concerned, reaching levels in excess of those achieved for the first phase of the Programme (Pérez Fra, 2003).

14 The budgets varied between 2 and 15 million Euros.

One of the figures in Table 2 refers to the proportion of public funds over private funds. As far as this question is concerned, it should be pointed out that, notwithstanding important differences between groups, the Table reveals a fairly low level of funding for PRODER I. The second phase of the LEADER Programme yielded more positive results, with perhaps the most outstanding feature being the improvements made regarding the results for the first phase of the Programme which were in the same order as for PRODER I at 0.55 (Pérez Fra, 2003).

The amount of local capital made available apparently yields similar results in both cases, notwithstanding the fact that the sources of this capital were quite different in either case as shown in Table 1, with PRODER 1 benefiting from an increased input from local government, whereas the ratio for LEADER II is provided by increased capital input from the private sector. Once again it is important to highlight the improvements made regarding the earlier phase of the programme, with its much lower level of local capital input, at 0.64 (Pérez Fra, 2003).

The level of investment per project reveals an increase in the case of PRODER I, while levels remained stable for LEADER II projects, only slightly above levels for phase 1.

In order to provide a clear overview of the situation, we shall now go on to analyse a series of differences based on two variables which we felt to be relevant, i.e. whether of the projects carried out were business-oriented and the type of partners involved.

We shall begin by analysing whether or not the types of project carried out were geared towards the production sector. Table 3 shows that both in the case of LEADER II and PRODER I only a small fraction of the total number of projects carried out were aimed at either creating, expanding and/or improving some kind of productive unit. This situation changes, however, when we turn to look at the actual amounts invested, which once again reveal differences between the two Programmes.

Table 3. Relative Weight of Business-oriented Projects

*	Business-oriented Projects		Non Business-oriented Projects	
	Nº of projects (%)	Investment (%)	Nº of projects (%)	Investment (%)
PRODER I	24.8	44.6	75.2	55.4
LEADER II	25.5	57.6	74.5	42.4

Source: The authors based on data provided by AGADER

There are also differences in the amount of investment per project depending upon whether or not a project is business-oriented:

- In the case of LEADER II, business-oriented projects received the greatest financial backing, i.e. 139,000 € as opposed to a 35,000 €, reflecting the same situation as for phase 1;
- The situation is reversed for PRODER I, with an average investment of 68,000 € for business-oriented projects as opposed to 111,000 € for non business-oriented projects.

Four different groups were set up in order to determine the type of local partners involved in the projects, namely:

- Public bodies. This group includes any project promoted by a public body. Table 4 shows that the presence of such partners was very high, especially for PRODER projects. Barring a few exceptions, the bodies involved were practically all local public administrations;
- Private entities, including individuals and other private bodies. Together with the previous group, this group accounted for the bulk for the projects carried out and in the case of LEADER projects, it was also responsible for most of the funding;

- Non-profit making organisations. Avery mixed group, by and large made up of small, local associations involved in small-scale cultural or social projects, which explains why this group is so underrepresented regarding capital input;
- LAG. This group includes all of the projects carried under the auspices of a LAG itself. Despite the apparently strikingly high level of participation of LAGs in LEADER II projects, it should be pointed out the figures referring to the number of projects implemented are magnified by the activities of one of the groups involved where the LAG played an active role in promoting[15] small-scale training projects. The actual figures for capital investment are substantially lower, more in line with the levels for LEADER I where they accounted for 10.9% of the overall capital investment.

Table 4. Types of Partners Involved

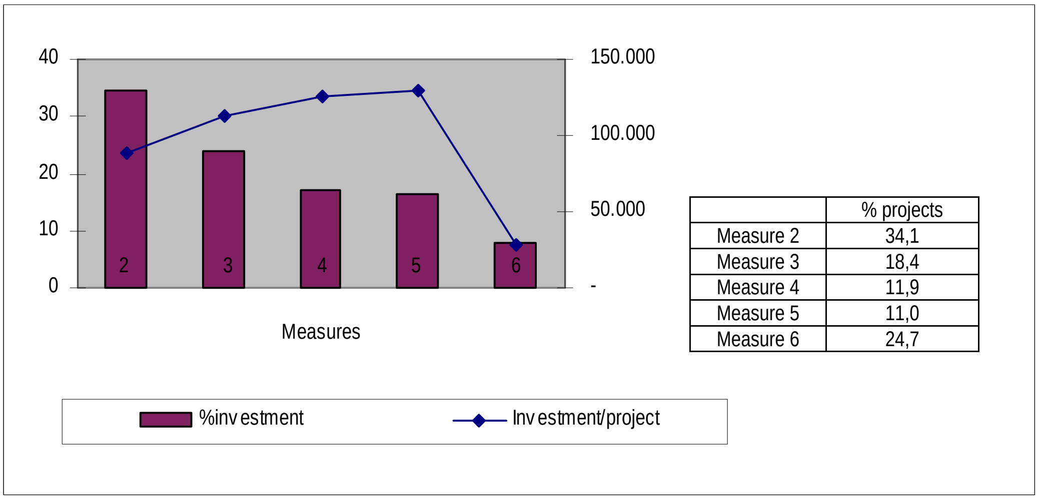
	PRODER I		LEADER II	
	Projects (%)	Investments (%)	Projects (%)	Investments (%)
Public Bodies	48.5	38.9	26.2	21.1
Private Bodies	30.7	46.9	28.3	59.3
Non-profit making Organisations	12.4	8.5	13.4	8.5
LAGs*	8.4	5.6	32.2	11.7

*This Table does not include any activities designed exclusively to provide funds to cover the running costs for the LAGs.

Source: The authors based on data provided by AGADER

We shall now go on to provide a more detailed analysis of the types of projects carried out. We shall begin by analysing the way the different Measures were spread out before going on to deal with the business-oriented projects, examining the way they were distributed over the different sectors.

Graph Nº 1 PRODER I[16]

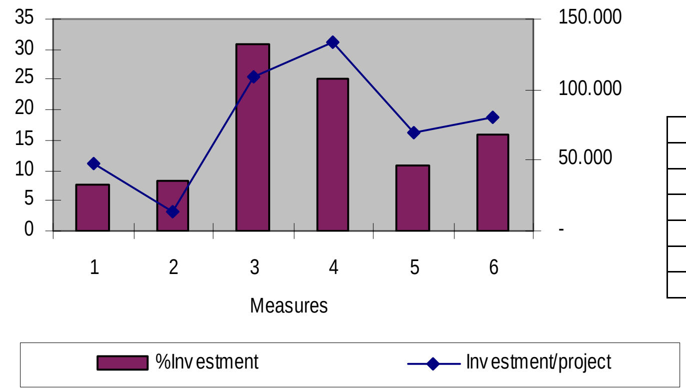


15 In concrete terms, this group was responsible for 49.4% of all of the projects included in this category.

16 The central areas of interest focused the Programme PRODER I were as follows:
- Measure 2, Making better use of local assets;
- Measure 3, Encouraging investment in tourism. Rural Tourism;
- Measure 4, Encouraging investment in tourism. Local tourism;
- Measure 5, Promoting small companies, crafts and services;
- Measure 6, Services and businesses.

Measures 1, 7 and 8, i.e. Making better Use of the Rural Environmental, Improving the Farming and Forestry Productive Capacity and Improving Farming and Forestry Disintensification were not implemented in Galicia.

Graph Nº 2 [17] LEADER



	% projects
Measure 1	9,8
Measure 2	37,9
Measure 3	17,5
Measure 4	11,5
Measure 5	9,6
Measure 6	12,2

Source: The authors based on data provided by AGADER

Graphs 1 and 2 reveal how the projects were concentrated in the tourism sub sector[18], with projects covered by Measures 3 and 4 of PRODER I accounting for 41% of the total funding available. This concentration was slightly less pronounced in the case of LEADER II, where Measure 3 accounted for 30.7% of the overall funding[19].

Other factors also worthy of examination for our analysis involve the following points:

- In the case of PRODER I, a large part of the available funding was concentrated in the Measure geared to improving local assets, taking pride of place regarding the number of projects and coming second place regarding funding, accounting for 34.7% of the total. Most of the projects carried out in this field involved the optimisation of local heritage together with the provision of small-scale infrastructures and basic amenities. Local public bodies were responsible for carrying out a large proportion of such projects;
- In the case of PRODER I, running and material costs incurred by LAGs were covered by Measure 6, which effectively accounted for 90.1% of the total capital investment for this Measure. In the case of LEADER II, these costs were covered by Measure 1, where they accounted for 97.3% of capital investment;
- Although on the whole Measures involving the tourist sub sector accounted for most of the available funding, it was not these particular Measures which involved the highest rate of investment per

[17] The central areas of interest focused the Programme LEADER II were as follows:
- Measure 1, Technical assistance for rural development;
- Measure 2, Training and contract assistance;
- Measure 3, Rural Tourism
- Measure 4, Small and medium-scale companies
- Measure 5, Developing and marketing agricultural products
- Measure 6, Environmental enhancement and improvement;

Two other Measures not included in Tables 1 and 2 involved were the Acquisition of Capabilities and Transnational Cooperation. Neither cases was well represented, with the former affecting involving only 6 groups, accounting for 0.4% of the total LEADER funds and 1.4% in the latter case.

[18] This phenomenon is not limited exclusively to Galicia, but is a trend which affects the whole of Europe.

[19] This figure illustrates another important shift regarding the results produced by LEADER I, with an even more marked concentration of funding in Measure 3, accounting for 63.3% of the total.

project. In fact, for both programmes, projects providing backing for small-scale companies showed the highest rate of investment per project.

The situation described can be accounted for by analysing the way the different types of partners are spread out over the different Measures. In fact, it is fair to say that there was a marked concentration of certain partners in certain Measures, although this tendency is less accentuated in the case of the LEADER programme:

- For PRODER, Measure 2 involving the optimisation of local assets, accounts for most of the projects run using public funds, amounting to 65.1% of all of the projects carried out by public bodies and 63.5% of public capital input. Private initiative is concentrated in projects geared to providing support for rural tourism and to encouraging small-scale companies. Measures 3 and 4 accounted for 56.6% of the projects run by the private sector, accounting for 58.1% of private capital input. Measure 5 accounted for 38.2% of the projects and 34.0% of the capital investment;
- LEADER presented a broader spread, with public capital investment concentrated in Measure 6 which accounted for 34.5% of the projects and 53.0% of the total capital investment for this group and Measure 3 accounting for 16.1% of the projects and 24.4% of the capital investment. Private initiative was primarily involved in Measures 3 and 4 which accounted for 31.4% of the projects and 40.6% of the capital investment and 41.9% of the projects and 40.1% of the capital investment respectively.

What this reveals is that public bodies were primarily involved with projects geared to improving the environment and heritage and to improving small-scale public amenities, occasionally involving the creating of tourism-oriented infrastructures. On the other hand, contrary to what this initial spread of the different Measures might suggest, particularly in the case of PRODER, private partners were primarily interested in setting up and improving business-oriented initiatives, although not exclusively centred on the tourism sub sector, with considerable investment in other sectors.

In the same vein, the figures yielded by the analysis of the relative weight of each kind of partner with each Measure are particularly interesting. These figures show that in both programmes, private initiative clearly led the way as far as Measures designed to provide support for business ventures were concerned, accounting for 82.5% of the projects in the case of PRODER and 935% in the case of LEADER. However, the situation is somewhat different when we turn to look at the Measures designed to back tourism, where both public administration[20] and, in the case of the LEADER, non-profit making organisations[21] played a leading role.

We shall now go on to analyse the business-oriented projects which not only accounted for a significant part of both Programmes, but also had a more immediate impact on the area in question, at least in terms of job creation.

The graphs No. 3 and 4 indicate the important role which tourism continued to play, although it is not actually as high as the Measure-based analysis would tend to suggest. We believe that this fact demonstrates that the vested interests of the private sector are only partly to blame for this sectorial bias detected in the Programmes which can be largely explained by the behaviour of the public sector

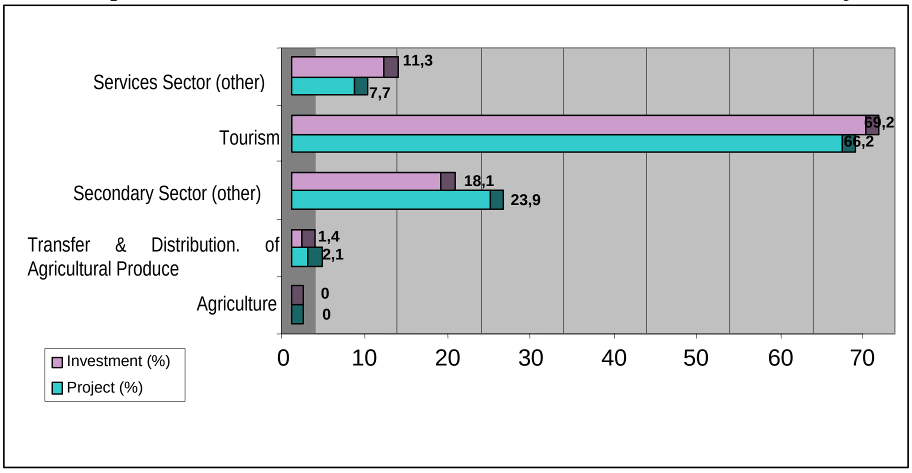
The low level of involvement in projects directly or indirectly related to agriculture is also clear, more markedly so in the case of PRODER, which can be explained by the fact that the Measures designed to provide support for farming, i.e. Measures 7 and 8, were not actually applied in the case of Galicia. The

[20] 41.9% for Measure 3 and 35.3% for Measure 4 in the case of PRODER I.

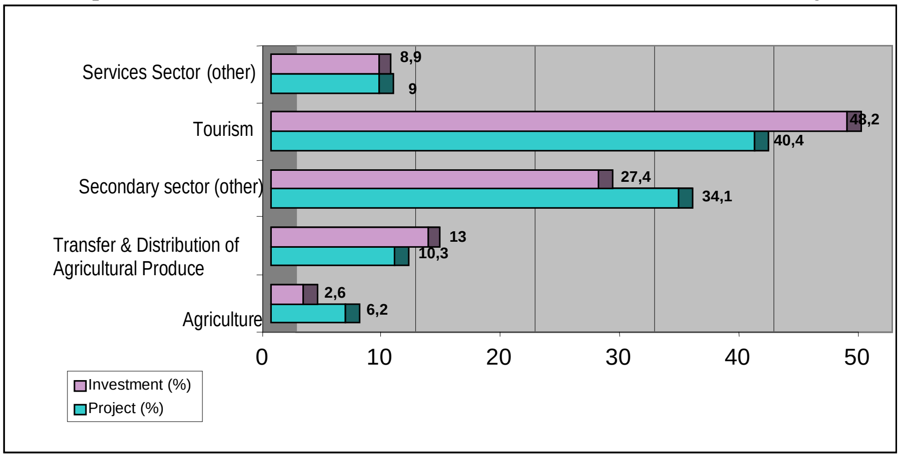
[21] For Measure 3 of the LEADER II Programme, public administration and non-profit making organisations were responsible for 21.9% and 21.7% of the projects respectively, although the latter's participation was substantially lower in terms of the actual funding provided.

negligible impact that the Programmes had on this sector is therefore due neither to a lack of interest on the part of agricultural partners nor to a lack of productive attitudes in the affected areas, but rather to the way both of the Programmes were actually set up.

Graph Nº 3 Sectorial Classification of the PRODER I Business-oriented Projects



Graph Nº 4 Sectorial Classification of the LEADER Business-oriented Projects



Source: The authors based on data provided by AGADER

Finally, we shall now turn to consider the effects that these Programmes have had on the diversification of activities in rural areas. It is a well-known fact that over recent decades farming has been undergoing an upheaval due, in part, to the need to bring farms in line with the European context. Amongst other effects, this process has led to a sharp drop in the total number of farms, in turn leading to a sharp fall in jobs in agriculture and this phenomenon has an inevitable knock-on effect on the areas dealt with here. In fact, it is fair to say that the areas studied are badly affected by this on-going process. The previous territorial study enabled us to define most of the areas covered as rural areas where the agricultural sector continues to play a key role[22].

The fact that the Farming Registers recorded a 41% drop in the number of beef farms[23] between 1989 and 1999 (INE, 1989, 1999), in turn leading to a 45,9% in the number of people employed on family

22 The following figures should serve to illustrate this fact: 30% of the population was involved in the agricultural sector in 20 out of the 26 affected boroughs, rising to 50% for 9 boroughs (Pérez Fra, et al, 2003).

23 We have chosen to quote the figures for this particular type of farm rather than giving overall totals because they represent the sector with the highest level of professionalisation within the general context of Galician farming.

farms, gives an idea of just how far-reaching of this process has been. In absolute terms, it is worth pointing out that this upheaval led to the loss of over 140 jobs for that same period.

What bearing has this process had on rural areas? Has it led to a diversification of the economy in these areas or has it simply meant the loss of jobs?. It remains clear that an analysis of the demographic evolution for these areas is far from optimistic, with the population censuses for 1991-2001 revealing sharp falls in the population for almost all of the areas studied.[24]

According to the previously mentioned source, in the areas of study this process implied the closure of 31,256 farms and a decrease in the agrarian labour of 37,678 people. Did these Programmes in any way help to correct this situation? A reply to this question would require a more in-depth study than that carried out to date, including fieldwork in the affected areas. However, an analysis of the impact they have had on job creation does allow for a certain number of conclusions to be drawn. According to the figures provided by the Galician Agency for Rural Development (AGADER), the number of jobs created by the Programmes increased by 414 for LEADER and by 274 for PRODER, while estimates for long-term jobs was in the order of 221 for LEADER II and 93 for PRODER. Everything would seem to indicate that the impact these Programmes had on job creation falls very short of making any significant contribution to solving the problems faced by these areas.

A comparison of the figures of population employed by sectors from the 1991 and 2001 Census, allows us to approach to the existence of economic diversification in global terms in these areas. Thus, the figures confirm the before mentioned sharp fall of agrarian employment: according to the 2001 Census the number of people working in the agriculture sector is, in this areas, the 51.5% of the level in 1991. But the figures also show the existence of an important increase of employment in the other two sectors, specially in the tertiary sector: thus, the number of workers in the secondary sector increases with respect to the figures in the 1991 Census in a 11.5% and the tertiary sector in a 42.4%

Unfortunately, these figures hide the existence of really different realities between the 26 analysis areas. The previously mentioned analysis of clusters allows us to make a cut between the boroughs that give form to these areas, in such a way that we can see the evolution of this variable according to the level of development of the areas.

Graph nº 5 Differences in working population 1991-01 (absolute terms)

	Primary Sector	Secondary Sector	Tertiary Sector
Cluster 1	-20,349	4,292	9,088
Cluster 2	-7,200	9,776	58,947
Cluster 3	-28,097	352	7,574
TOTAL	-55,646	14,420	75,609

Source: Population Census 1999 and 2001

The graph allows us to verify that only in those borough included in cluster 2 the creation of employment in the secondary and tertiary sector is over the loss of agrarian employment. It seems thus clear that, independently of the existence of a PRODER or LEADER programme, the areas with a higher level of backwardness the fall of agrarian employment is balanced with the passing of population from active to inactive population or with the people in working age leaving the region.

[24] The population increased in only 4 of the boroughs affected, all of which were located in the most dynamic part of Galicia, with three of them located within the sphere of influence of Galicia's largest city. The remaining boroughs have continued to register a drop in the population since 1981, amounting to a fall of over 20% in 14 cases. (Pérez Fra, et al, 2003).

Conclusions

To sum up, the following conclusions can be drawn from our analysis:

- The application of LEADER II and PRODER I programmes was without doubt a take over fact, but not due to the volume of funds or their impact in the involved rural areas, but because of the innovative side of their approach: they constitute a new way of intervention which gives the rural communities a manoeuvre margin, until now unheard of.
- We could verify that the most part of the areas involved in the management of one of these programs show backwardness levels in the analysis indicators, with respect to the average in Galicia. This situation will get worse due to the great impact of the agrarian adjustment process. An analysis of the capital provided by each of the different groups involved clearly stands to highlight the chasm which exists between the stated aims on the one hand and the means made available to achieve them on the other. The shortage of the funds available seriously stunted the true potential impact that these programmes could have had which could never be capable of providing an overall solution to the problems of underdevelopment faced by the areas in question.
- Alongside the similarities which exist between the LEADER II and the PRODER I programmes with consequences for the outcomes of their implementation, a series of differences were also identified, some of which refer to the results for each programme. These differences can be attributed to the following reasons:
  - Some of the LEADER II groups responsible for running the initial phase of the programme found it very difficult to implement the second phase;
  - Despite their similar aims, the PRODER I and the LEADER II programmes used different criteria when selecting the areas where they were to be implemented, with the LEADER programme reserved for highly underdeveloped inland and coastal areas where the primary sector continues to be the main source of employment, whereas the PRODER Programme covered a wider range of situations. What this means in practice is that there are areas which, despite being rural in nature are nevertheless economically dynamic, side by side with other areas with characteristics similar to those which belong to the LEADER groups;
  - A series of differences regarding the actual design of the Programmes, particularly concerning their respective main focuses, which determine whether any given type of projects is feasible or not. The decision of the Galician Government to exclude the agrarian sector from grants and subventions in the case of PRODER programme has been a limiting factor for a great part of the groups.
- As in the past, a large part of the funds and projects are concentrated in the tourism sub sector, although this concentration must be contextualised by referring to the level of private initiative investment. The vested interests of the private sector are only partly to blame for this sectorial bias detected in the Programmes which can largely be explained by the behaviour of the public sector.
- The comparison of projected employment figures with the reduction of agrarian employment in the last decade does not leave any doubt: these programmes are far from being a solution for the problems that these areas have to face. The contribution of these programs to the diversification of their economy is extremely modest. Once again, it is evident the difference between the purpose of the programmes: development of rural areas through the diversification of their economies and funds to gain this aim.
- On the other hand, population census demonstrate that although at a regional level in Galicia it may seem that the economic diversification will be to come, the areas with a lower level of development were excluded, and the disappearance of explorations translated into the net destruction of jobs and a loss of population.

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"The quality of rural life – Investigating the relationship between farming styles and biodiversity in Austrian agricultural landscapes"

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Abstract

Austria is characterised by a great variety of different landscapes. Not only wilderness areas, but also traditionally maintained agricultural landscapes are a major contribution to Austria's high biodiversity. Seen from a wider perspective, some agricultural landscapes in Austria are showing even higher levels of eco-diversity than natural or semi-natural areas. The full range of human activities has created a distinctive and rich landscape character which is maintained by a system of adaptive management. Farming is the main activity in rural areas, especially in mountainous parts of Austria, although it is largely dependent on agro-environmental subsidies. The presented article investigates the relationship between biodiversity and farming activities in representative Austrian agricultural landscapes. The concept of farming styles is used to show the very different ecological performance of Austrian farmers. As a main result it has been found that there is a close link between mentality of farmers, land use intensity and biodiversity. The farming styles also differ in their dependency on subsidies. We come to the conclusion that agro-environmental subsidies, which are the main factor to guarantee sustainable farming in less favoured areas in Austria, would have a much better effect, if they were tailor suited to the individual needs of different regions and predominant farming styles.

Introduction

Situated in the heart of central Europe, Austria comprises a high variety of natural, semi-natural and agricultural landscapes (Wrbka 1992, Wrbka et al. 2002b). A climatic gradient from the west to the east and the large extent of mountainous areas with a pronounced inner differentiation and vertical zonation are responsible for the comparably high biodiversity in our country. Moreover, the long history of human interference and different cultural influences have also contributed to a high eco-diversity.

Among the economic activities that have shaped the rural areas in Austria, farming has been and still is the most important one. Therefore we find a large variety of different agricultural landscape types. Some of them are still showing the patterns of traditional land use and are among Austria's biodiversity hot-spots (Ellmauer 1995). High nature value of habitats and landscapes is not only found in wilderness regions, but also in some agricultural regions. These traditionally maintained agricultural landscapes are either found under less suitable bio-physical conditions for agriculture – as this is the case for mountainous areas - or in regions that have been marginalised due to political and economic processes. Almost one fifth of the Austrian territory is occupied by agriculture landscapes, that can be regarded as national biodiversity hot-spot regions (Wrbka et al. 2004 in print). Consequently, the maintenance of

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high biodiversity values in Austrian landscapes cannot only rely on the preservation of natural and semi-natural areas, but has also to include large regions with agricultural activities. An efficient strategy for nature conservation, with the aim to maintain the high biodiversity values in agricultural landscapes, has to be embedded in a sustainable regional development.

Eco-diversity (Naveh 1994, 2000) can be seen as an amplification of the biodiversity concept: It includes also the diversity, which is added to the landscapes by human activities and the economical, cultural and spiritual values that are assigned to it. In that sense, traditional management techniques, that often differ regionally, such as hedgelaying in mountain hedgerow landscapes, contribute to eco-diversity. For landscape and regional planning, but also for successful nature conservation this implies that farmers who are practising such traditional management techniques are the most important target group for maintaining this high cultural and natural values.

Agro-environmental subsidies are an important political measure to sustain eco-diversity (Marggraf, 2003). But the question is whether they are targeted enough to direct economic activities into a desirable direction.

Farming and biodiversity – the research project "RURAL LIFE"

Farmers are not a homogeneous part of the population but on the contrary a highly diverse group of individuals (Falconer 2000). Farmers decision are influenced by many factors, such as external pressures or vocation, hardly ever aiming at the unique goal of profit (Willock et al. 1999). Farmers are not passively determined by technology and market, the observed heterogeneity in farming is proof of that. But technology and market constitute the space in which farmers take individual rather than uniform decisions (van der Ploeg, 1993) with highly diverse consequences. The implementation of the targets of a national agro-environmental programme into regional and local activities, given the voluntary participation, may encounter difficulties.

The need for sustainability is agreed on by farmers but also citizens and politicians all over Europe (e.g. European Comission 2001, BMLUW 2002, DEFRA 2003). But how is sustainability defined on the farm level and on the regional scale, especially when we take into account the maintenance of high biodiversity values? To fill this knowledge gap at the local level, the here presented research project "RURAL LIFE"[1] aimed at the investigation of the relationship between farmers activities and biodiversity. Our goals were to illustrate the influence of individual farmers on local biodiversity, to investigate which farming style has the best performance in producing public goods, like biodiversity, and finally we reflect on future agricultural policies.

Methods

The "RURAL-LIFE" approach was to combine a socio-economic survey of farms and a biodiversity assessment of the related farms, including singular land parcels and the adjacent landscape in which the farm was embedded.

The survey was performed in eight study areas (each between 1 and 3 km²) distributed over Austria in order to reproduce the variety of different landscape types in Austria (Fig. 1). Each study area represents predominantly one cultural landscape type (Wrbka et al., 1997, 2002b).

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[1] The project "RURAL LIFE – diversity and quality of life in rural Austria in the 21st century" was conducted between 2000 and 2002 by an interdisciplinary project team of agro-economists and ecologists from different research institutions.

Socio-economic farm survey

Within each study area, one to three farms where selected with the help of the responsible district farmers chamber, resulting in a total of 23 farms. All farms in our study were within the typical variation of their region in regard to farm size, livestock and crop types, and the typical economic values for the farming branch (Statistik Austria, 2001).

The farmers were interviewed intensively on their economical, but also personal situation using a structured interview technique based on a questionnaire. The interview was organised in several subsections, including questions on (1) the economic situation, (2) management actions on each individual field parcel in a very detailed way, (3) opinions and attitudes, and (4) perception of landscape and nature. All interviewees approved with the use the data they provided to the official database of agro-environmental subsidies.

The information gathered by the farmer interviews allowed to calculate economic characteristics, such as the profit margin, both on farm level as well as for each individual field. Profit margin per area unit (ha) and profit margin per working hour (profit margin/wh) were used. Land use intensity data are available for fertilising as Nitrogen input (kg N/ha) and for mowing intensity as number of cuttings per year (1, 2, 3 ,>3). Intensity of silage use was assessed in eight classes defined by the proportions of harvests used as silage.

Biodiversity assessment

For the whole landscape of each study area detailed land use and hemerobic state of all landscape elements were mapped. At the farm level a total survey of valuable habitats including an assessment of biotope quality was performed to determine the overall ecological performance of the investigated farms. At the landscape element level vegetation was recorded in a random sample of individual parcels of each farm and adjacent biotope structures. These samples include species lists of vascular plants with abundance values using the Braun-Blanquet (1964) method. Bryophyte species lists were recorded in ten 1m² quadrats per field.

The human impact on nature can be addressed by single parameters (for example nitrogen input, e.g. Bobbink et al. 1998; Vitousek et al. 1997), but data are often not available (e.g for semi-natural habitats). which is

Hemeroby as the “degree of human impact” is a qualitative measure of the naturalness of vegetation and an integrated measure for the anthropogenic influence on landscapes or habitats. It takes into account rather the reaction of vegetation to human impact over time than the human impact per se. Hemeroby is assessed in seven classes in the field by the trained ecologist. The concept was introduced by Jalas (1955) and further developed by several authors (e.g. Blume and Sukopp 1976; Kowarik 1988; Sukopp 1969, 1976). An overview is given in Steinhardt et al. (1999) and Zechmeister & Moser (2001).

Finally, species richness of bryophytes and vascular plants, as well as the hemerobiotic state on landscape element and on farm level were used to assess the biodiversity status. These biodiversity factors could be related to the economic and land use intensity data from the farm survey.

Statistical analyses include non parametric Spearman Rank Correlation of economic and land use parameters against biodiversity factors on the landscape element level. To test for differences in biodiversity features between groups e.g. of farming styles, variance analysis (One-Way-ANOVA) was used where appropriate, followed by a Games-Howell post hoc test. In other cases, non parametric Mann Whitney U-test was used. The results are presented as box and whisker plots

Farming styles

The observation that under similar production conditions and in comparable locations farms are managed quite differently lead to the introduction of a typology of farmers, the so called "farming styles". The classification was based on the economic, social and attitudinal data from the socio-economic survey and included previous data (Holzner et al. 1995, 2001), and experience brought in by the socio-economists. A total of about 84 farm interviews built the basis on which finally eight farming styles could be identified. The main objective underlying this typology is to stress the broad spectrum of motives, attitudes and goals in farmers and how these are linked to different economic performances. The classification thus followed both personal and economic criteria.

Economic criteria included: Input of labour time and production means, machinery, farm development (in the past as well as future perspectives), economic situation, dependence from subsidies. Personal criteria included: Attitude towards agriculture, attitude towards nature conservation, landscape perception.

Results and Discussion

Farming styles

farming style classification resulted in the definition and description of eight farming styles, four major types: the traditionalist (D), the yield optimiser (A) the support optimiser (B), the innovative farmer (C); Four farming styles with minor importance are: the idealist (E), the part-time farmer (F), the forced farmer (G), the social farm (H)

The "traditionalist" is mainly found in mountain or marginalised areas. Such farmers identify highly with traditional rural culture and prefer "long proofed" management to increased yields. They refuse new developments and changes and show low flexibility. Traditionalist are often old farmers, many retired, others part time farmers. The economic situation is comparatively weak, with a proportion of support above average. In many cases traditionalist farmers have no successors or, if they have, the successors will change their lifestyle entirely or will give up farming at all. Their landscape and nature perception is characterised by the quote: "Landscape is there for working and living." Traditionalist farmers keep cultivating labour intensive and little productive areas due to tradition. Nature conservation is basically seen negative, although they often practice conservation work incidentally - purely due to the traditional farming methods. Consequently they have to be seen as forced partners for nature conservation. Very often they do not receive specifically targeted subsidies for conservation work or extensive land use, because they simply do not know or are not interested in it. Their attitude towards agriculture is best illustrated by the quote: "I hope that agriculture will turn away again from industrial production."

The "yield optimiser" is mainly oriented towards achieving maximal yield. Management of the farm and also of individual parcels is carried out as efficient as possible. A strong tendency towards farm enlargement, optimisation of working stock and the use of very modern machinery are predominant features. They produce for global markets and are not interested in marketing their products directly locally and regionally. They are showing a strong tendency to give up labour intensive or less productive areas. The economic situation of yield optimisers is strong, the proportion of support below average and the profit margin above average. "Farming is a profession and not a vocation" expresses the attitude towards agriculture. Landscape is seen primarily as "a place of production" and thus reduced to economic parameters. Nature conservation is seen as interference or "expropriation" and therefore not appreciated.

"Support optimisers" are aiming at receiving as much financial support as possible with minimal expenditure. Farm management is aligned to specifications of support programmes, e.g. set aside or destocking. Yields from agricultural production are of secondary interest. The farm size among support optimisers is above average, but with extensive management, and there is a tendency to give up labour intensive areas. In many cases farmers do not have a successor. The perception of landscape and nature is quite simple in a way that farming is necessary to keep the landscape open and tidy. The attitude towards nature conservation is basically positive as long as incentives are high enough to be interesting. The economic situation of support optimisers includes a high dependency of subsidies and in return the profit margin is below average. Food production becomes increasingly less important for support optimisers, and their attitude towards agriculture is characterised by the following quote: "Set aside is the only way of farming in our region!"

Mainly younger farmers are belonging to the "innovative farmer"-group. Not surprisingly, their general attitude is optimistic, open minded towards new ideas and developments and highly flexible. They are willing to co-operate with other farmers, but also with consumers and conservation authorities. They explore market niches and produce for regional and local markets. They value high quality of their products and dedicate their work strongly to consumer demands, which often leads to high labour expenditure and personal engagement. Often several branches of income are combined. Innovative concepts including organic farming or seminars on farm, holiday on farm etc. are widespread among this group. The attitude towards landscape and nature conservation is heterogeneous but basically positive as nature conservation may be seen as a chance on a diversified market. Sometimes nature conservation is part of the individual marketing concept. In some cases charismatic species are specifically used as a brand to demonstrate the co-operation between agriculture and nature conservation. Economically, innovative farmers are less dependent of support and have a profit margin above average. Farming is not only a profession but a vocation. This attitude towards agriculture can be characterised by the quote: "Consumers want to see beautiful landscapes and happy cattle. It is more and more important for farmers to meet these wishes!"

Apart from these four major types also four minor farming styles have been found.". Lack of time is a characteristic feature of the "part-time farmer. This generates the necessity for good up-to-date machinery and effective management, which includes the abandonment of labour intensive areas and the necessity to intensify productive fields. Landscape and nature perception tends to not influence the farm management. The loss of landscape elements and biodiversity is regretted but accepted, as agriculture is seen as a self-chosen source for additional income.

The "forced farmer" regards agriculture as a burden but necessary to earn a living out of a lack of other perspectives. He stays on the farm involuntarily and has a weak economic performance, as the proportion of support is above and the profit margin is below average. He gives up labour intensive areas and has no interest in becoming a partner in conservation programmes.

The "idealist", in contrast, spends a lot of time and efforts in cultivating little productive and labour intensive areas. Agriculture is a leisure activity and regarded as a self-fulfilling lifestyle. The size of farms is below average, but the proportion of support is high above average, income and profit margin are far below average.

Finally, the "social farm" is a rural phenomenon illustrating a change in social structure and family relations. Agriculture is seen as a as possibility to combine income and family, mostly by women with partners not interested in agriculture, or by one divorced partner that is staying on the farm. But there is no time for labour intensive production or conservation work, so that set aside of labour intensive areas and a high proportion of support combined with low profit margin are characteristic features of this farming style.

The farming styles differ in their position in a space created by a gradient of dynamics, and an economic axis displaying the composition of their income (dependency from subsidies versus self reliance) (Fig. 2). The farming styles occupy different areas in this space, their position indicating the farmers potential of behavioural change. The position along the dynamic axis indicates the likelihood of a shift. A traditionalist, for example, will hardly become an innovative farmer, whereas a shift between a yield optimiser and an innovative is more likely.

Potter & Lobley (1992) also stress the importance of elderly farmers for conservation and found them to be willing to enrol in environmental schemes as long as changes can be accommodated with existing management.

In many fields of social life, lifestyle typologies are used successfully, such as the Euro Socio Styles (Cathelat, 1993) that are used to focus marketing efforts. Life style concepts use attitudes, social status and manifest behaviour (Georg, 1998), all of which are part of our farming styles. Many authors - implicitly or explicitly – use typologies of farmers, but often defined only by economic criteria, such as farm size and type of production (Kristensen, 2003). An emphasis on economic constraints underlies the distinction in "survivor farms" and "accumulators" (Mardsen et al., 1986), two groups that resemble our "traditionalist" and "yield optimiser". Also in colloquial language knowledge about such differences is present e.g. "machine farmer". Salomon's (1985) "commercially orientated" and "farming-as-a-way-of-life" types indirectly imply attitude. The term "farming styles" was coined by van der Ploeg (1993) as a "unity of thinking and doing", stressing the necessity of a holistic view on farmers as actors in rural landscapes.

Biodiversity and farming practice

Despite a high variation in the data resulting from the spreading of our investigations over eight quite different regions a negative correlation between parameters of land use intensity and biodiversity features could be shown (Table 1 and 2). For meadows this is discussed extensively in Zechmeister et al. (2003). Also on arable fields a negative correlation between vascular plant species richness and land use intensity in terms of fertiliser input was found (Table 2), although species richness in arable fields is influenced by many factors not directly correlated to land use intensity: Crops differ in their vegetation cover during the growth season and consequently e.g. in light conditions for segetal plant species. Only Bryophyte species number in arable fields seems to be influenced more by factors other than fertilising intensity. These results agree with numerous previous investigations confirming the detrimental effect of high land use intensity on biodiversity (Soule, 1986; Schuhmacher, 1997; Bunce et al., 1999; Zechmeister and Moser, 2001; Moser et al., 2002, Smart et al. 2003). Many of the correlations and differences presented we also found in the individual test areas.

It has sometimes been argued, that farmers have to be economically strong to be able to "afford" the maintenance of biodiversity on their land. But in focussing our analysis to that question we found the opposite relationship: A negative correlation was found between profit gained from a parcel as a measure for economic performance and biodiversity features such as hemerobic value, vascular plant species richness, and in grasslands also bryophyte species richness (Table 1 and 2).

This means, that farmers with a very good economic performance have less biodiversity and nature value regardless which farming style they are belonging to. In our interpretation this finding is an indication, that caretaking for biodiversity on farms is not limited by financial resources but more a matter of awareness and mentality of farmers.

Ecological performance of farming styles

After validating the general trends of land use intensity and economic performance on biodiverstiy and stating major differences in attitudes and farming practices between farmers, it seem very interesting to look for the possible consequences for nature values in their sphere of influence. We investigated whether there are differences in selected biodiversity features between the different farming styles. 21 farms of 3 major farming styles could be used for this assessment. Fig. 3 shows the difference in vascular plant species richness between the main three farming styles. Data sets here are all sampled landscape elements, regardless of their land use type. This leads to a very high variance, nevertheless the differences between yield optimisers and traditionalists resp. innovatives is highly significant. Bryophyte species richness shows the same trend (ANOVA $F = 9.611$ $p < 0.001$), as well as hemerobic value, where traditionalists' land is being less strongly transformed than that of yield optimisers (Mann Whitney U-test $p < 0{,}05$). In subsamples of various land use types, the same trend can be observed. Fig. 4 illustrates how field margins on the land of traditionalists show higher vascular plant species richness. Bryophyte richness on small biotops such as woodlots, hedges and grass strips is lowest for yield optimisers and highest for traditionalists (Fig.5). We can sum up that farmers who rationalise all their activities according to economic efficiency to maximise the yield of agricultural production, have the lowest level of biodiversity. On the other hand traditionalists and innovatives have significantly more species on their farms. Whereas traditionalist farmers are caring for nature because they are doing their work in the old way, it is very promising that also young open-minded farmers are making their living in concordance with nature. Our findings support the notion that farming styles have consequences eg. in term of pressures they exert on the environment and are highly relevant in assessing all sorts of problems in rural areas (van der Ploeg 1993). We are drawing the conclusion, that the agro-environmental support system should specifically support the innovative farmers by helping them to make wise use of biodiversity, not only with respect to land management but also in regard to marketing possibilities.

Farming styles, biodiversity and subsidies

The traditionalists are showing the highest percentage of farm income made up by agro-environmental subsidies. Innovative farmers are achieving up to 25 percent of their income from agro-environmental programmes, whereas yield optimisers are depending only to about 10 percent on that source of income (Fig.6). This demonstrates the high importance of agro-environmental measures for farmers' income.

But these public supports do not positively influence biodiversity. No statistical correlation between the amount of agro-environmental subsidies per hectare and any of our investigated biodiversity features, both on farm level and on field level could be detected.

Most of the agro-environmental measures are rather promoting a more environmentally friendly way of agriculture, like reduction of fertilisers and pesticides, than strictly nature conservation targets. Only very small proportion of the agro-environmental funds are directly targeting ecologically valuable objects (3%, or 10 % in a wider sense in 2002; BMLFUW, 2003), like extensively used areas such as dry grasslands or wet meadows. Although in our study only a marginal number of fields were funded under the header of "ecologically valuable area" in grasslands, those meadows showed significantly higher species richness than the rest. (Fig. 7).

Many studies try to enlighten the question why farmers are not sufficiently participating in agro-environmental schemes (e.g. Battershill & Gilg, 1997, Beedell & Rehman 1999, Falconer 2000, de Buck et al. 2001,Willock et al. 2001). Considering the adoption of more environmentally friendly farming practices as just another technology is inadequate (Vanclay & Lawrence, 1994). In this context, it is vital to acknowledge the role of farmers as actors with individual decisions, that are not solely lead by economic considerations (van der Ploeg 1985, Ward & Lowe 1994, Battershill & Gilg 1997). Battershill & Gilg (1997) found attitudes to be more important than external factors such as economic constraints.

It is sometimes argued that biodiversity is supported as a by-product of environmentally friendly farming, an idea that is clearly rejected by our findings. In contrast, they suggest that the maintenance of high biodiversity values in agricultural landscapes cannot be safeguarded with the current programme. Much more targeted measures have to be developed, which includes different lines that better reach the different farming styles.

Conclusions

- Traditional farming has maintained a high eco-diversity in Austrian agriculture landscapes and is therefore still delivering a wide range of public goods.
- Farmers are important stakeholders for sustaining biodiversity in cultural landscapes but have to be seen as a heterogeneous group.
- Distinct farming styles can be identified and classified with respect to attributes describing the mentality, attitude towards agriculture and nature, and the economic situation.
- Farming styles correlate strongly with biodiversity values at the farm level. Economy-oriented farmers have a comparatively bad ecological performance, at least regarding the maintenance of biodiversity.
- Agro-environmental support is a constituent part of farmers income in Austria and has so far stabilized the loss of nature value on the average, but it has failed to do so in regions having very high and high nature value.
- Farming styles could therefore be used to improve the effectiveness of agro-environmental support measures by creating tailor-suited support packages for the different regions and landscape types.

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Table 1: Spearman Rank Correlations between economic, land use intensity and biodiversity factors in arable fields. N°spec (VP)… species number of vascular plants (n = 33), N°spec (Bryo)… species number of bryophytes (n = 40), hemerobic value (n = 114)

		Profit margin/wh	N (kg/ha)	N°spec (VP)	N°spec (Bryo)	Hemerobic value
Economic	Profit margin/ha	0.648**	/	-0.367*	ns	-0.591**
	Profit margin/wh		/	-0.557**	ns	-0.486**
Intensity	N (kg/ha)			-0.552**	ns	-0.591**
Biodiversity	N° species (VP)				/	0.433*
	N° species (Bryo)					ns
	Hemerobic value					

Table 2: Spearman Rank Correlations between economic, land use intensity and biodiversity factors in grassland. N°spec (VP)… species number of vascular plants (n = 42), N°spec (Bryo)… species number of bryophytes (n = 43), hemerobic value (n = 95)

		Profit margin/wh	N (kg/ha)	Cutting	Silage	N°spec (VP)	N°spec (Bryo)	Hemerobic value
Economic	Profit margin/ha	0.654**	/	/	/	-0.467**	-0.301	-0.376*
	Profit margin/wh		/	/	/	ns	-0.344*	ns
Intensity	N (kg/ha)			0.736**	0.536**	-0.350*	-0.394*	-0.340*
	Cutting				0.760**	-0.404**	-0.647**	ns
	Silage					ns	-0.377*	ns
Biodiversity	N°spec (VP)						/	0.695**
	N°spec (Bryo)							0.333*
	Hemerobic value							

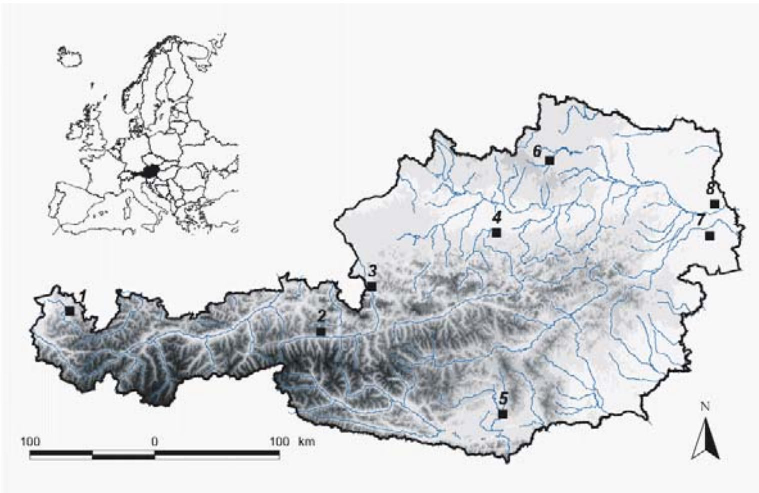

Fig. 1: Map of Austria showing the location of study sites.

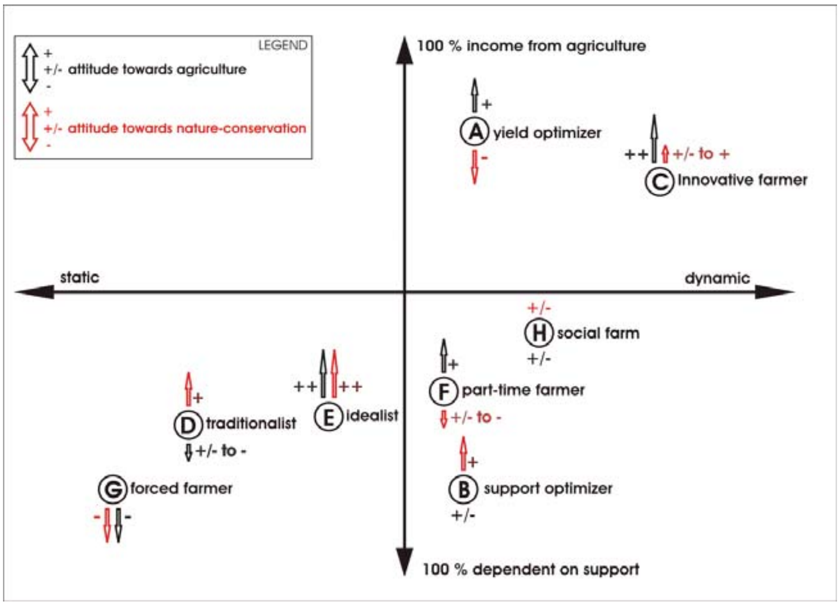

Fig. 2: Position of the different farming styles in the gradients between static and dynamic, dependent and self-reliant and their attitude towards agriculture and nature conservation.

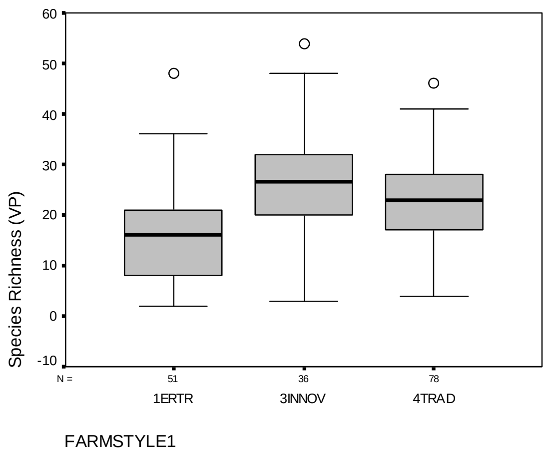

Fig. 3: Differences between Farming Styles in vascular plant species richness on their farmland; 1ERTR…"Yield Optimiser", 3 INNOV…. "Innovative", 4 TRAD…"Traditionalist"; (Anova: F = 9,195 **p < 0.001; Games Howell-test reveals the difference between 1 Yield Optimiser and 3 Innovative and between 1 Yield Optimiser and 4 Traditionalist to be highly significant: **p < 0.001).

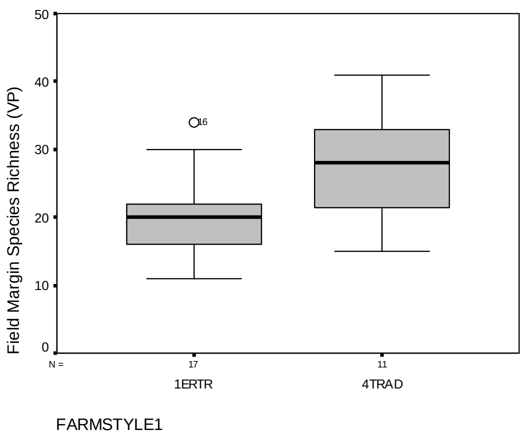

Fig. 4: Differences between Farming Styles in vascular plant species richness on field margins. 1ERTR…"Yield Optimiser", 4 TRAD…"Traditionalist". (Mann Whitney U-Test *p = 0.025)

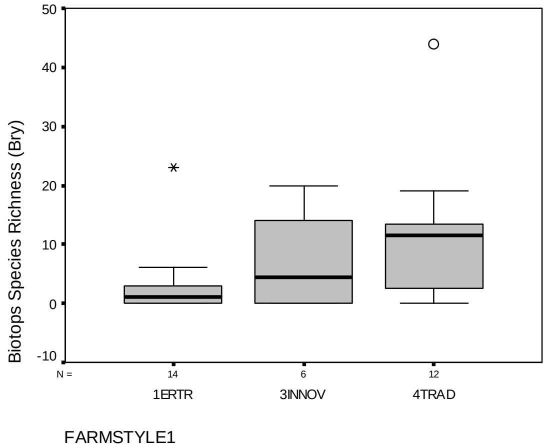

Fig. 5: Differences between Farming Styles in bryophyte species richness on small structures (Field margins and small woodlots).. 1ERTR…"Yield Optimiser", 3 INNOV…. "Innovative", 4 TRAD…"Traditionalist". Difference between 1 Yield Optimiser and 4 Traditionalist is significant (Mann Whitney U-Test: *p = 0.027)

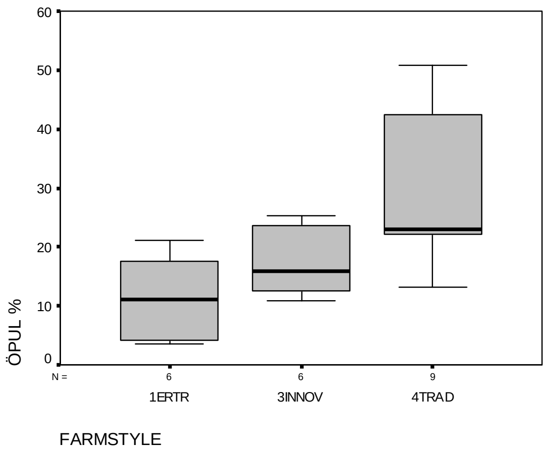

Fig 6: Proportion of agro-environmental subsidies on total income (Profit Margin II) of farmers belonging to different farming styles: 1ERTR…"Yield Optimiser", 3 INNOV…. "Innovative", 4 TRAD…"Traditionalist". (Anova F = 5,974 *p = 0.010, Games-Howell 1vs 4 0,014*)

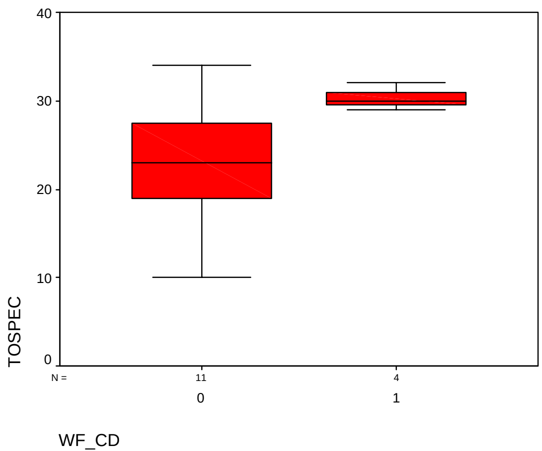

Fig. 7: Difference in vascular plant species richness [TOSPEC] in meadows taking part in the measure "maintenance of ecologically valuable areas" [1] and without this measure [0] (Mann Whitney U-Test: **p < 0.01)

"Economic and Ecologic Assessment of Groundwater Nitrogen Pollution from North Florida Dairy Farm Systems: an Interdisciplinary Approach"

Victor E. Cabrera* **and Peter E. Hildebrand****

Abstract

The presence of nitrogen (N) in water is an environmental hazard because it affects human health and ecosystem welfare. The Suwannee River Basin in Florida has received much attention in recent years due to increased N levels in water bodies. Dairy waste is thought to be an important factor contributing to this water N pollution. Dairy farmers are now required to comply with stricter environmental regulations either under permit or under voluntary incentive-based programs. Dairy farmers are also aware that environmental issues in the near future will be the greatest challenges they will have to face. Evidence indicates that farms may reduce their total N loads by changing some management strategies. Using published and stakeholders' information, a dynamic, empirical, interactive, and user-friendly model was created to simulate north Florida dairy farms and use it to test management strategies that may reduce nitrogen pollution and still maintain farm profitability. Testing different crop rotations, crude protein contents, time spent on concrete by milking cows, and time of liquid manure in the storage pond, it was found that intensive crop rotations have the greatest impact on reducing N loss and at the same time improve profitability. It was also found that reducing crude protein may reduce N release and increase profitability. Reduction in time spent on concrete reduces the amount of manure N handled by the system and consequently may reduce the amount of N lost to the environment. Increasing the time liquid manure spends in the storage pond may reduce the risk of N lost to groundwater but increases the amount of N lost to the air, which is not used by the crops and consequently decreasing profitability. A combination of decreasing crude protein content in the rations and efficient crop rotations may considerably increase profitability and decrease N loss to the minimum.

1. Introduction

Dairy farming is an important part of Florida's agricultural industry. Milk and cattle sales from dairies contributed $429 million directly into the Floridian economy in the year 2001. Florida is the leading dairy state in the Southeast; it ranks 13th nationally in cash receipts for milk, 15th in milk production and 15th in number of cows (*Bos taurus*). According to the USDA (http://www.nass.usda.gov/fl), there were about 152,000 cows on about 220 dairy farms at the end of 2002, and more than 30% of these dairy operations and cows are located in the Suwannee River Basin. These dairies face increased government regulation due to social pressure because they attract the attention of neighbors and activists concerned with odors, flies and mostly with potential leaching of nutrients that might influence water quality (Giesy et al., 2002).

The presence of nitrogen (N) in surface water bodies and ground water aquifers is recognized as a significant water quality problem in many parts of the world (Fraisse et al., 1996). Over the last 15 years, nitrate levels in the middle Suwannee River basin have been increasing and these elevated nitrate levels

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can cause health problems in humans as well as negative impacts on water resources. In addition to making water unsafe for humans (Andrew, 1994) and many other animals, high nitrate concentrations lower water quality in rivers and springs causing eutrophication that results in algal blooms and depletion of oxygen that affects survival and diversity of aquatic organisms (Katz et al., 1999).

The Suwannee River basin has received much attention in recent years due to increased N levels in the groundwater-fed rivers of the basin that could seriously affect the welfare of the ecosystem (Albert, 2002). According to Katz (2000), N levels have increased from 0.1 to 5 mg l^{-1} in many springs in the Suwannee basin over the past 40 years. Pittman et al. (1997) found that nitrate concentrations in the Suwannee River itself have increased at the rate of 0.02 mg l^{-1} $year^{-1}$ over the past 20 years and that over a 33 mile river stretch between Dowling Park and Branford, the nitrate loads increased from 2,300 to 6,000 kg day^{-1} while 89% of this appeared to come from the lower two-thirds, where agriculture is the dominant land use. One of the most publicized concerns is N losses in the form of nitrate into the groundwater through the deep sandy soils of the Suwannee River basin (Van Horn et al., 1998).

Dairy farmers are now required to develop manure disposal systems in order to comply with Florida Department of Environmental Protection water quality standards (Twatchtmann, 1990). This fact has led to considerable research efforts that emphasize N recycling and address such issues as maximum carrying capacity and nutrient uptake by crops (Fraisse et al, 1996). Dairymen in the Suwannee River basin have expressed their willingness to participate in initiatives that promote reduced environmental impacts, and in fact, many of them are already involved in using Best Management Practices (BMPs) promoted by the Suwannee River Partnership (Smith, 2002, Pers. Comm.). Staples et al. (1997) after interviewing 48 dairy farms in north Florida found that the perception of the anticipated costs of having to comply with probable upcoming environmental regulations was rated, by far, the top challenge to successful dairying in the future.

The Netherlands has implemented the Mineral Accounting System (MINAS) which focuses on nutrient (nitrogen and phosphorus) flows on individual farms, and taxes farms whose nutrient surplus exceeds a defined limit. MINAS embodies a new approach to environmental problems caused by agriculture. According to Ondersteijn et al. (2002) focusing on individual farmers has two major advantages. First, individuals are considered polluters and are individually held accountable for their pollution, according to the 'polluter pays' principle. Second, individuals have control over their pollution problem and will be able to deal with it on an individual level instead of being forced to comply with general measures that may be ineffective for their specific situation.

Nitrate overflow in dairy systems is affected by management practices and by environmental conditions. Changing management practices might have a great impact on overflow amounts. Agronomic measures of nutrient balance and tracking of inputs and outputs for various farm management units can provide the quantitative basis for management to better allocate manure to fields, modify dairy rations, or develop alternatives to on-farm manure application (Lanyon, 1994).

2. North Florida Dairy Farm Systems

Most dairies in Florida manage animals under semi-intensive or intensive systems. North Florida dairies are business enterprises and have full access to credit opportunities, information, and new technologies (Adams, 1998). The main production components of north Florida dairy farms are the herd and the crops. The herd is composed of young and productive livestock, while the crops are rotations of different crops in defined fields. When a heifer has her first calf, that heifer enters the productive group as a fresh cow - first lactation, and her calf, is sold or kept. All male calves are sold the day after they are born. Young livestock are usually managed in a different facility outside the main production facility.

During young and adult livestock periods, a number of animals will be culled from the herd because of their production performance, age, weight gained, general health, fertility, etc. Culling rates are characteristic of management and vary greatly across dairy farms.

The adult or productive herd develops in approximately yearly cycles. A fresh cow produces milk for ten or eleven months after which she will be dried for approximately two months. After the dry period, the cow delivers again and starts her next lactation. This intense productive cycle is possible because a cow that starts her lactation after a delivery is quickly inseminated again and can be pregnant after only a two month period (Voluntary Waiting Period (VWP)).

The number of cycles depends on management decisions. Some farmers prefer to keep cows only for three lactations, while others may want to keep them for six, seven or more. After the second and third lactations, milk production performance may decrease. Keeping cows for more lactations saves the cost of replacement, but at the same time has an opportunity cost of giving up higher expected rates of production with new cows entering the herd. During the 300-day milking period cows follow a typical milk productivity curve that increases rapidly at the beginning until reaching a peak. After that peak, production steadily decreases until the dry period.

In general, milking cows are confined while dry cows and young stock are kept in less intensive production facilities. The same happens with the diet: milking cows receive the highest nutrient-concentrated diet depending of their productivity. These diets are closely related to the N balance in and out of the farm. Different categories of milking cows are managed in the “intensive” facilities, which are the free stalls, walkways, and the milking parlor.

Florida dairies are required by official agencies to manage their on-farm waste. In north Florida, the most common practice of waste disposal is through flushing, removal of solids, storage, and crop systems. Free stalls and milking parlor (and other adjacent intensive facilities) are implemented with open canals that allow constant flushing of manure to a treatment lagoon, then to a storage pond from where liquid manure is applied to cropland (sprayfields). Before reaching the treatment lagoon manure is screened for solids, which are separated and do not reach the lagoon.

Dry cows and young stock are usually not included in the waste management program because they produce much less manure (and much lower N quantities) and spend most of their time grazing. In the case of milking cows, time spent out of confined areas also will determine the amount of reduction of manure produced. Dairy farm systems have surrounding crop fields where pasture, forage and silage crops are produced as a complement for cow diets.

For this study, the dairy farm boundaries are defined spatially as the physical farm limits excluding pastures to one meter below the surface. Any resource that enters these farm boundaries is recognized as a source (input) and any resource that exits these farm boundaries is a sink (output). This study emphasizes the flows of N entering the dairy farm system, its interactions within system, and its flows leaving the dairy farm system. Pastures are excluded because they are not presently regulated and are not seen as environmental hazards.

3. Objectives

The main aim of this research is to create a north Florida dairy farm simulation model and simulate north Florida dairy farm systems to assess the economic impact of management strategies that may decrease N leaching. This study intends to: a) understand north Florida dairy systems, b) create a north Florida dairy farm model, c) simulate north Florida dairy farms under different management strategies, d) estimate economic and ecological impacts of north Florida dairy farm systems, and e) create a user-friendly computer model for the benefit of dairy producers and other stakeholders.

User-friendliness and interactivity of models are required to gain understanding and direct feedback from stakeholders. The model developed in this research is intended to be a discussion tool for system understanding and at the same time an analyses tool. It will be used to obtain additional input during the development of a more complex model.

4. Methodology

Analysis in the systems approach is marked by recognition of the whole system and the interactions within that system rather than looking only at a system component. A systems approach employs specific techniques and tools, such as rapid appraisal, pattern analysis, diagrams, and modeling, often in a multidisciplinary fashion, to identify system boundaries and recognize component interactions (Kelly, 1995).

Rationality in the simulation models follows the logic of budgeting or accounting for the flows of N in the system, as developed by Van Horn (1997), Van Horn et al. (1994, 1998, and 2001), and by the Natural Resources Conservation Service from the USDA, NRCS (2001). The simulation model accounts for N inputs (sources), within-system interactions, and outputs (sinks), according to a defined dairy farm system boundary.

Changes in alternative management strategies such as: 1) crude protein included in the diet, 2) time herd spends in confined areas, 3) time of liquid manure in waste storage pond, 4) crops planted, and 5) area planted will be tested in five-year time frames to compare economic and ecological outputs. Information was collected from published sources, personal observations, and stakeholders' communication, of which are documented in the modeling section.

Dynamic Modeling of North Florida Dairy Farm Systems

A dynamic, event-controlled, empirical model was created to represent north Florida dairy farm systems and in it the flows of economic and environmental variables are accounted for.

The Dynamic North Florida Diary Model (DNFDM, Figure 1) was intended to be user friendly as an interactive spreadsheet in Excel® software that could be shown to dairy farmers and other stakeholders in a way easy for them to understand. Creation of the DNFDM was suggested by a stakeholder as a way to gain dairy farmers' interest. The DNFDM also intends to be a powerful analyses tool for representing real situations. It runs in monthly steps, using monthly budgets, as opposed to the yearly approach of Van Horn et al. (2001) and NRCS (2001). At this point the model is considered to be preliminary to be used for user feed back while a more complex and complete model is being developed.

The DNFDM has the following modules: feedstock, cattle, milk production, waste management system, and crop system. All these components interact among themselves and have two common variables throughout: N and money. It runs on a monthly basis for a desired number of years.

The model considers 11 classes of milking cows, from one-month to eleven months of lactation; two classes of dry cows, one and two month dry cows; and 24 classes of young stock: calves and heifers. At every monthly update, cattle classes increase their age by one month. Then, cows of milking group # 1 will become cows of milking group # 2 and three month-old calves will become four month-old calves, etc.

Culling rates apply to any month and the total culling rate for a specific farm is divided among the cattle groups and applied at each update. At any point in time, different cow groups require different diets, produce different milk quantities, require specific dairy facilities, and recycle specific amounts of N.

Dry matter intake (DMI) is calculated adapting research results of Van Horn et al. (1998). It changes with the stage of cow production, from 11.4 to 25.4 kg per cow per day for dry cows to highest productive cows, respectively (Table 1). The amount of crude protein in the diet varies from 15 to 17.5% and is a user choice option. The amount of crude protein determines the quantity of N entering the system and the flow of this nutrient in the system. Crude protein could be reduced without affecting milk production, if the herd is well managed, Børsting et al. (2003), Jonker et al., (2002), Wu et al. (2001), Van Horn et al. (1998), Tomlinson et al. (1996). Therefore, higher crude protein concentrations may produce similar milk quantity, but increased environmental risk and increased costs. To assure that the highest producer cows in a group have sufficient protein, the whole group would be fed a supplement diet for the highest producers and excess of proteins will usually be provided to lower producer cows in the group. Higher crude protein rations are believed beneficial for production purposes and that is why dairymen like to use them.

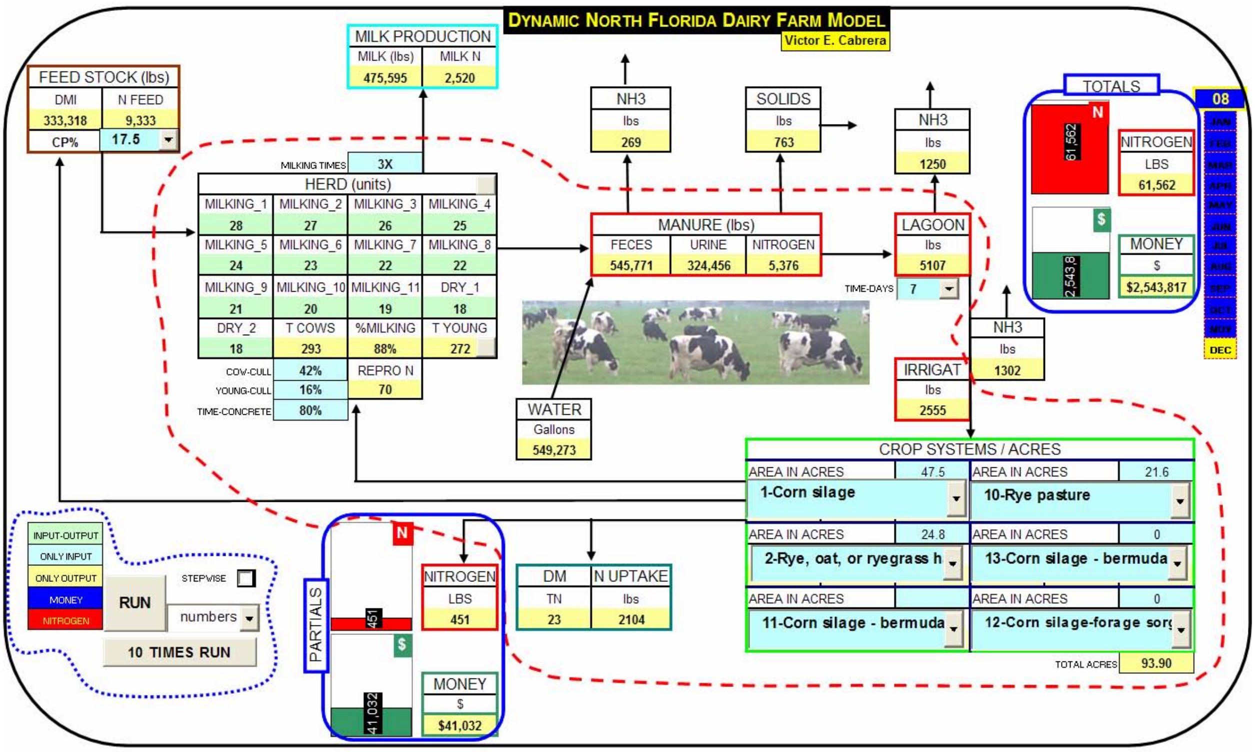


Figure 1 Dynamic North Florida Dairy Farm Model (DNFDM). Units are in local usage for interaction with the users

Milking cows require different amounts and different qualities of feed and at the same time they produce different amounts of manure (feces and urine) containing different amounts of non-digested N according to the production of milk (Table 1). Milk production per group was estimated based on the Florida average cow performance of 8,240.1 kg per year per cow, obtained from the Dairy Herd Improvement (DHI) data source (http://www.drms.org).

Manure time spent on concrete is the proportion of time milking cows stay inside intensive facilities from which manure is collected (free barn stalls, walkways, and milking parlor). Consequently time spent on concrete determines the quantity of manure (and N) for recycling. Dry cow and young stock manure is not part of the recycling program (i.e. their manure is deposited directly on pasture or it is managed in another way) because quantities are much lower than the production group. Cattle flow on the farm is greatly influenced by culling rates. Culling rates are farm-specific parameters for adult and young stock that determine the proportion of cattle that leaves the herd (for any reason) in time frames. Culling rates of 42% for the productive herd and 16% for the young stock, in a year, are acceptable for Florida dairies according to data from the DHI.

On north Florida dairy farms, the most common system used to handle manure is a liquid manure system that encompasses a flushing system, a solid screening system, a treatment lagoon, and a storage pond. The flushing system uses large amounts of water to wash the manure from point of concentration to the treatment lagoon. Before reaching the lagoon a system separates solids from the remaining liquid. Liquid manure passes through the treatment lagoon, where some sedimentation is expected, and reaches the larger waste storage pond, where it is kept for a variable time. Liquid manure from the storage pond is used as fertilizer in the farm crop fields, usually applied to fields through sprinklers in central pivot irrigation units. Solids separated from the liquid manure take only a little more than 15% of the total N and it is usually composted for use on-farm or sold.

Table 1 Milk production, dry matter intake and manure excreted by cattle groups

			kg day^{-1}cow^{-1}			
group	Description		milk	DMI*	feces	urine
1	milking	open	22.7	17.9	34.9	22.0
2	milking	open	45.4	25.4	57.3	30.0
3	milking	open	40.9	23.9	52.9	28.4
4	milking	open	31.8	20.9	43.9	25.2
5	milking	pregnant	29.5	20.1	41.7	24.4
6	milking	pregnant	27.2	19.4	39.4	23.6
7	milking	pregnant	25.0	18.6	37.2	22.8
8	milking	pregnant	22.7	17.9	34.9	22.0
9	milking	pregnant	20.4	17.1	32.7	21.2
10	milking	pregnant	18.2	16.4	30.5	20.4
11	milking	pregnant	15.9	15.6	28.2	19.7
12	dry	pregnant		11.4		
13	dry	pregnant		11.4		
		TOTAL MILK	8,240.1 kg per COW/YEAR			

Source: Adapted from Van Horn et al., 1998. *DMI is Dry Matter Intake

Using the Van Horn et al. (2001) nutrient flow approach, the amount of N that *reaches the waste system* is the difference between the amounts of N input in the feed less the digested proportion of it plus the weight gained by cows plus the amount of N used for reproduction (new calves):

$$N(waste) = N(feeding) - [N(milk) + N(weight) + N(reproduction)]$$

Part of the N is lost to the air as gaseous forms during flushing, storage, and spraying. While losses during flushing and spraying are difficult to control, the loss of N during storage can vary greatly according to management. In the DNFDM, storage time determines the quantity of N available for applying to crops. Storage time is a user choice. The greater the time in storage, the lower the N quantity available for recycling.

Parameterizations of the amounts of N that do not reach the sprayfields were adapted from Van Horn et al. (1998 and 2001) on a monthly basis. These are the result of extensive long term research in Florida which found that 5% of N is lost during flushing, 14.02% is extracted with the solids, 24.48% of the rest is lost during storage in the pond, and 50.94% of the rest is lost during the spraying.

Van Horn et al. (1998) indicate that most of the N that reaches the sprayfields is urea, ammonia, and other easily degradable N forms, and long term research applying this liquid manure developed by Newton et al. (1995) presented estimations of N uptake by crops in dairy farms. Van Horn et al. (2001) adapted these values for nutrient balances by adding 30% of N that is lost in the soil by volatilization, and discounting 20% of N that is fixed by bacteria in the case of legume crops (alfalfa and peanuts). These values can be found in Table 5: in Van Horn et al. (2001).

Dairy farms have many crop options for their land. Many times options are narrowed by trying for the most efficient use of nutrients from manure. There are many crops cultivated in north Florida dairy farm systems. Some are corn, rye, oat, ryegrass, peanut, alfalfa, bermudagrass, and sorghum. These are usually planted from seed or sod planted in rotations according to season. Some of them can be planted for different dairy purposes as for example the case of the bermudagrass that can be used as hay or as pasture. Crops are assumed to be well managed and with all their required nutritive demands to accomplish maximum dry matter accumulation; if the amounts of manure N are not enough for crop growth, farmers apply additionally chemical fertilizers. Biomass produced by crops is entirely used by the farm cattle, closing in this way the nutritive cycle.

The DNFDM allows choosing up to 6 different field sizes with the 13 most common crop rotations for north Florida. Following rationality of many dairy farmers, total N available to apply is evenly distributed to all sprayfields. Different crops under different environmental conditions in different seasons with different areas applied with liquid manure (sprayfields) will uptake different amounts of N. In some circumstances the quantity of applied N will be lower than the quantity required by the crop, a situation in which extra fertilization of N would be justified. But other times the quantity of N applied is greater than the uptake capacity of the present crops. In this case, extra N in the soil will be lost out of the farm boundaries (leaching below one meter soil depth) and may constitute an environmental hazard for groundwater resources. The DNFDF estimates in monthly steps the amounts of N outgoing from the farm.

Income to the dairy farm comes basically from selling milk and male calves. Male calves are sold at $30 per head one day after they are born and milk price is a stochastic function based on historical milk prices collected for the last five years from the USDA Website (http://www.nass.usda.gov/fl). The milk price contains an independent stochastic function that generates monthly milk prices based on the ranges of variation observed in the last five years as seen in Table 2. Farm expenses are only based on feed protein purchased after using all dry matter produced on farm evaluated at the market price of $290 per Mg (http://coopworth.org.nz/coopbul8.html). The cost of a pound of feed varies according to the chosen protein amount as a function of the following form: $1.2 \times [\%crudeprotein] - 0.07$, which is an equation adapted from Van Horn et al. (1998) with information on prices obtained from the Louisiana State University Agricultural Center (http://www.lsuagcenter.com/dairy/pdfs/1997report/feed%20cost.pdf).

Assessment of quantities of N lost as well as economic performance are calculated on a monthly basis, so comparisons of environmental and economic outcomes can be achieved in monthly time frames or be accumulated for long term analyses. The DNFDM is a user-friendly, interactive model that allows input and output data directly from the model. Color codes indicate properties of cells with respect to inputting or outputting data in cells. Light green cells indicate cells that are input and output cells: users can introduce data in those cells by overwriting them; results will be displayed in the same cells. Light blue cells (including scrolling boxes) indicate cells that allow the user to change parameters of the model before running; these cells will not change values during simulation. Yellow cells are output cells that display the internal model calculation results.

Table 2 US$ price per 45.4 kg of liquid milk in Florida, (1998-2002)

MONTH	MIN	MAX	AVG	RANGE OF VARIATION
JAN	12.00	17.99	15.86	5.99
FEB	11.80	15.95	14.75	4.15
MAR	11.90	16.65	14.84	4.75
APR	11.90	17.44	14.35	5.54
MAY	12.10	18.21	14.59	6.11
JUN	12.30	18.99	14.88	6.69
JUL	12.60	19.34	15.12	6.74
AUG	12.50	19.40	15.35	6.90
SEP	13.00	19.56	15.51	6.56
OCT	12.60	19.93	15.30	7.33
NOV	12.30	19.76	14.82	7.46
DEC	13.10	15.98	14.51	2.88

The DNFDM can run in different modes. It can run showing "number" results which appear in cells. The "number" simulation is intended to show the friendliness of the model to stakeholders, especially to dairy farmers to gain their interest; additionally four boxes indicate graphically the monthly and accumulated values of N loss (red) and money (green). The DNFDM can also be run in a "graph" mode which shows the big picture of the main variables (profit, N leached (temporal and total), and cattle flow) during the time frame of simulation. "Graph" outputs are intended for analysis purposes, after several simulations. In either mode, "number" or "graph," there is the option to run a "stepwise" simulation, which stops the running every month to provide time to analyze the evolution of the variables. Simulations of main variables are also stored in an independent spreadsheet as an organized table for analysis purposes. Additionally, a "run 10 times" button is conveniently located to allow the user to run the model 10 times with chosen parameters and save results in an independent table. Experiments analyzed in this study were accomplished using this useful function.

5. Limitations of the DNFDM

Some current limitations of the model need to be recognized in order to improve it for further versions. These are:

- Cows get pregnant at the same time; monthly groups are assumed to be exactly the same age
- Costs and incomes only include variable costs related to the parameters in the study. For example initial cost of waste management facilities were ignored
- Production of milk is not seasonally corrected, it is only cow stage dependent
- N is evenly applied to all sprayfields. If fallow present, N goes first to covered land.
- The same crop rotations are present for the whole simulation time
- Milk production concentration in winter, which may be a management strategy in some north Florida dairy farms, was not included
- The value of manure solids are not yet incorporated in the model.

6. General Results of Simulations

A simulation was set up for the cattle module to reach a “steady state” after a number of years of simulation. Analyses were done after the herd reached this steady state, in which there were about 300 adult cows (88% of them as milking cows) and about 270 young stock. This simulated dairy farm had 37.48 Ha of sprayfields with three crops: 19 Ha of corn silage, 8.64 Ha of rye pasture, and 9.84 Ha of oat haylage. Also, this farm was assumed to use a 17.5% crude protein diet for milking cows, have their milking cows 80% of the time confined on concrete, and applying the liquid manure after seven days of storage.

An N balance for this arrangement for December indicates 9,564 kg of N entering the system in the feed, is used to produce milk containing 2,120 kg of N. Additionally, 1109 kg of this is used in reproduction and weight gain of animals and the difference, 6,334 kg, are excreted in feces and urine. 316 kg of N are lost during flushing and 887 are recovered in solids. Therefore, 5,130 kg of N reach the storage pond from which 1,256 kg of N are volatilized. From the remaining, 3,875 kg of N, 1,972 are lost to the air during spraying and effectively 1,902 kg of N reach the 37.84 Ha of land. Thirty percent of this is lost as volatilization (571 kg) and the difference, 1,330 kg of N, are available for crops, that equals approximately 35 kg of N Ha^{-1} month $^{-1}$. In December, crops uptake 1078 kg of N and the difference, 282 kg of N, will be prone to leach.

Simulation also for this arrangement was run for a five-year period, where profit varies every month because of the stochastic price variability. Figure 2a shows that August is the most profitable month because more feed is produced on farm in that month. The opposite is also true; November and April are least profitable months because of the purchase of maximum quantities of feed because there is no on-farm production.

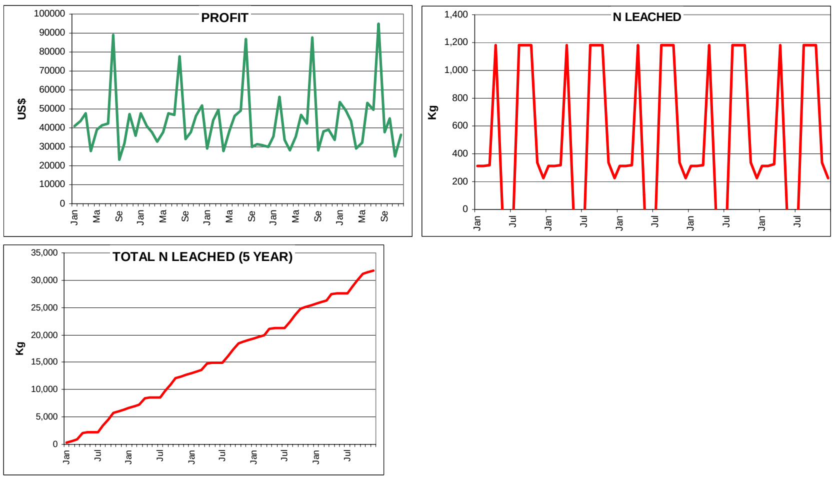


Figure 2 a) Monthly changes of profitability, b) N leached by month, and c) Cumulated N leached in five-year period

N leached into the subsoil is highly related to crop N uptake, and to profit. It changes completely according to the area planted and crop rotations. Using the above crop and areas, the N leached changes seasonally as seen in Figure 2b. Figure 2b shows that with these 37.48 Ha planted, there will be considerable N lost in most months, however no leaching will be expected during May, June and July. Figure 2c shows the cumulative N leached during a five-year period.

7. Five-year Management Strategies

Ten different management strategies were experimented with using the DNFDM model. These are summarized in Table 3. The control management strategy was based on the same farm parameters shown in section 4: 17.5% crude protein for feeding milking cows, milking cows spend 80% of the time in confined areas, liquid manure is applied after seven days in the waste storage pond, and there are 37.48 Ha of sprayfields to apply manure.

Experiments one to four tested the output changes with respect to changes in crude protein content in the diet of milking cows. Experiments five and six tested different lengths of storage of liquid manure in the storage pond. Experiments seven and eight tested the possible decrease of time spent in confined areas by milking cows. Experiment nine changed the crop of the largest field of 47.5 acres to a rotation (crop rotation # 2) of corn silage, forage sorghum, and rye silage. The last experiment, number ten, was similar to number nine for crop rotations, but crude protein in the diet was reduced to 15%. For each experiment, five years of simulation time was run, from January 2004 to December 2008, and two main variables were monitored: profit and N leaching. Every experiment was run ten times to observe the distribution of results for the profit that has stochastic price functions. Results are summarized in Figure 3. The baseline, or control treatment has the following outputs: 90% chance of getting at least $2.02 million of profit, 50% chance of getting at least $2.12 million of profit and 100% of chance of getting less than $2.18 million. There is an estimated N loss of 28,148 kg of N during this five-year period.

Table 3 Control and "experiments" with DNFDM for a 5-year period

Experiment	Crude Protein (%)	Time on Concrete (%)	Days in Lagoon	Crop Rotation
CONTROL	17.50	80%	7	1
1	17.00	80%	7	1
2	16.50	80%	7	1
3	16.00	80%	7	1
4	15.00	80%	7	1
5	17.50	80%	14	1
6	17.50	80%	28	1
7	17.50	60%	7	1
8	17.50	50%	7	1
9	17.50	80%	7	2
10	15.00	80%	7	2

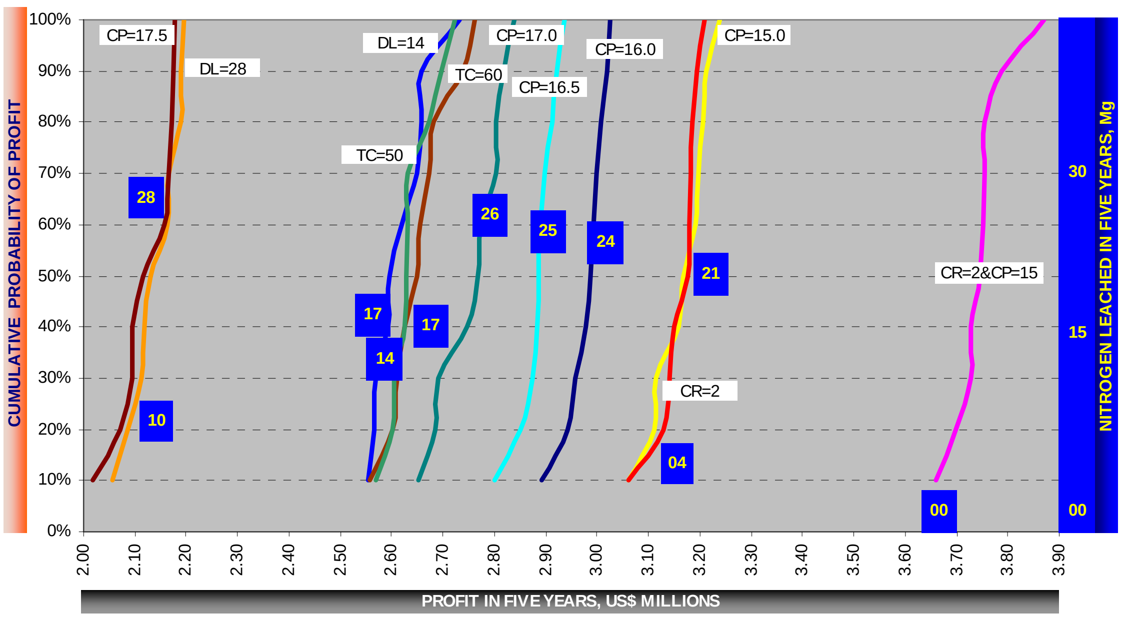
Van Horn et al. (1998) indicate that some diet control over N excretion is possible. Decreasing crude protein may decrease the amount of N in the manure still maintaining optimum animal performance and milk production. These authors tested two different diet formulations proposed by the National Research Council (NRC, 2001): high and low. The high diet requires more crude protein to *assure* requirements are met and the low diet minimizes dietary N. These levels, high and low, were estimated to be 17.5 and 15.0 % of crude protein on diet by local dairy farmers. These ranges along with numbers provided by Van Horn et al. were used as functions in the DNFDM.

Total N lost during the five-year period varies considerably with different protein diets as seen in Figure 3. If crude protein is 17.5%, 28,148 kg of N is expected to be leached, but if the crude protein is only 15% it is expected to leach about 20,884 kg of N. Profit changes inversely; while with 17.5% crude protein the profit would be less than $2.2 million, with 15% crude protein there is 90% chance that the profit could be greater than $3.0 million. Inputting less crude protein saves important feeding costs and decreases the risk of N overflows.

Time that the liquid manure is stored in the waste pond affects the results in the following way: the N leaching amounts would decrease from 28,148 to 17,152K kg when the manure is stored 14 days instead of 7 days, and it could even decrease to 9,988 kg when it is stored 28 days; the profit increases to $2.5 million (90% chance) when it is 14 days instead of 7 days, and decreases again to original levels when it is stored 28 days. Less N leached will be expected with more stored time because large amounts of ammonia N are expected to be lost to the air during storage time; this decreases the risk of N groundwater pollution, but it increases the risk of air pollution and it requires larger facilities. Time of liquid manure storage in the pond is part of the nutrient management plan and it could be controlled by the regulatory agencies. It is also expected that in the future, N pollution to the air could be measured and regulated. On the other hand, by not recycling maximum amounts of N on the farm there is a negative economic impact because of the lost value of N as crop fertilizer.

Time that milking cows spend on concrete has a direct relationship with the amount of N produced as waste for the system to handle. With 60% or 50% of the time on concrete (versus 80% in the control) the amount of N leached would decrease from 28,148 kg to 16798 kg and 13,620 kg respectively. The profit will also be affected by these changes because mainly the N as fertilizer has a value and produces biomass as feeding for the milking cows. With both treatments (60% and 50%) larger profit margins than the control are expected. With the 60% level, profits greater than the 50% level are expected because greater utilization of N as fertilizer is expected.

Changing the main field (47.5 acres) crop has a relevant effect on the results. Changing the corn silage to a rotation that includes forage sorghum, corn silage in summer, and rye silage in winter implies first, that the field will be cultivated longer in time, and second, it will have greater rates of N up take at any point in time. That is why with this rotation only about 4,086 kg of N would be leached during five years (compared to the control 28,148 kg). Besides the low rate of N leached, a much greater profit is expected because of the use of the N as fertilizer: with this new rotation at least $3.062 million profit is expected (90% chance) and at most $3.21 million. Profit of this treatment is quite similar to that from crude protein at 15% as can be seen in Figure 3, although the levels of N leached are quite different.



Note of abbreviations: CP is crude protein, DL is days in storage lagoon, TC is time in concrete, and CR is crop rotation.

Figure 3 Profit and Nitrogen Lost with Different Treatments for the Whole Farm

A final treatment combined the most encouraging previous results: crude protein at 15% and a crop rotation of sorghum, corn, and rye in the largest field. The results were quite revealing. First, no N is expected to be leached out of the farm, the entire N produced is recycled on farm. Second, the profit levels are far above the previous ones: it would be at least $3.66 million (90%) and at most $3.87 million. There is less risk of N lost in the system because the low protein in the diet and the high up-take capabilities of the crops. Higher profits are expected because of maximum use of the N as fertilizer and greater biomass accumulation.

8. Conclusions

- Seasonality and monthly nutrient balances make a difference compared with the traditional one-year nutrient budgeting
- Crude protein and kind of nitrogen as a feed supplement have a great impact on outputs, but experimental data are required to support and tune up interactions with N flow
- Crops are the best way of N recycling on farm. Dairy farms have to complement livestock activity with crop activity. If crops are well managed they can provide a good feed source to livestock and they can recycle large amounts of N
- Increasing the time of liquid manure storage would not be practical in real situations because facilities are designed for a specific holding time according to the herd size. Besides trying to lose N to the air intentionally (in order to decrease soil N lost) could be a bad economic decision and another environmental hazard
- Changing the time milking cows spend on concrete facilities is highly dependent on climatic conditions. Milking cows will be grazed only when weather is cool enough not to affect milk production because of heat stress. Therefore, options on trying to change time spent in confined facilities should be combined with changes in the herd breed (breeds with heat tolerance, for example) or providing shade in grazing areas. In practical and real situations, it seems that dairy farmers try to graze as much as they possibly can.

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POSTERS

The Provision of Information, Advice and Training to the Scottish Farming Sector: a Sudy of the Key Organisations

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Abstract

Like all regions in Europe, the agricultural sector in Scotland has seen major changes in the structure of farming and rural businesses, and also in the role of supporting agencies. Moreover, most European countries are in the process of reformulating aims and policies for rural areas, particularly for those that are disadvantaged or environmentally fragile. At the same time, UK and European Union organisations with responsibility for rural policy are increasingly concerned with assessment procedures[1]. It is in this context of change that we propose to analyse the role of knowledge and information systems in the Scottish farming sector, namely the performance and interaction of institutions that provide rural decision-makers with information, advice and training (IAT).

Three techniques were used to gather qualitative information in 1998: 1) semi-structured interviews with key people of the main providers of IAT services in Scottish Less Favoured Areas (LFAs), i.e. those parts of the country where farmers are deemed to operate under permanent natural handicaps; 2) a Rapid Rural Appraisal exercise known as "Venn diagram" to explore relationships among providers and 3) the analysis of secondary data. The Isle of Skye was used as an example of a Scottish LFA, for the selection of regional levels of national organisations. Twenty interviews were completed, at different levels of 16 organisations, taped, transcribed and analysed.

Although the deliberate selection and low number of providers contacted prevent results from being representative, and so preclude generalisation, this study highlighted interesting aspects of IAT provision in Scotland. The Venn diagram proved to be a very useful tool to explore network relationships; concentrating on the diagram allowed for a more relaxed, but still very focused conversation. Graphic illustration of relationships clarified the issues of importance and frequency of contact, with arrows indicating shifts in size and distance.

The performance of IAT providers in Scotland is frequently very good, but varies with the organisation in question, and with specific programmes or projects. Performance often remains in project mode, with output being channelled through programmes that don't always form a coherent whole. Local delivery generally produces good results, and can be even more effective given the common lack of strong planning and communication between headquarters and local offices.

However, the lack of separate planning for IAT, reduced importance of rural businesses in most organisations´ remit, reactive nature of delivery methods, and rudimentary targeting and promotion activities, all increase the characteristic biases that have been described for the uptake of IAT services by these businesses[2,3,4,5]. Most providers realise that coverage and penetration of their services isn't uniform, but the fact that some didn't see a need for collecting information on their clients is telling of their targeting and evaluation processes. The use of poor evaluation criteria, concentration on larger

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projects and reliance on informal feedback discriminates against small-scale projects and non-financial or indirect impacts.

While at national headquarters level relationships between major players can be quite hostile, local ones are often described as very good, and frequently down to a small number of people. The range and type of bodies that figure on an organisation's "network" are very much dictated by direct need, for funding, crucial information or political credibility. Most organisations concentrate on key players in their field of interest, and their interaction is often at superficial level (eg: consultation) and rather fragmented (eg: concerning single projects only). There is also under-used potential in the different networks within organisations themselves, particularly large ones.

All providers have witnessed a growing tendency to work in collaboration with other organisations, accelerated by reductions in individual funding, opportunities for "collective" funding, and the need to enhance project credibility. Overlap, in terms of competition or duplication, isn't thought to be a major problem, especially in the Highlands and Islands, where resources are considered to be thin on the ground, and to do something significant, organisations must "pull together".

We recommend the following improvements to organisational performance: rethinking planning and evaluation, so that programmes are coherent and flow clearly from policies; carrying out qualitative planning and evaluation and adjust targeting to at least take biases into account, if not attempting to correct them; and investing more in staff training to reduce isolation and improve performance.

We also agree with Röling[6], who suggests that in order to promote knowledge utilisation, it might be more effective to strengthen the capacity of intended users to form an effective user system, than to strengthen the intervention capacity of institutions involved in agricultural development. This could be achieved by fostering support among rural businesses, for example.

As to network flows, we recommend: widening the range of organisations in the network to include standard agencies such as banks, accountants and farming press; seeking synergy with other areas and organisations, such as that between the farming and tourism sector; increasing collaboration to the level of strategic planning; and establishing information flows from customers to agencies.

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Evaluation of Agricultural Sustainability by the Mesmis Method: a First Aproach

Alexandre Manuel Silva Dinis Poeta* and Ana Alexandra Vilela Marta Rio Costa**

Abstract

The term sustainability, today very common in our vocabulary, seems to be the key for the future of the agrarian sector, in the direction of a development of balancing quality, environment, social promotion and, simultaneously, generation of income for the agents who depend on it.

In this regard: How to identify the most sustainable production system? How to design the production model of the future, in the context of sustainability? These questions impose, in the truth, an evaluation or a "comparative measurement" of sustainability, to conclude which is the sustainable system and to allow, in the future, to plan new solutions that must answer to the problems known today.

To this intention Masera *et al.* (2000) point out as main strategies, resulting from the aggregation of some attempts already developed to evaluate the sustainability, the following ones: definition of a list of indicators; use of a composed index; development of a reference system; and the systematic approaches through frameworks of sustainability evaluation.

Among the various strategies elaborated with that finality, one methodology can be stressed: MESMIS - "*Marco para la Evaluación de Sistemas de Manejo de Recursos Naturales Mediante Indicadores de Sustentabilidad*" (Framework for the Evaluation of Natural Resource Management Systems Incorporating Sustainability Indicators). This is the most recent methodology developed for sustainability evaluation, which tries to approach some aspects insufficiently treated in others methodologies, which are arrested with the lack, in all or part, of the integration and quantification of variables and indicators related to the biophysical, economic and social aspects (Masera *et al.*, 2000).

The presentation of this work intends to exemplify the MESMIS methodology using a case study from Northern Portugal and to promote the discussion of some methodological questions in relation to the sustainability evaluation process of the agrarian production systems.

It should be underlined that this work constitutes the first stage in a study to be developed over the next four years and, as such, should understood as a first approach.

Case study of the horticultural sector

The evaluation subject of this study is the horticultural production system of conventional and organic farms, situated in the North of Portugal. The first one corresponds to the reference system for the evaluation, that is, the standard system practised in the region. The other is the alternative system that

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makes use of the technologic and social innovations relative to the reference system which is, in this case, the production system that obeys to the organic production of agricultural products.

To evaluate the comparative sustainability of these systems the MESMIS methodology was applied, which consists of a comparative evaluation of a series of translating indicators of sustainability, whose cycle process integrates six principal steps as visualised in Figure 1.

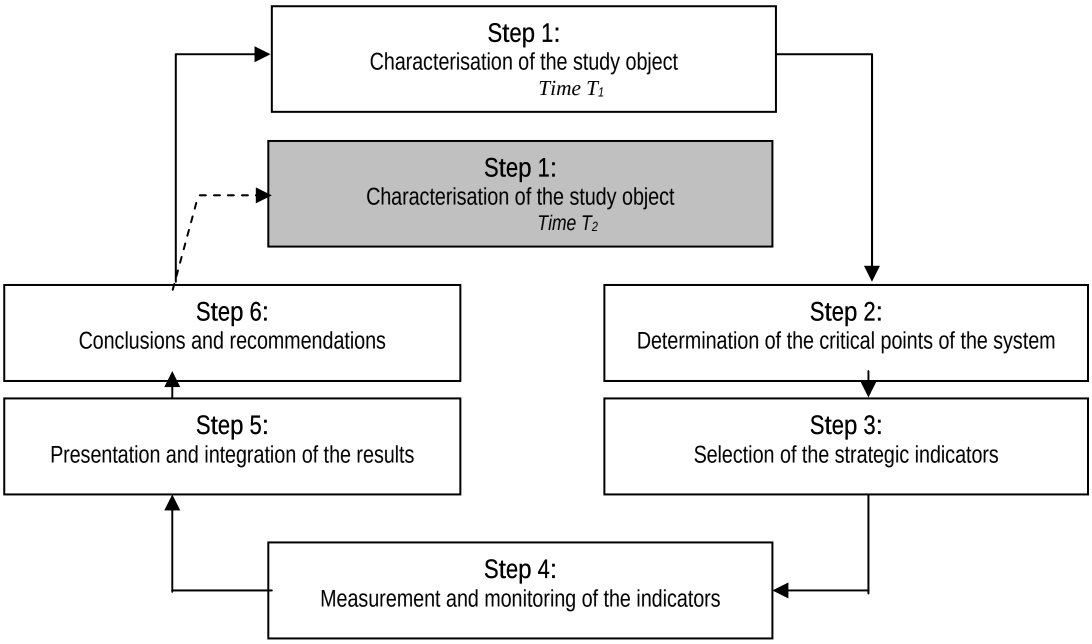

Figure 1. Operative structure of the MESMIS (Masera *et al.*, 2000)

Figure 2 shows the values obtained for the selected sustainability indicators in the organic case and in relation to the standard farm, in the context of the methodology under consideration.

It is clear that when the standard farm is used as the reference, the organic farm exceeds the index 100 by a substantial margin. The values of the adaptability and equity attributes are very similar in both systems considered, whereas there is a wide disparity for the productivity, stability and autonomy attributes, these being about three times higher for the organic case, compared to the conventional farm.

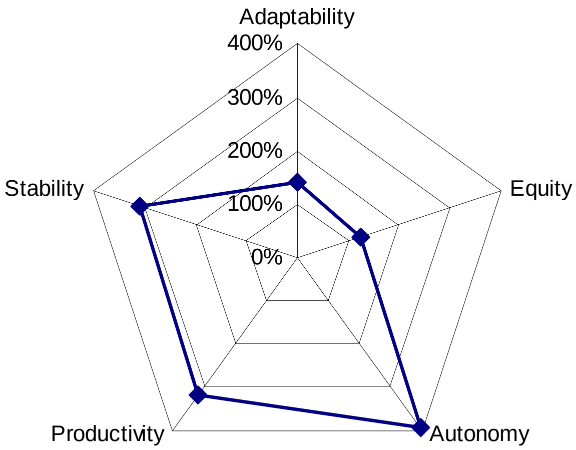

Figure 2. Synthesis of the sustainability evaluation for the organic case compared to the standard case (Reference case = Index 100)

Final considerations

In spite of the recent development of programs about sustainability evaluation, some of its conceptual problems and gaps have originated news methodologies.

An important conclusion in this context is that sustainability evaluation is valid for a specific management system in a specific spatial area and for a determined time period; it necessitates an evaluation team with a multidisciplinary perspective; must focus on relevant aspects of the physic, economic and social context; should be based in procedures and data scientifically valid; and must be based on selection of criteria and indicators which reflected as much the symptoms as the causes (FAO, 1993). In the other hand, sustainability can not be measured *per se*, but rather through the comparison of two or more different systems or analysing the evolution of a system over time (Masera *et al.*, 2000).

The last assumption, developed with the MESMIS methodology, presents great importance and should be underlined. This because, the variations observed in the sustainability evaluation become irrelevant given their identical probability of occurrence in both cases. Using this methodology it is possible to identify, among various systems, the most sustainable one, and this is quite useful to identify the way or direction to reach sustainability. This is, without doubt, the main question related to the development of these evaluation programs.

However, there are many gaps that can be identified in this methodology, making clear the need to corrected and improved it in the future. For example, one of the key-aspects of the MESMIS method consists in the selection of the indicators and in the way to integrate results in a qualitative valuation. Clearly, the way criteria are adopted, to choose indicators and to punctuate results, will condition the final value of sustainability, even if the relative punctuation is the same. Such consideration leads, once more, to emphasise the multidisciplinary character that this methodology must have in its application in order not to underlined one of the aspects in detriment of other.

Finally, from the data used and with the results obtained, it can be conclude that the organic production system case study shows a much more autonomous, productive, stable, well-adapted and equitable management process than the standard production system. Based upon this study, we can also identify the indicators that more heavily condition sustainability in the organic case. Once corrected these indicators, a new production system will originate. This system will also be evaluated in a next phase (by a comparative approach) and, it can be assumed that, in each additional cycle, we will be able to get closer to the ideal sustainable system, in economic, social and environmental all terms, once a multidisciplinary approach is used.

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Use of Indicators as Tools of Decision-Making

Anja Yli-Viikar and Leena Savisalo*

The philosophers have only interpreted the world, the point is however to change it.
Karl Marx

1. Introduction

The basis of this research was on the administrative process of Finnish Ministry of Agriculture and Forestry (MMM) to develop sustainability indicators. Indicators were aimed to be tools for monitoring the Strategy for Renewable Natural Resources (MMM 2001). Indicators were expected to provide reliable and timely information about the state of resources including the pressures and threats that will affect management of resources. However, creating of such an information system is quite a challenge. The task of this research project was to produce additional theoretical understanding on the functional role of indicators.

2. Methodological Settings

The research process was based on the theoretical framework expressed by Hugo Fjelsted Alroe and Erik Steen Kristensen (Alroe & Kristensen 2002). According to them the role of science should move from that of an independent science to science as a special learning process for society. The optimal situation for the creation of new knowledge would be the utilisation of both insiders and outsides perspectives, which together facilitate the self-reflective cycle of learning. In this particularly study the insiders perspective was built up through the personal participation in the administrative process of developing the indicators. That provided the access to the values, worldviews and goals involved in the administrative system. The outside viewpoint was made up with the assistance of three different data basis. They were collected independently from the administrative process. Given the strong role of developer the outside stance of these studies is obviously not free of values. It is rather representing conditional independence. Eventually, the quality of the current findings will be conformed or disconfirmed along with the feed back from the administrative process. However this kind of information is not yet available for this presentation.

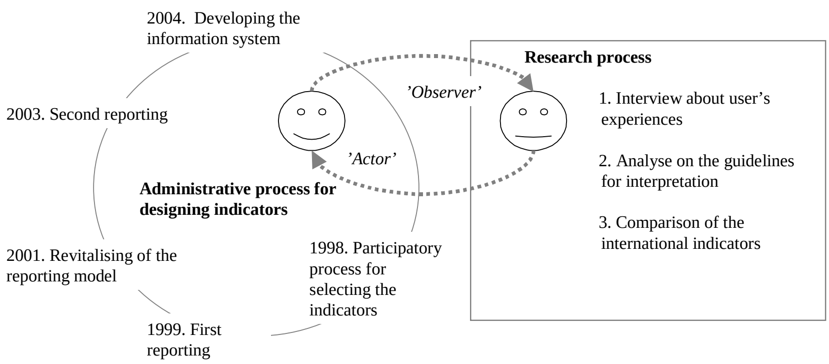

Figure 1. Methodological settings for the research

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3. Results

3.1 User study

Thematic interview among the users revealed that the use of sustainability report (MMM 1999) has been, so far, quite modest. However, actors were interested in quantitative methods in order to address the issues of environmental management and sustainability, and they found the report as a promising start for these efforts. The reasons for the minimal use were studied further with the assistance of information theories. There was included the viewpoints of rationalist, cognitivist, constructionist and policy approach.

3.2 Theoretical underpinnings for the interpretation

The guidelines for the interpretation were studied on the basis of the same report as user's experiences. In this report, information was mainly presented in the form of temporal trends. The other cases for making the interpretation were found to be qualitative descriptions, regional comparisons and settings to the performance targets. The trends provided present information about the overall direction of recent changes. They lack however the exact definition about current state in regard the policy goals. Future alternatives to develop the report model were considered on the basis of these findings. Adopting of the stricter target lines for the evaluation would eventually make the report managerially more effective tool, but simultaneously could result the narrowing scope for planning. The other possibility would be an adoptive mode of planning, where emphasis is to facilitate the communication, and discussion over the subject. In such context interpretation of data sets takes the form to gradually improving understanding. The key challenge of interpretation is to address the meaning of the hard facts in regard the overall policy issues.

3.3 Comparison of international indicator sets

In third phase, the quality aspects of indicator's knowledge were highlighted by comparing the performance of international indicator sets from national point of view. Such a perspective is obviously restricted in terms of the overall evaluation of the indicator set, but is useful for reaching deeper insights on the quality of indicators' knowledge. The data for comparison was collected from the publications of OECD (OECD 2001) and Commission of the European Communities (CEC 1999). In the beginning, indicators were analyzed at thematic level. Some data sets with reasonably good data availability and scientific soundness were found to exist already. The main problem of indicators appears is in relating these results on the policy goals, which are dealing with much broader and more holistic issues than indicators. Moreover, the interpretation of these figures should be developed to address the varying natural and socio-economic circumstances of European agriculture. Further on, the systemic correlations between the prevailing data sets were examined. Some sort of integration in the environmental problems of agriculture was found between the countries. The relationships between the ecological and socio-economic indicators were however rare. This means, that current selections of socio-economic indicators are actually acting as general presentation to agricultural sector rather than any particular driving forces for environmental change. The findings are however preliminary due to the limited nature of data materials. More important is that the study raises a question whether indicators are appropriate tools for examining the performance of agricultural systems. Deeper understanding will be necessary about the underlying mechanisms of the change than indicators are able to express.

4. Conclusions

There appears to be several ways to use the indicators. The way of utilization needs to be accustomed according to the current needs of the situation. Table 1 illustrates the antipodes for the use. The appropriate model for utilizing indicators in strategic planning of natural resources appears to be closer to the communicative use than technical use.

Table 1. Alternative functions for the indicators in a decision-making process

	Technical use	*Communicative use*
1. Role of indicators	Tool for achieving certain goals	Tool for managing change
2. Purpose	To assist the management processes	To assist the social learning and interaction
3. Selection of the parameters	Fixed	Resilient
4.Interpretation	Emphasis on universal explanations	Contextual explanations
5. Process of information transfer	Linear	Multiple
6.Power aspects	Closing of the discussion. Stabilisation of existing institutional structures	Opening of the discussion for new information and for alternative interpretations. Empowering of the stakeholders.

In a complex policy context such as natural resource management indicators are foremost *communicative tools for demonstrating issues that are already known ones*. Successfully used, indicators may be tools for crystallizing the key of information flows. This kind of simplification is essentially needed to manage the currently expanding information flows within the limited resources of decision-making, Simplified information of indicators facilitates also the communication between people who have various professional background. The reduction of the information flow is, however, also the major restriction of the approach. For instance in the case of qualitative issues or while the system properties are examined much broader information basis will be needed. Under question is also to use indicators for analytical purposes as the measurements with predetermined nature are quite unlike to provide some new and novel insights.

Contrary to technical use of indicators the *circumstances of information utilization* need to be emphasized in a complex policy context. Rather than designing some universal indicator sets the efforts need to be placed on incorporating measurements into the specific informative needs of each situation (Pastille consortium 2002).

Critical point of indicator's approach lies also in making of the *interpretations*. In policy context, the measured data itself is unlike to "talk" unless it will be placed into certain context of interpretation, which is spelling out the meaning of presented data. This is essential for information to have impacts on the policy choices and for creating the expected added value.

Finally, there are also *power aspects*, which should be noted for. The dual nature of indicators makes these tools appropriate for empowering of the stakeholders but also capable for establishing of certain problem definitions and closing off the conversation from any alternative viewpoints.

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Swot Analysis of a Reforestation project with *Caesalpinia spinosa* in the central sierra of the Huacar District (Perù)

Bernardini C., Contini C. and Omodei Zorini L.

Objectives of the Project

- Full exploitation of *Caesalpinia spinosa*'s potentiality as a cash crop
- Rising family incomes and diversifying income's sources
- Improving environmental conditions (especially with regards to erosion)

Caesalpinia spinosa is a hardy species, endemic of the area. It grows in symbiosis with nitrogen-fixing bacteria and it is able to consolidate instable slopes. This plant is traditionally used by the local community as firewood, medicine and forage.Recently, the products derived from *Caesalpinia spinosa* (tannins, colourings, oils and rubbers) are becoming established in the international market, thanks to the growth of national industries which process the fruits.

Project's State of Realisation

The productive phase has not started yet, even though 3 years (which were considered to be enough for the fructification) have already passed from the beginning of the project.

- 30% are abandoned plots. No improvements concerning incomes or environment protection are expected
- 28% are plots whose conditions are sufficient to keep alive an adequate percentage of plants. Moderate improvements both in family incomes and in environmental condition are expected
- 42% are plots with optimal phytosanitary conditions and vegetative strength. Significant improvements both in family incomes and in environmental conditions are expected

Methods

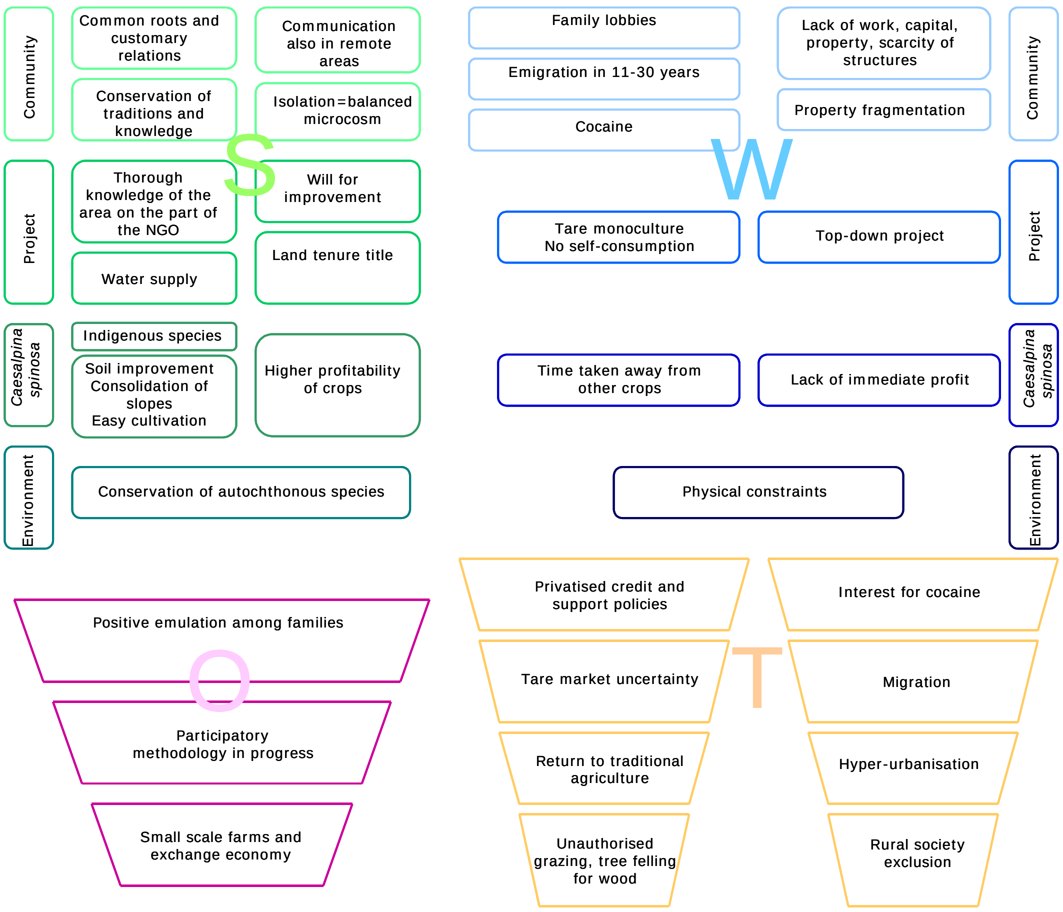
- Three month's stay in the area, participating to community activities;
- carrying out questionnaires with all the families (45) involved in the project;
- meetings and discussions with different stakeholders in order to verify the problems highlighted during the interviews.

Results

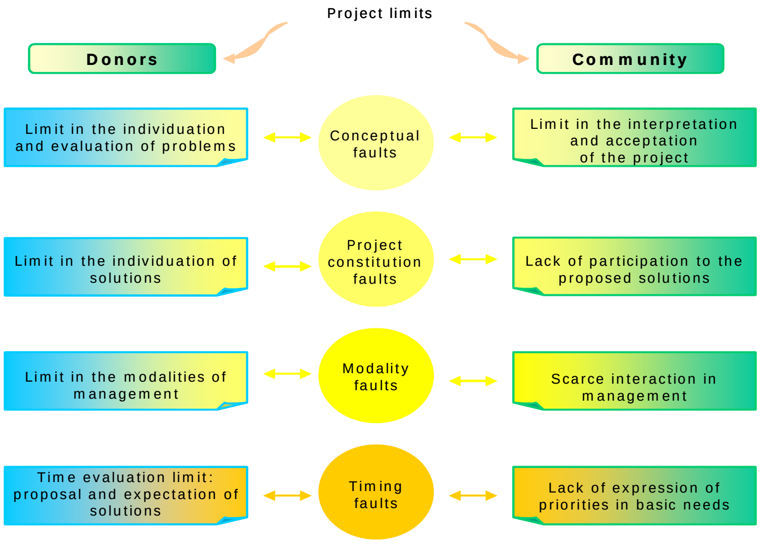
Weight of farm and off-farm income (%) on the total family income

Class	Off-farm income	Farm income
Rich	85	15
Middle	77	23
Poor	36	64

The SWOT analysis identifies the strengths and weaknesses of the project, in support of the identification of future actions, able to achieve the optimal use of the opportunities and the control of the threats.



Discussion



The real strengths of the project are the beneficiaries themselves.

The solution of the problems should be shared both by the managers of the project and by the local community. As ready-made solutions, suitable for all the situations, do not exist, it is essential that beneficiaries and donors determine the conditions for a good communication and a full participation. In case the project will succeed, the income growth will be particularly relevant for poor families, whose income is strongly dependent on farm activities. Indeed, poor families are the ones who have supported the project with the highest involvement.

Study on Productive and Economic Indicators in Two Types of Sheep Farms in Bulgaria

Dimitrinka Kuzmanova, Doytcho Dimov[*] and S. Chipeva[**]

Summary

This study attempts to establish and evaluate some productive, margin and expenses characteristics in two types sheep farms in lowland's areas of the south part of Bulgaria. Data were collected using a survey of 21 farms divided into two types: without take on a labourer and with take on labourer. Statistical analysis was performed and mean, standard error, minimum and maximum of productive and economical indicators of the farms were calculated.

The result indicates good milk yield per lambed ewe 117.85 l and 97.16 l, respectively for the first and second type. Flock litter size of two types of farms is similar (1.45 - 1.46). The weight of the sold lambs vary between 16.77 and 23.98 kg which determine market demands for light carcasses. It was find out that gross margin per lambed ewe was one and the same 31.12 - 31.42 €. Gross margin for the farms of type 1 was 956.43 € per flock and second type of farms provides gross margin from sheep farming were 2760.26 € per flock.

Key words: sheep farms, productive and economic indicators.

Introduction

Sheep farming play very important role in social and economical live of rural areas in Bulgaria. In lowland and mountain regions exist grate diversity of production and farming systems with sheep component. Unfortunately, nowadays most frequently skepticism predominates about perspectives of these systems especially small farms. In many production systems are included traditional practice at sheep farming with low degree of electricity and fuel consuming technique. Traditional production systems lately show distinctive characteristics with respect to others, mainly in the capability of quality livestock productions. These systems must also provide a balance between the animals and the grazing resources (Escribano et al. 2003). Till now there is no unprejudiced scientific analyze of existing sheep production systems concerning, productivity, profitability, social justice, preservation of agrobiodiversity and environment.

The aim of this study was to find out some productive and economical indicators of sheep farms in lowland region of Bulgaria and to estimate perspectives of sheep farming.

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Materials and Methods

The analyzed data belong to dairy sheep farms scattered over the Plovdiv region in Bulgaria and they were recorded in 2003 with in the framework of larger study on sheep production systems. Data were obtained from direct questionnaire carried out with responsible person for study dairy sheep production systems. The farmers were visited three times per year. Ewe numbers, lambings and other production facts were recorded during the visits. Database included 30 farms, but all basic information was available only on 21 farms and those were retained for this study. The farms were localized in a homogeneous soil and climate lowland's area. They were divided in two types: type 1 - without take on labourer and the other type 2 - with take on labourer.

The productive objectives of the analyzed sheep farms were milk and meat production. Milk is mostly sold to industry. Meat product is mainly lambs sold to the market as live animals.

Statistical analysis was performed and mean, standard error, minimum and maximum of productive and economical indicators of the farms were calculated. The differences between group means were checked using mean comparison by t-test. All calculations were made using the (9.0) version of the SPSS statistical package (SPSS,1999).

Results and Discussion

In the first type of farms the farmers keep their own herds, but sometimes they use the help of family members. In the second type of farms during the grazing period or the whole year the farmers take on labourer. From farming system point of view, all surveyed farms can be classified as "small holders" according FAO classification (2001). Two types of studied farms differ by the number of lambed ewes (31 and 89). Milk yield per lambed ewe was higher at farms type 1 - 117.85 l than the milk yield of the farms type 2 - 97.16 l. This result was lower than Sarda sheep framing system (Natale et al. 1999) but higher of Latxa dairy sheep farms (Gabinia et al. 1999). Flock litter size of two types of farms is similar (1.45 - 1.46). Lamb mortality and percent of empty ewes were higher in the second type farms. The weight of the sold lambs vary between 16.77 and 23.98 kg in two types farms which determine market demands for light carcasses

Table 1. Mean, standard error, minimum and maximum for productive indicators

Variable	Type of farm[1]	Number farms	Mean	SE of Mean	Confidence Intervals		t-test	2-tailed Sig. level
					minimum	maximum		(1)
Lambed ewes per flock	1	13	31.615	3.54	13	51	5.17	
	2	8	89.128	10.54	31	129		***
Ewe lamb, %	1	13	46.79	8.91	29,33	64.26	.797	.436
	2	8	36.08	9.11	18,22	53.93		ns
Milked ewes, %	1	13	75.48	3.33	68,96	82.00	.211	.835
	2	8	74.33	4.40	65,70	82.95		ns
Flock milking period, days	1	13	177.31	8.31	161,02	193.59	.110	.913
	2	8	175.88	9.54	157,17	194.58		ns
Milk yield per lambed ewe, l	1	13	117.85	6.08	105,93	129.78	2.285	.034
	2	8	97.16	5.90	85,61	108.72		**
Flock litter size	1	13	1.45	0.4	1,37	1.54	-.057	.955
	2	8	1.46	0.07	1,32	1.60		ns
Sold lambs per ewe	1	13	.87	0.03	0,80	0.95	-.927	.366
	2	8	.93	0.04	0,85	1.01		ns
Weight of sold lambs, kg	1	13	20.46	1.89	20,16	23.98	.543	.594
	2	8	19.05	1.16	16,77	21.33		ns
Wool yield per ewe, kg	1	13	2.88	0.09	2,70	3,07	1.555	.136
	2	8	2.64	0.12	2,40	2,88		ns
Replacement rate, %	1	13	24.16	3.07	18,15	30,16	1.203	.244
	2	8	18.35	3.60	11,29	25,41		ns
Abortion, %	1	13	2.21	0.56	1,12	3,30	-1.175	.255
	2	8	3.61	1.23	1,20	6,02		ns
Lamb mortality, %	1	13	2,12	0.46	1,22	3,02	-2.641	.016
	2	8	4.64	0.97	2,74	6,53		**
Empty ewes, %	1	13	1.24	0.41	0,44	2,05	-1.921	.070
	2	8	3.04	1.00	1,08	4,99		*

*,**, and *** indicates significant differences at the 0.05 0.01and 0.001 levels, respectively. ns - non-significant. [1]- type of farms: 1- without take on labourers; 2- with take on labourers;

Tables 2 and 3 lists indicators of margins and expenses expressed in euro (€) per lambed ewe and structure of different margins and expenses expressed in percent per lambed ewe. Sheep activity margin into the two studied types of farms was one and the same - 85.6 € per lambed ewe. The most significant sources of income were milk and lambs sales - 47.97 % and 34.50 % for the type 1 and 42.23 % and 39.53 % per ewe respectively for type 2. Other sources of income with less significance are culling ewes sold as live animals into the market which part vary between 4.27 % and 10.46 %, and subsidies with variation from 0.00 to 11.69 %. Some of the farmers did not receive subsidies during 2003. Usually farmers sell their sheep production as row materials: live lambs or adult animals, row wool and milk. Because of this fact the selling of hides provides non significant income of the flock.

Table 2. Mean, standard error, minimum and maximum for economic indicators

Variable	Type of	Number farms	Mean	SE of Mean	Confidence Intervals		t-test	Significant level
					Low	High		
Sheep activity margin / ewe, €	1	13	85.60	2.27	81.14	90.04	-.012	.991
	2	8	85.64	2.55	80.64	90.64		ns
Milk sales / ewe, %	1	13	41.97	1.63	38,78	45,16	-.107	.916
	2	8	42.23	1.61	39,07	45,39		ns
Lamb sales / ewe, %	1	13	34.50	1.42	31,73	37,28	-2.284	.034
	2	8	39.53	1.60	36,40	42,67		**
Culling ewes sold live / ewe, %	1	13	7.50	1.06	6,31	10,46	.827	.419
	2	8	6.96	1.37	4,27	9,65		ns
Wool sales / ewe, %	1	13	1.65	0.09	1,48	1,85	1.874	.076
	2	8	1.40	0.09	1,21	1,58		*
Yearling lambs sales / ewe, %	1	13	5.76	2.97	3.70	7,82	1.042	.311
	2	7	4.14	1.54	1,33	6,96		ns
Raw hide sales / ewe, %	1	13	2.17	0.84	0,89	3,45	1.976	.064
	2	8	0.67	0.39	-0,05	1,38		*
Subsidies / ewe, %	1	13	6.45	2.17	0.00	11,69	1.079	.299
	2	8	5.08	2.79	0,00	9,39		ns

*,**, and *** indicates significant differences at the 0.05, 0.01and 0.001 levels, respectively. ns - non-significant. 1- type of farms: 1- without take on labourer; 2- with take on labourer;

Table 3. Mean, standard error, minimum and maximum for sheep activity expenses

Total expenses / ewe / year, €	1	13	54.18	1.75	50.73	57.63	-.086	.932
	2	8	54.52	4.25	46.17	62.87		ns
Feed expenses / ewe / year, %	1	13	75.57	1.11	73,39	77,76	4.856	.001
	2	8	57.39	3.57	50,39	64,40		***
Labour expenses / ewe / year, %	2	8	22.05	2.96	10.54	37.21	-	-
Electricity expenses / ewe / year, %	1	13	5.70	0.43	4,85	6,55	1.075	.296
	2	8	5.00	0.42	4,17	5,84		ns
Water expenses / ewe / year %	1	13	4.54	0.43	3,71	5,38	1.889	.074
	2	8	3.38	0.36	2,67	4,09		*
Veterinary expenses / ewe / year, (%)	1	13	6.87	0.70	5,49	8,24	1.970	.064
	2	8	4.81	0.68	3,47	6,14		*
Shearing expenses / ewe / year, %	1	13	3.11	0.82	1,50	4,72	.533	.600
	2	8	2.47	0.77	0,96	3,97		ns
Cleaning expenses / ewe / year, %	1	10	2.40	0.45	1,63	3,17	-.719	.483
	2	8	2.84	0.40	2,06	3,63		ns
Transport / ewe / year, %	1	6	1.86	0.67	0.00	2,75	-.511	.625
	2	3	2.42	0.78	1,49	3,36		ns
Gross margin / ewe / year, €	1	13	31.42	1.75	28.04	34.95	.108	.915
	2	8	31.12	3.13	24.98	37.29		ns
Gross margin / flock / year, €	1	13	956.43	73.69	492.37	1634.69	5.11	0.001
	2	8	2760.26	345.01	1049.17	5550.07		***

*,**, and *** indicates significant differences at the 0.05, 0.01and 0.001 levels, respectively. ns - non-significant. 1- type of farms: 1- without take on labourers; 2- with take on labourers;

Feed expenses were the most significant in the two type of farms - 75 % for the type 1 and 57.39 % for the type 2. Labourer expenses for the type 2 were 22.05 %. Nevertheless sheep farming is low electricity consuming production, in this study expenses for electricity and water per lambed ewe were comparatively higher - 5.00 - 5.70 % for electricity and 3.38 - 4.54 % for water expenses, because these figures include household's electricity and water consumption. The sheep are kept in the farmyard of the farmer (this is distinctive character of Bulgarian farmers in lowlands) and it was not possible to divide flock and household electricity and water consumption. Veterinarian expenses vary between 3,47 and 8,24 % and in small flock they were higher. It can be seen that gross margin per lambed ewe in the studied types of farm was one and the same 31.12 - 31.42 €. Minimum and maximum values of this indicators vary between 24.98 and 37.29 € per lambed ewe. The number “Lambed ewe” includes lambed ewe plus ewe lamb. Obviously, comparatively uniform farming conditions (feeding, grazing, mating and lambing seasons) contributes to similar gross margin per ewe.

Two type of farms were rather different by gross margin per flock. Gross margin 956.43 € per year for the farms of type 1 is additional and reliable income for the old people who lived in rural areas

Second type of farms in this study belong to younger farmer and larger households having capacity to manage larger farm unit. Their gross margin from sheep farming were 2760.26 with confidence interval from 1049.70 € to 5550.07 € per flock.

It must be taken into account that other sources of income for the farm families (pensions, incomes from other agricultural and nonagricultural activities) in this study were ignored in order estimate the role and perspectives of sheep farming component in the farming activities in the rural areas.

Conclusions

From the obtained results it is possible to conclude that sheep farming is reliable source if income for the households in rural areas.

Gross margin of 31.42 € per ewe and 956.42 per flock in the farms of type 1 provides monetary income which is larger than income from the pension per year of older man. The farms of type 2 provides significant family income per flock - 2760.26 €, which provide security of the younger families in rural areas.

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Food Safety. Consumers' Reaction to a False Alert: Listeria in a French Cheese

Eric Cahuzac, Daniel Hassan and Sylvette Monier-Dilhan*

Main focus of food safety economics

- Impact of information, according its origin -scientific or not- on consumption habits
- Measure of the willingness to pay for a reduced food safety risk
- Voluntary versus mandatory approaches to food safety
- Impact of a crisis on consumption (mad cow for example)

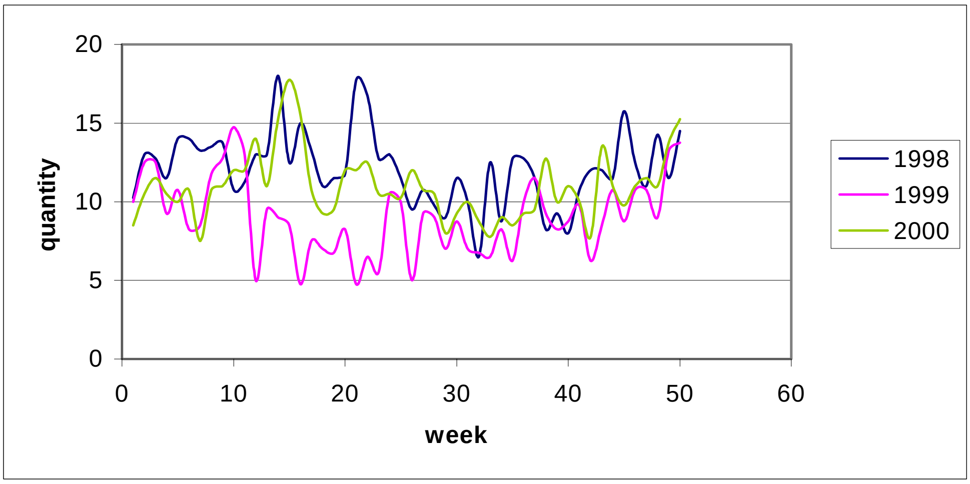
▬▶Listeriose is a **major risk** occurring from consumption of raw milk cheese, pork butcher, uncooked vegetables... In 1992, 250 people have been infected and 60 of them died, due to consumption of pork butcher.

▬▶Our study deals with a Listeria **false alert** which concerns a famous French raw milk cheese : the Camembert, a traditional production from Normandy, in the west of France.
The alert takes place in March 1999. Only one brand is accused, called "B" brand. Media coverage is first negative, giving substance to the idea of food-contamination. A few weeks later, it became positive and aims to clarify the true nature of the alert.

▬▶**Data** comes from the 1998-1999 French survey collected by a specialised firm, the Secodip. This dataset provides information on all purchases of Camembert. For each purchase, the brand chosen and the quantity bought are known, and for each household, several demographic parameters, such as age, household size and occupation are collected.

▬▶**Main results:**

- The crisis lasts for almost 4 months (14 weeks), which is important



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- It has a deep depressing impact on global consumption: -40%. During this period, the probability of leaving the brand grows up by 21% and reaches 66.4%.
- Each type of consumer reacts to the alert:
  - Big eaters are concerned; usually they never stand out of the market for a so long period
  - Education does not allow consumers to realize the false nature of the alert
  - Only people living in Normandy have a different attitude: the probability of deserting is 30% weaker, perhaps due to better information.

Abandon probabilities

Variables	Probability
In average	66.4%
Living in Normandy	37.1%
Consumption habit of "B" brand :	
Small	79.4%
Middle	52.5%
Big	22.2%

- The population at risk (specially the elderly) does not react differently than the rest of the population This result reflects the lack of scientific information concerning the disease.
- There is not "side damages" for pasteurised milk camembert and other brands of raw milk camembert.
- On the contrary, several consumers leaving B brand transfer their demand on other raw milk brands.

➡ These results are obtained using different **binomial and multinomial regressions analysis**.

Learning experience through theoretical, practical and experiential knowledge: a case study in North Tuscany (Italy)

Galli Mariassunta[*] and Bonari Enrico[**]

Given the complexity and different social perceptions surrounding the sustainable land management, the challenge facing science is to develop learning environments to better understand agri-environmental situations and to support effective decision-making through collective action.

The increasing focus on systemic approach – related to both social and physical systems - poses new challenges for researchers in providing a learning environment where to develop “the useful knowledge” needed to provide practical decision support (Allen, W.J., 1996).

The case-study area is placed in a mountainous area in the North of Tuscany (Italy), which has suffered a process of marginalization and abandonment of agriculture, even if it still maintains a residential function. In that sense the research’s aim was to identify the priorities of the local community to “requalify” the relation between environment and agriculture by the light of the current social conditions.

The choice of this topic was based on the researchers’ perception; in fact the first impression got from the case-study area was the compromised landscape, in particular the local complex architecture of olive terraces (***external perception***).

The research steps were the following:

1) acquisition of information:
    - the collection of information concerning the socio-economic transformation and the implications on the environment by the telling of the local “old” people, using individual unstructured interviews (Pieroni P., Galli M., Brunori G., 2003b; Galli M., Pieroni P., Brunori G., 2002)
    - the collection of the views expressed by local trade associations, non-profit associations and authorities representatives, using semi-structured interview.
2) elaboration of information: the quantitative analysis of interviews pointed out a high perception of hydrogeological and hydraulic risk among local actors due to the abandonment of the practice to keep well operating terraces (***internal perception***).
3) sharing of information with local authorities: on the basis of the priorities given by local actors, the researchers and the local administrators submitted a project to some institutions that could fund scientific research. The project’s aim was to organize a Territorial Information System in order to solve environmental problems and to help with land planning

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In order to re-equilibrate the relation between agriculture and environment, the main results obtained were:

1) to switch the attention from the external perception (aesthetical quality of landscape) to the internal perception (hydrogeological and hydraulic risk) in relation to the change in land management among all actors involved;
2) to raise funds for research activity - by submission of a project - that can be immediately transferred to the local administrations to solve the problems that came out.

In conclusion the case-study emphasizes a systemic learning process, combining three phases: “learning for knowing”, characterising the specific situation; “learning for doing”, identifying the priorities of the local actors, “learning for solving”, sharing with the local community a research activity useful to solve the problems (Galli M., Pieroni P., Brunori G., 2003a; van Schoubroeck F., 1999; Kolb D.A., 1984)

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Scenario development as methodological approach for defining vision for rural landscapes: case study southeast Portugal

Isabel Loupa Ramos*

European rural landscapes today face the challenge of finding a new rationality within the constellation of diverse, and sometimes conflicting, political and societal goals.

Landscapes understood both as natural and social features, are dynamic in the sense that they are shaped by societies along time according to the set social values and believe in force.

Among the policies with impact on rural landscape, Common Agriculture Policy (CAP) plays a fundamental role. More recent reforms by introducing non-productive goals brought confusion into the mind set of the agriculture sector used to think in terms of production and productivity.

This conflict became already evident with the introduction of the accompanying measures in 1992, when the sector got financial support, but missed to find a clear set of goals for new development models. Meaning, new agricultural or rural models ensuring economic growth, ecological integrity and social vitality and thereby setting an active contribution to the construction of new landscapes with sound socio-ecological relations.

The 2003 CAP reform goes one step further in this direction by proposing decoupling of payments and production. The impact of this policy, both in social and environmental terms, is not clear yet. There might be regional difference, but it will definitely threaten the maintenance of high nature value farming and shape European Rural Landscapes in the near future.

The reform also aims at reinforcing the second pillar of CAP through increased support to Rural Development (RD), nevertheless there seems not to be much consensus about the meaning and extent of the RD concept when it comes to make operational use of it.

Taking into account that there are countries that were not able to spend the already allocated RD funds and that it emerge doubts on its efficiency, at this stage, it becomes demanding to define how to guide the use of this instrument to the benefit of the rural landscapes.

In this context, this study argues that there is lack of coherence among policies, mainly due to a missing vision on rural landscapes' future and therefore it aims at proposing the development of prospective scenarios as a basis for the definition of the 'rural landscape *Leitbild*'. The latter concept is proposed within the German literature (e.g. Gaede and Potschin 2001). It is composed of two words – *leiten* (to guide) and *Bild* (image) - meaning (if literally translated) the 'guiding image', or the image (in terms of the final goal) that guides action towards its achievement.

In the specific framework of this study it is aimed to set a guiding line for the development and articulation of policies and policy measures towards the 'desirable' landscape as stated by the local population.

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The methodology used to define the *Leitbild* is based on the approach developed by Nassauer et al. (2000) for the study of the cultural acceptability as defined by Nassauer (1995) of innovative agricultural practices based on farmers' perception.

Thus the scenario design follows a 3 step approach: (a) definition of possible futures based on alternative objectives, (b) validation of the scenarios by an expert-panel (decision-makers and scientific community) and (c) visual simulation of scenarios on digital landscape photos. The resulting images are than used to perform questionnaires on local stakeholders asking for what shows, in their opinion, the best future for their community 25 years from now.

For the sampling of landscape images that serve as basis for scenario visualisation, the LUCAS grid is used, which covers Europe with a 18km2 sampling plan collecting biennial data on land use and land cover, environmental variables and landscape photos (Bettio *et al.* 2002).

So far the methodology is being applied to the landscape of Mértola (Southeast Portugal) using 6 points of the LUCAS sample. This region is suffering of severe desertification processes, understood in the wider sense of landscape degradation, meaning the loss of sound socio-ecological relations.

The results so far show the definition of 5 scenarios that aim at making the implication of alternative policy option apparent. The scenarios, named after its main function, are as follows: agriculture, forest, game, recreation and infrastructures. These scenarios are currently under validation by the expert panel. During the poster session, where the scenarios are going to be extensively presented, the participants of the conference are asked to contribute to the expert validation procedure by answering a questionnaire.

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Using a landscape scale to approach resources management and farm functions: the case of vanishing wooded structures and small ruminants itin erancy over the agrarian matrix

José Castro and Marina Castro[*]

Abstract

The agrarian policy of national governments and EU, practiced for decades, was part of a growth-oriented industrialization and economic policy. This had lead, among other things, to the loss of diversified rural landscapes, which had developed in the course of history; sites and utilization, both in area and time, tend to be standardized. As a consequence, not only habitats had been lost, which is documented by an increasing number of wildlife species threatened by extinction, but also a considerable number of domestic animal and plant species have become misplaced of their natural context, in despite of some of them have been artificially maintained last decade by compensatory issues of new "environment oriented" CAP.

Authors look upon two examples of threatened landscape process in three rural communities of Trás-os-Montes: (1) the vanishing punctual, linear and spatial wooded structures of agricultural matrix, and (2) the flocks' itinerancy of native sheep and goats. In the first case, the reduction in punctual (since 1950 by -50 percent) and linear (since 1950 by -75 percent) wooded structures, as a result of functional lack such as fencing, animal forage, summer sheltering, handcraft tools, etc could have consequences in many landscape ecological process (soil loss, hydrological disturbance, seed bank removal, fragmentation, etc.). In the second case, new perennial plantations of olives and chestnuts, resulting in several constraints to animals' circuits and forage resources availability, have disrupted traditional cereal open fields and spatial rotation. Implications for relationships of process on patterns in landscape dynamics, and incoherent consequences of financial support of some productions are discussed. The landscape scale has allowed the identification of some conflicts among environmental CAP issues for specific natural resources protection and the landscape functions in the farming system.

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Aspects of Interdisciplinary Research on Nature Quality in Organic Farming Systems

K. Tybirk and J. Fredshavn*

Abstract

The conflict between conservation of the rare and high quality nature and management of the common widespread nature is discussed based on the concept of Natural Capital Index. Nature Quality on farms should include considerations for both types of nature challenging the methodological research approaches behind.

Background

Organic farming is often considered an environmentally friendly alternative to traditional farming based on numerous results of a more varied biota in the organically grown fields. However, the expectation that organic farming favours land use and farm practises that supports ecosystem functioning and to a higher extent contribute to nature qualities (Stoltze et al. 2000) are thus generally not well documented. The EU regulations in Natura 2000 and Agenda 2000 provide a policy framework for planning at national and regional levels. The aim, however, of the two instruments is very different. Natura 2000 focus on the rare and threatened species and habitats, whereas the AES in Agenda 2000 provides tools for integration of nature considerations for the less threatened, common species and habitats in e.g. the agricultural landscapes.

Three major strategic issues need to be balanced in the considerations on nature qualities of the farmed landscape: Production interests, biological conservation interests and esthetical/recreational attributes of the landscape (Tybirk *et al*. 2004.). This calls for integrative research on agricultural systems, where environmental and other societal aspects are considered together with the production aspects in order to support a development encompassing the future demands on agriculture.

Objectives

The objective of this work is to identify and discuss the effects of conflicting and interacting approaches in interdisciplinary farming on nature quality. The research approach consider the use of the Dutch Natural Capital Index in order to combine the results from horizontal and vertical analysis on biotope, farm and landscape level.

Methodology

The fundamental difference in quantity and quality of the common and the rare nature in the agricultural landscape are exemplified by the Dutch concept of Natural Capital Index (van Hinsberg et al. 2002). The underlying principle is that changes of biodiversity can be measured as the product between the two components: i) *changes in number and size of habitats*, or "ecosystem quantity", and ii) *changes of ecosystem quality*. Ecosystem quality is measured relative to a baseline or reference situation, i.e. a

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relatively low-impacted ecosystem. The Natural Capital is defined as the product between ecosystem quality and ecosystem quality.
The Danish Research Council for Organic Farming (DARCOF) has founded the research project *'Nature Quality in Organic Farming – Localisation, farm practice, biological conservation, ecosystem functioning and landscape aesthetics'* started in 2001 (http://www.dmu.dk/1_Viden/2_Miljoe-tilstand/3_natur/nk-oj/default.asp). The project consist of a 'horizontal' analysis of distribution patterns of organic farms in Denmark and a 'vertical' analysis of specific interactions between farming practices and nature quality on both cultivated and uncultivated areas.

Results and discussion

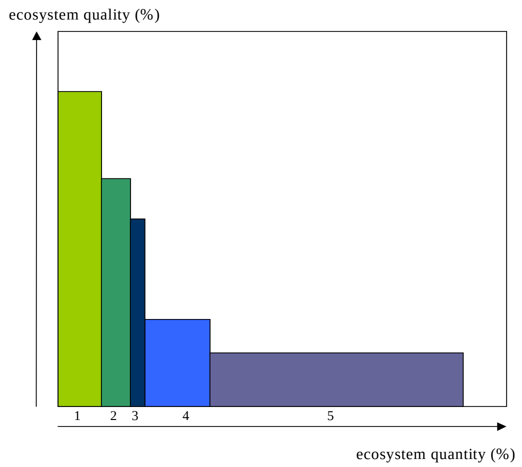

Figure 1. The principle of the Natural Capital Index (adapted from van Hinsberg et al 2002). Ecosystem quality and quantity exemplified for an intensive agricultural landscape. The different parts of the diagram could be: 1: permanent semi-natural grasslands, 2: permanent set-aside, 3: hedges and road verges, 4: extensive cropping areas (organic farming and other low-input farming systems), 5: traditional intensive agricultural land

Results of research from both approaches are now appearing and the great challenge is to combine such partial results through cross-cuttings. An example is that agricultural data on permanent grasslands registered on farms through a livelihood analysis (Frederiksen & Langer 2004) do not fulfil the data needs on grazing and nutrient applications through time to interpret detailed biological data on vegetation and associated arthropods.

The basic assumption of the work is, however, that specific knowledge on nature quality is not very relevant without the coupling to the production data and vice versa. This is a way to combine the two axes of NCI (Figure 1): The farmers understanding of the values of (biological) nature quality on his farm and the tools (e.g. Agri-Environmental Schemes) to take action to incorporate considerations for these values in his farming system. In this way, AES can help to improve the 'quality of the common' and NATURA 2000 can be focused on conserving and improving the 'quality of the rare' on a specific farm.

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Minifundios and Metropolis: territorial management of Organic Farming in Ibiúna (São Paulo, Brazil)

L. Santiago de Abreu* and S. Bellon**

Introduction

In spite of the growing demand in green vegetables from three main cities in São Paulo State, small-scale vegetable farmers are still facing economic problems. Subsequently, the maintenance of small farmers and families depending solely on agriculture appears as very difficult. Organic Farming (OF) is increasingly considered as a possible alternative for designing a "new rural" in Brazilian communities (Abreu, 2000). It is seen as an opportunity for economic valuation of horticulture products (root, fruit and leaf vegetables for salads). The existing demand for this type of product, together with favorable green market prices, especially during summertime, would both stimulate and propitiate an expansion in production (Assis, 2002). The consumer of organics also expects a product that has certified or guaranteed quality, and such standards are not yet fully stabilized in Brazil. Organic farming is also considered as a way to preserve environment; although this attribute is not always recognized by consumers. However, the ways small farmers adopt OF in new peripheral "green belts" (Ueno, 1985) to conquest a urban demand in organics have not been investigated extensively. We explored this issue with a case study in the wide community of Ibiuna, located close to three main cities of São Paulo state, comprising together 20 million inhabitants. This study shows how small farmers were organised or organise themselves to meet urban demands and develop organic production. It explores a diversity of development models of horticulture organic farming, based on four forms of social organizations which are characterized and discussed.

Study area and methods

The wide municipality of Ibiúna (1093 km^2) is presented as a tourist station located in the fringes of Paranapiacaba mountain, which grant it a temperate humid climate. It belongs to a Biosfera reserve, as it is formed by original Atlantic Forest vegetation. It also harbors environmental protection units established by state and federal laws (Ahrens, 2003). This rural territory is rich in strategic aquiferous resources, which provide not only irrigation water for vegetable growing but also feed the cities of Sorocaba and Ibiúna. Formal or illegal real estate building and development of activities such as pay-per-fish fishing resorts contribute both to lower quality and higher demand in water. Other activities also take place, either associated to country society's values (second homes, horse farming and horse-riding, ecological trekking..). Ibiúna (SP) attracts in average 20,000 tourists every weekend. It counts 64160 inhabitants; including 42979 in the rural zone. Farming is still considered as the basis of its economy (IBGE, 2000). The landholding structure in the territory is formed by small properties, where over 50% of all properties have less than 10 hectares of area. With such structures, horticulture is the prevailing agricultural activity, with a total vegetable crop area of 7728 ha (including 4096 ha of leafy vegetables i.e. 53% of crop area).

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Based on secondary data, we identified the number and location of organic farmers in Ibiuna. We then have focused our study on a micro-basin (Verava), where most of the organic farmers are located (72 organic/ total of 90 farms). We have interviewed a number of local social stakeholders, including: 12 organic farmers and 01 conventional farmer; 02 people in charge for a company that commercializes produce; 02 presidents of associations of small organic farms, 02 inspectors of certification organs; 02 Rural Office ("Chamber of Agriculture") technicians. We also discussed with political representatives (councilmen) of the local population, and with environmentalists.

Results

From the point of view of social forms of production, we have found a diversified socioeconomic universe. Today, we can identify in OF ***four*** basic forms of social organization that express *a priori* different concepts about the market and the organic farming. The first one is the oldest and congregates the majority of organic farmers: it has been a constant reference for all stakeholders interviewed.

The company's structural strength

The first form of insertion of farmers in the market is characterized by hierarchical relations between farmers and the company's officials, whose main goal is to occupy spaces in big supermarkets and possibly expand its space of commercialization both domestically and outside the country. It was legally defined as an association of small organic farmers, but it actually operates as an enterprise with private-capital company. A total of 130 farmers sell their products through this company, and a significant part of them, approximately 70 farmers, are geographically located in the Verava rural neighborhood, which is also a hydrographic micro-basin occupied by organic vegetable farming. This double configuration brings forth questions of organic-based-entities for environmental resources management.
The contract that rules the relationship of farmers with the company is based on a relation of exclusivity, meaning that farmers compromise to sell the entirety of their production to the cooperative, based on a previous production plan defined by the company. Inputs and technical assistance services are part of the production planning, and costs of it are paid by farmers; nonetheless, the company does not compromise to buy or sell the whole production. Products are sold on consignment, that is, prices received by farmers refer only to the part that has actually been sold, thus excluding transportation losses and remnants of production not sold to supermarkets. Costs are high and contribute to further burden farmers' profit. The certification process is carried out by a certifying institution chosen by the company, and paid by the farmer. Several farmers were initially certified by AOA (Association of Organic Farmers of São Paulo), and started being certified later by IBD (BioDynamic Institute), which is accredited by IFOAM. This production is clearly identified today in supermarkets in all major cities.

Associative form of horizontal relation, with a different productive and commercial positioning

A second form of social organization in Ibiúna is found in the association of 15 small farmers, where 08 farmers give assiduous precedence to commercialization through this association, and the others do not observe a very regular frequency. Therefore the relation of farmers with this association is not based on a contract of exclusivity, as was the previous company. This is a group led by one member farmer who chose, for ideological reasons, to create a new organization based on principles of exchange of experiences and information on daily problems of production and commercialization. This group, as opposed to the one mentioned above, prioritizes the definition of a "socially just" price both for producer and consumer, and the association keeps 10% of the commercialized value. It operates in a flexible and participative way, and is distributing produce to two large supermarkets and smaller points of sale. The group also operates with home delivery and sells to a consumer community organized in the outskirts of São Paulo that is connected to the Catholic Church base communities.

Integration through an existing cooperative

A third form of organization is being born, from the rupture with principles and practices as established by the first form of market insertion. This is the case of farmers from a same rural neighborhood who are worried with the low price paid for their products when compared to prices practiced in supermarkets. They seek to assure economic value for their production, and they hope to achieve this goal with the creation of an association of small farmers in the neighborhood. This association intends to integrate dissident organic farmers into a traditional and well known rural cooperative established in the region, so they will have support for produce commercialization through the cooperative's functional structure.

Persistency of individual, direct selling forms

The last form is classic and individual. It is represented by small farmers who sell their products in street markets and free spots of commerce in the city streets. They sell their products directly to consumers. This distribution seems incipient to us and was not closely investigated. We can also observe a diversity of forms of a wider organization, connected to world visions and systems of value that are different from all those presented above: these are biodynamic production systems. Commercialization is based on a net of consumers across cities in the state of São Paulo that keep geographical proximity. This system is characterized by a greater diversity of products (vegetables, fruits and dairy products) that are commercialized through direct sales in the production unit, or through home delivery.

Discussion and conclusions

Our field case study starts from the theoretical point of view that there are reproduction spheres that are socially structured and economically distinct in the contemporary rural universe, and that inside such rural territories there are social nets that articulate to one another, or overlap, but do not mingle (Carneiro 1999). This conception of the process of farmer's insertion in the market may propitiate and enrich understanding of that complex territory.

In the case of organic farmers in Ibiúna (SP), the space of articulation and action cannot be singled down to the municipality of Ibiúna, or to the circle of commerce and proximate relations in terms of geography (neighborhood and municipality), since those organic farmers keep relations with larger and more diverse nets either of market, or technical assistance systems, or certifications, as well as relations with urban consumers. Therefore, it seems we should consider this territory from the point of view of the expressions of multiple possibilities for the integration of farmers and development agents to the global society.

Although Ibiúna presents itself as a tourist station, its configuration is not essentially based on rural tourism. The Verava micro-basin has a dual status: horticultural production and resources conservation. That it also is in the organic horticulture activity that this rural territory can be original and even contribute with a relevant experience in the direction of a better economic position for farmers, as regards qualification and addition of value to products of this territory. The role of the Ibiúna municipality in organic farming development is probably more crucial with decentralization, and it differs from imposed citizen dynamics in peri-urban areas (in Lorda and Duvernoy, 2001).

The insertion process of farmers in the market also shows the lack and deficiency of public policy instruments for the support and strengthening of organic farming (Assis, 2002), and in general, of Brazilian familial farming. However, in spite of scarce resources of the Micro-basins Environmental Monitoring State Program, in this specific territory the program can be seen as an indirect financial support to local development: organic farmers have close relationship with environmental requirements and constraints, and these are regularly monitored by the certification body. This indirect support allows for an expansion of environmental practices, especially because there are conditions for the implementation of practices destined to recuperate soils and ciliary (river-bordering) forests, actions that improve the quality of water and natural resources. Farmers are open to the technological and environmental propositions contained by that project.

Some questions emerge from this study like clues for a deep research in this territory. First, it is necessary to reconsider the environmental issue as a constitutive element of those forms of organization. Secondly, it is necessary to analyze the meaning of the different forms of organization in terms of systems of values, which may be associated to an ethical dimension of the activity, since relations (direct sale) with consumers will likely contribute for the integration of new values; and it is also necessary to deepen this study so as to analyze OF's contribution for social stability.

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Subsided planted hedgerows as part of construction of rural landscape in Brittany (France)

Laurence Le Du-Blayo*

Objectives: Farmers effort for hedgerow planting is quite important since twenty years, but the evaluation is complexe and not properly carried out. The aim of this study is to analyse how farmers have taken part to the public policy of planting hedgerows and how it affected the construction of rural landscape.

Method: The research is based on a case study, the subsided hedgerows plantation in the departement of the Côtes d'Armor, in Brittany. As there is no statistic analysis of this policy, we have work on all files of subsides from 1988 to 2000: 5 547 files have been analysed, according to a list of criteria: who is planting, where, how long, what types of species etc. We have tried as much as possible to propose a spatial repartition of these informations, in order to understand the impact on rural landscape. This main reflexion at regional scale is completed with two case study where we mapped at local scale the evolution of the hedgerow network.

Context: The place of hedgerows in rural britton landscapes is very important. The density of hedgerow network in the Côtes d'Armor was around 326 meters/hectare in 1961, with a traditional bocage of very small fields enclosed with rather large hedges.
Hedgerow removal was necessary to improve agriculture and the density went down to 87m/ha in 1981 for the departement of Côtes d'Armor. Hedgerow removal has been very intensive with a regression of 73% of the network from 1961 to 1981, and often carried out without proper reflexion on the environmental impact on soil erosion or shelter for the cattle. As wood land is rather rare in this region (less than 10% of the surface) linear trees have also an important role as habitat for wildlife préservation. Hedgerow removal is a very important background to explain this politic of hedgerow plantation, although both are subsided with public stocks. Both participate to the idea of pushing farmers no improve agricultural landscape with enlarged fields and the construction of a new hedgerows network.

The subsided hedgerows: the first public aids for planting hedgerows started in 1978, but became realy efficient after 1991, when more money was involved in: from 1978 to 1991, the average hedgerow plantation per year is around 30km, and after 1991 around 150km. After the neighbouring department of Ille et Vilaine, where 200km of hedgerow per year are subsided, the department of the Côtes d'Armor is one of the first in France for this replanting policy. As a general result, 5m/hectare are planted every year.

Farmers participation: The programme is based on the individual will to participate: the local concil (commune) bring together the demands and all the files are transmitted to the departemental level, responsible of this policy. Around 60% of the cost of the hedges is subsided. Some technical aid is also provided to explain how planting.
This program is open to public plantations, but 96% of the susbides are undertanken by private people, mainly farmer. The average plantation is around 260 meters per person wich is not important, but the positiv aspect is the participation, around 500 people every year [|GRAPH 1].

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Where and what for ? The main results of this research is to analyse the spatial impact of these new hedges on landscape construction.
- **At regional scale**, the presence of new hedges is not systematic, as 20% of the commune did not participate to the program of subsided hedgerows.
We can analyse the density of planted hedgerow in comparision with the existing rural landscapes. There is obviously a strong correlation, as most of the hedgerows are planted where farmers work in a rather open landscape. The landscape units with very dense bocage mainly correspond to poor soils on granitic hills, where it wasn't worth improving the landscape structure: few hedges have been removed and it's nearly impossible to plant more. On the opposite side, where the agricultural potential was good, farmers have improved the landscape structure with land regrouping, fields enlargements and hedgerows removal since 1956. 80% of these communes then participate to the program of hedgerow plantation, but of course not in the same proportions: hedgerow removal when up to 3 750 km per year, when the subsided planted hedgerow was maximum at 175 km per year.

[MAP 1: total of planted hedgerows from 1988 to 2000 per communal surface on the departement of the Côtes d'Armor;
MAP 2: landscape units from landsat TM image on the department of the Côtes d'Armor
MAP 3: correlation of subsided hedgerows and land regrouping]

- **At local scale**, it's very interresting to examine where hedges have planted, and consequently what for. As farmers are free to plant the subsided hedegrow where they want, 1/3 of the new hedges are not in beetween fields but close to the farm buildings.

[GRAPH 2: localisation in fields or close to constructions]

The aesthetic motivation is very important and most of the farmers declare planting hedges in order to mask some buildings, have nice looking house and planted path.
This amenity purpose is also noticable trought the chose of species, wich are mainly ornemental species, without any correlation to the traditional hedges.

[GRAPH 3: repartition of species in the new hedges].

The official aim of the subsides for hedges is not so clear, but environmental questions (soil erosion, water polution, biodiversity...) are generaly consider as the main end. This is hardly achieve, as most of the 2/3 of the so called "field hedges" are in fact along the roads, or along the farm property border, but without taking account of the slope or the existing network. The analyse of the following maps show the evolution of landscape construction and the tendance due to the subsided hedgerows.

[MAP 3-4-5: hedgerow network on the commune of Plémy mapped from aerian photography 1952, 1966, 1998].

Conclusion: the role and place of hedgerows in the farms now is quite complex, and the landscape management must be adapted as shows the example of the Côtes d'Armor, where the policy slowly changed: no subsides for ornemental species, global planning, spatial data base...

[GRAPH 4 evolution of planted species
TABLE 1: new process for planting].

The Role of Consumer in Saving the Cultural Landscape in the Countryside

Leena Savisalo*

Abstract

Our environment is depending on the human activity. Its impacts are often unpredictable and deeply interdependent. Resistance for change among the inhabitants and other parties involved is reduced by participation and information throughout the planning. In the financial, technological, environmental and social points of view the changes in cultural landscape are to fix together. The 2000 Land Use and Building Act in Finland has given more opportunities to the citizen, in other words consumer of his or her living surrounding.

The purpose of the study is to observe and to evaluate participation in the land use process and the potential of civil activity in influencing the impacts of planning in the cultural landscape in the countryside.

The program is a part of Social Impact Assessment (SIA) that is one of the programs in communal land use planning. The information collected from the people is one part of improving the welfare in the living area. The new legislation has directed the authorities to give the inhabitants and other actors a more active role in the process and in this way bring long term sustainability and acceptability into planning.

The Act on Environmental Impact Assessment Procedure was passed in 1994 according to the EU directive 85/377/EEC from the year 1988. Finland has signed the ECE general agreement of the environmental impact influenced over the national borders. Apart from the environmental impact the research of the social impact has become more accurate. The civil involvement in the land use development is new issue after the passing of new legislation. The new activity of inhabitants is thought to reach the official communal and regional authorities.

"The regulations and rules have transformed into the learning of organisations, women organisations and extension in rural areas focusing on co-management, multi-stakeholder approaches and long term pro-active change" (Magnus Ljung, SLU, Sweden). The co-operation between farmers and other professionals in rural areas in order to increase social wellbeing beside environmental welfare is notable.

The mechanisation of the farm work, the decrease in number of farms and the bigger size of farms is leading to the need of better information to influence the living area. The population is quickly decreasing in many parts of Finland. At the same time the Southern areas of Finland are wondering how to plan sustainable long term welfare to the new consumers in the previous land available for building. Now the newcomers must settle down into the empty building reserves. In the Northern parts of the country problem is how to keep the land vivid and in the new suburb the problem is the same.

The study questions are: 1) What is the present situation and attitudes for landscape in the population. 2) The official vision of the communities' authority 3) The point of view of

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temporary population (summer / and other holiday makers) 4) The vision of new service based professionals (tourism, machine contracting or other side line entrepreneurship in the farm) in the countryside and in the new city suburb.

The Environmental and Social Impact Assessments are used direct evaluate the welfare of the inhabitants in the rural and semi rural areas. The extension and advisory quarters are significant in disseminating the multilevel knowledge. The results are neutral and possible to use without prejudice. The IT technology and media is supposed to extend the research to the consumers who are the opinion leaders and the decision makers in the working level.

See

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Susteinability and Diversity in the Production Systems of Rural Settlements in Brazil

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Objectives

In Brazil, starting from the last decades of last century, through the politics of Agrarian Reform, in response to a great progress of the social movements in the field, about 500 thousand families were established in rural settlements. In spite of this, the country continues with high indexes of concentration of land property. However, those establishments, considered as "social spaces in construction", have allowed the social scientists to study and to reflect on countless subjects.

This work, resultant from a research in one of these nuclei of settlements - the farm São Bento, in the municipal district of Mirante do Paranapanema, area west of the state of São Paulo - it had as a main objective to study the different production systems there existent, through a typology. In the settlements the possibilities of combination of the resources addressed to production are many, because the activities in many of that small landholder can only be addressed to agriculture or to cattle production and, in the case of a larger diversity, to both cattle and agriculture. As a result of that multiple production systems are found. Consequently, the sustainability of the systems and the maintenance of the family reproduction are noticed under different situations. It is observed although, that other factors contribute to the income diversity found, the sources for obtaining income are not necessarily agricultural, and they are, for example, retirements or pensions, jobs out of the settlement and government aids.

Methodology

Data sheets, having closed questions, were used to collect the data. Direct interviews of 54 small landholders (30% of the total) were randomly applied. In this questionnaire 23 socioeconomic and technological variables were selected for characterization and tipification of the production systems. On this group of variables, two multivariate statistical methods (Principal Components Analysis and Ascending Hierarchical Classification) were applied.

They allowed evidencing the likeness (or differences) among the individuals (small landholders) and bonds among the variables, as well as building the classes (types) of small landholders with the maximum of internal likeness and maximum differences between classes.

Results

Four tipological groups were identified as being representative of the diversity of the production systems of the settlements. They are: Small Milks Producers; Families with Low Production Dynamics; Medium Milk Producers and Diversified Producers.

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The "Small Milks Producers" are the majority group, with 30 individuals (55% of the sample). Their cattle income corresponds to more than 70% of the total family monetary income, and for 1/3 of them it is the only source of income. They have a good technological level with average annual production of 721 liters/ha-year. The average annual gross income of these families is R$ 6.065,00 (US$ 1.743). Incomes coming from non agricultural activities, such as retirements or pensions, are insignificant for this group, either for the number of families (less than 20%) or for the contribution to the family total income (around 20%).

In the "Families with Low Production Dynamics" (13 in the total) it stands out the importance of the retirements and/or pensions for the income composition (70% of the families), representing from 33% to 100% of the total income and average annual income of R$ 6.817,00 (US$ 1959). It was observed, also, that a significant part of the incomes originate from non agricultural activities (46% of the families), varying from 16% to 64% of the total family income. The complementation to these comes, fundamentally, from rudimentary milk production (average 500 liters/ha-year).

The group of "Medium Milk Producers" includes 3 individuals and they present significant milk production (average higher than 2.500 liters/ha-year), high values of grass capacity (average of 6,27 head/ha); bovine flock of medium size (60 to 150 heads) and average annual income of R$ 16.886,00 (US$ 4.852).

The forth and last group, the one of the " Diversified Producers" (8 families), is characterized by the importance of the agricultural income in the composition of the family total gross income (between 62% and 100%). All lots have agriculture, taking between 40% to 78% of the area. Everybody produces cassava, with low technological level. Half of the families produce corn, with average technological levels. More than half of the group (62%) leases lands or takes it in partnership, incrementing the productive area between 7% and 122%. The average gross income of the families in 2003 was R$ 15.116,00 (US$ 4.344). For 25% of the families (25%) the income coming from cattle production is important (about 50% of the total income). All the lots had grass, and 50% of them have grass in 65% to 83% of the total area. Over half of the families (60%) have a small milk cattle herd (between 15 and 30 heads), whose annual medium production is of 900 liters/ha and the grass capacity is quite low (0,87 head/ha).

Should be pointed out that the small landholder requires special attention for the effective success of a rural setlement. The State Government maintains, through the Fundação Instituto de Terras do Estado de São Paulo (ITESP), a technical attendance and rural extension team for this purpose. It is expected that the present work contributes to guide the activities of the team in the search for the sustainable development of the rural settlements.

Coordination of farmers activities and land use patterns: from single-scale management to multi-scale management

Mathieu Capitaine*, **Jacques Baudry**** **and Marc Benoit***

The farmers as landscape managers

In France, as in other countries of Western Europe, agriculture plays a major role in changing landscape, because agrarian land covers as much as 60% of the total land area. Farming activities are the main drivers of land use patterns and landscapes changes. When making decisions on land use, farmers take into account their own prospective as well as informations coming from collaborations with other farmers, advisers, etc. and family objectives. Productions and their relative importance, farming methods and also cropping patterns are important points of the decision process. The results, land use allocation, is seen in fields and landscapes.

Farm territory characteristics (fields characteristics and spatial distribution) and land use allocation decisions are the joint factors of the land use spatial pattern.

The standard view of a farmer running his/her farm is more and more overridden by the view of farmers organised in groups to buy machinery and to help each other in their activities. This necessitates a decision process at both the farm and the farmers group levels. The objective of our work is to understand how this multiple scale decision process influence land use and landscape patterns within small regions.

Farmers organisations and technical coordination

There are various forms of cooperation among farmers from informal networks to cooperative for production.

In France, a specific cooperative network was developed after the Second World War. They are cooperatives for the common use of farm implements (CUMA = Coopérative d'Utilisation du Matériel Agricole). It was created to reduce the costs of the farm mechanisation; but it is also a professional work group. CUMAs allow to compensate the increasing lack of work-force in farms thanks to organisation and, especially, realisation of farming work in common. Not only are equipments mutualised, but also working forces and skills. There is a real technical coordination which allows to share efficiently farmer's resources. The CUMA is, as the farm, a decision making and operational entity (decisions are taken and carried out by the same operators).

The necessity of technical coordination varies according to:

(i) numbers of people, of equipment and competences to be mobilized to implement an action or a technical operation. A mowing operation only requires a driver and a tractor, whereas a silage operation requires during its most active part, an silage harvester, a minimum of two trailers, three tractors and corresponding drivers. Agricultural activities carried in groups, particularly harvesting, need more technical coordination than individual activities.

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(ii) time constraints disposition (period) and shaping (duration) of a favourable temporal frame, is also primordial in the technical coordination. Winter activities benefit from a large temporal flexibility owing to a weak competition between activities during this period. Activities can be spread over time and therefore minimise the need for coordination. On the contrary, an activity which takes place in the summer as wheat harvesting does not benefit from the same flexibility, for it competes with other activities (grass regrowth haying, milking, etc.). The available temporal frame is reduced and requires coordination between activities, and also for the realisation of the activity itself (pressing, simultaneous straw collection with two tractors, a press, a trailer and two drivers). Finally, frequency of activity also has an influence. Being in a CUMA for a selective activity such as weighing animals does not have the same implication as carrying a daily activity (e.g. feeding animals).

Technical coordinations have a spatial projection

We make the hypothesis that the field pattern is an important factor for technical coordination. The latter includes a coordination on land use allocation to fields within the set of farms. Three sets of variables are taken into account in the organisation of the work (i) field characteristics as size, shape, type of access (sunken or tarred road), distance, topography, (ii) machinery characteristics (width, height…), and (iii) modes of the financial cost evaluation of the work (on the basis of an hour, hectare or tonne) or modes of functioning. Available land for a given activity will either be reduced or enlarged when decisions are made within the cooperation. Technical coordination can therefore have an influence on land use allocation. Thus, the technical coordination has a spatial projection : the land use coordination.

A survey design has been set to test this hypothesis, which is supported by a survey of CUMAs and of their adherent farms. The aim is to reveal CUMAs organization (functioning, management, decision rules) and then estimate its role as land use spatial organisation agent of farms. The employed method is applied to silage and crop harvesting situations (farming activities which need more coordination) for which we collect organisation forecast (dates, progress, location, contributors, planning documents). We follow farming work while in progress to analyse the discrepancies between actual and projected work. Having identified and measured the gaps between forecasted and realised action, we try to determine how and on which occasion land intervenes. The work mobilizes three types of tool : (i) field pattern maps, (ii) crop successions and grassland management statements, and (iii) involvement of equipment and labour schedules. We choose these three tool types in order to register, visualise and compare, in time and space, CUMAs activities.

Framework for assessing the Sustainability of Agricultural Systems: the SAFE concept

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1. Introduction

A large number of national and international institutions has recently put effort in the design of sets of so-called agri-environmental indicators. Most of these initiatives are restricted to the environmental pillar of sustainable agriculture, and indicators are more or less arbitrarily selected. In agriculture, unlike forestry, remarkably few efforts have been made to develop a generic, conceptual framework of Principles,Criteria and Indicators (PC&I) of sustainable agriculture .

2. Objective

To develop a consistent framework of PC&I for evaluating the sustainability of agro-ecosystems, referred to as the SAFE framework.

3. Methodology

SAFE is situated in the evaluation path of sustainable development (fig 1). The SAFE analytical framework defines hierarchical levels to facilitate the formulation of sustainability indicators in a consistent and coherent way (fig 2). After definition of principles and criteria, indicators serve as actual measuring tools of sustainability at three spatial scales (field, farm and landscape). A core set of indicators is selected following elaborated criteria concerning quality and cost/benefit ratio of the proposed indicators. The proposed methodology is tested on four experimental farms (see practical poster).

4. Results

Table 1 lists the principles and criteria defined for the environmental, economic and social pillar of sustainability. Indicators are proposed for each criteria, but are not shown due to limited space.

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Framework for assessing the Sustainability of Agricultural Systems: the SAFE concept - Preliminary Results

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1. Introduction

A methodology (SAFE) was developed for a consistent and holistic sustainability evaluation of agricultural systems. This methodology defines a framework of principles, criteria and indicators that serves as a structured evaluation tool (see theoretical poster).

2. Objective

To test the methodology developed in SAFE. Indicators are selected for the different principles and criteria. These indicators are quantified at three spatial levels using detailed management data and other field data.

3. Methodology

Experimental sites:
Four farms are selected that are situated over different agricultural regions in Belgium. Different regions, land-use practices and soil types are covered by the range of selected farms. Figure 1 shows the geographical situation of the farms in Belgium and a table is inserted which gives an overview of some characteristics of the farms.
Data collection and management:
Data collection is done through field work, interviews and literature research. Data management is performed in dBASE and linked with geographical information system for spatial evaluation and visualization
Indicators, verifiers and calculation:
The following indicators are presented:

- **Pesticide use** (g active substances/ha): entire applied dose of active substances present in herbicides, insecticides, fungicides, growth inhibitors, dressing powder and seed coatings.
- **Occurrence of earthworms** (ton/ha and number of species/parcel)
- **Soil perturbations** (number of treatments): number of passages by tractor with working tools
- **Humus** content in topsoil (%): organic carbon content, determined on mixed soil samples at 0-15cm.
- **Organic matter input** (kg C/ha): organic amendments, plant residues and intercropping.

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- **Direct and indirect fossil energy input** (MJ/ha): direct fossil energy is the energy input in the agricultural system under the form of diesel, electricity and lubricants, indirect fossil energy is the fossil energy required to produce and transport inputs like fertilisers, machines, seed and pesticides.**4. Preliminary results and future work**

Two amoeba figures are inserted for visualization of the results. The amoeba show the indicators for respectively parcels under grassland and arable parcels. There are clear differences between parcels of different farms and crop. Future work will be oriented towards aggregation of indicators which allows sustainability scoring of parcels, farms and landscapes at the level of principles.

Find your way to rural landscapes: contributions to integrated approaches for landscape analysis and management

Pinto-Correia T., Breman B., Dneboská M., Doorn A. van, Ferreira A., Horst E.ter, Oliveira R. and Ramos I.L.[*]

This poster aims at presenting the approach developed within the research group DYNAMO, located at the University of Évora, and dealing with the dynamics and management of rural landscapes. This approach is being developed by an interdisciplinary group, within the scope of several research projects and applied studies for national and local customers: CapLand (Integrated Landscape Management in the Municipality of Mertola: new parameters for the CAP management), VISTA (Vulnerability of Ecosystems Services to Land Use Change in Traditional Agricultural Landscapes), EUROLAN (Strengthening the Multifunctional Use of European Land: Coping with Marginalization), ELCAI (European Landscape Character Assessment Initiative), Landscape Character Assessment in Action, BioHab (A framework for the coordination of biodiversity and habitats), Ribeira Grande – managing rural landscape for man.

During the last decades, the farming sector and its role in most European rural landscapes has been under strong processes of change. As a consequence of these various processes, farming does not anymore secure the preservation or simple management of many landscapes, which at the same time are considered valuable for many other functions they support: conservation, environmental balance, identity preservation, life quality, culture, recreation. Thus, the increasing expectations for the multifunctionality, not just of farming, but mainly of the connected landscapes, ask for new approaches that integrate farming and the related stakeholders and policy instruments with these other functions of rural landscapes. There is a need for the understanding and evaluation of these functions and of new forms of rural landscape management, taking into consideration the new conditions faced by rural areas.

The required analysis and understanding aims to be the role of DYNAMO, which tries to integrate various perspectives, not just for the analysis but also for the design of rural landscapes, seen in a dynamic perspective. As such, the scope of the work in this group is within the study and understanding of rural landscapes, their character, their multifunctionality and their changes, the changes in land use and land cover, the role and involvement of various stakeholders, as well as the evaluation of policies and instruments for management, and related proposals.

Most of the work is developed at a case-study level, integrating assessment of land use and landscape changes with stakeholders interviews. Some of the projects have the following objectives: understanding the reactions of different types of landscape users and managers to the changes occurred until now, as well as their expectations for the future; evaluating how the support for multiple functions does change in a local landscape when the land use pattern changes as a consequence of transformations in the farming sector; evaluating the process of land abandonment at the farm level: when is land really abandoned, what are the causes for it, what are other uses of land abandoned for agriculture; defining proposals for the design of instruments within the Common Agricultural Policy in order to better take in

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account the mentioned multifunctionality of the rural landscapes in concern; creating innovative design alternatives of local landscapes in the future.

But also some projects demand a more large scale approach. There is for instance one project dealing with the evaluation of the process, or processes, of marginalisation in rural areas, in a first phase at national level. And another dealing with methodologies and uses of Landscape Character Assessment at various levels, and comparing approaches developed in different countries and regions.

The different projects mentioned above are related to each other as they cross each others scope and concerns, or are applied to the same areas, or use similar methodogies. The main aim is to develop approaches which take in account the complexity of rural landscapes and of the relations established by different people, with different roles and positions, with these landscapes. Even if each project does not deal with this complexity, it tries to integrate in a framework where the various components and factors of rural landscape analysis are considered – so that it can be identified what the project contributes to, and what could be complementary studies, how the knowledge acquired could be used, etc. The philosophy of this group is mainly to produce research which may be used in different ways for a progressively more integrated and aware management of rural landscapes.

DYNAMO deals mainly with landscapes, but rural landscapes, and thus also with farming and with people. As a consequence, it was considered relevant to present the group in the framework of this Symposium as, looking at its subject and scope, it became clear that there may be many bridges and connections to establish with other projects dealing with farming and society and the challenges they face today in *learning to manage change.*

Tools of assessment and monitoring for sustainable agriculture in mountain areas. An experience in Alps (France , Austria, Italy, Switzerland)

S. Petit, L Dobremez, K. Steininger, O. Roque and P. Fusani*

Objectives

To present a multi-method approach of sustainability combining inter-discipline insights (ecology, agronomy, sociology, economy, geography).
To highlight the processes and key factors related to the local implementation of action plans in favour of sustainable agriculture.

Background

The current challenge faced by farmers and actors in agricultural sector in Alps is to render the concept of sustainable agriculture into operational action plans adapted to mountain agriculture.
The multifunctionality is recognised as a key factor of sustainability. The construct of multifunctionality requires to bridge the farm level with the territory level and develop the related and needed scientific analysis and tools for action.

Four pilot areas across the Alps decided to build a partnership between actors and researchers responding to the new challenges faced by agriculture of multifunctionality and sustainability. This partnership is concretised through an European project of research and demonstration so-called IMALP "Implementation of sustainable agriculture and rural development in alpine mountains".
These pilot areas are considered as "laboratories" of sustainable agriculture, and the project is implemented through 4 key phases:

1. In each pilot area, a local group involving farmers, elected officials and civil society is constituted.
2. Action plans for sustainable agriculture are discussed and designed by the local group, then implemented.
3. The impact of action plans at the 3 levels is evaluated by an interdisciplinary team of scientists and experts.
4. Methods and tools to disseminate the results are proposed.

The main problems regarding sustainability of agriculture in these areas are :

- environmental: manure pollution, odours nuisance, quality of countryside landscape to be maintained.
- economic: agricultural income remains lower
- social: overloads of work, farmer feeling themselves as at the margin; living in remote areas.

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Methodology

Two approaches:

1) An analysis of the processes (characterising changes in progress and the role of action plans within process of change). This analysis is based on 2 methodologies:

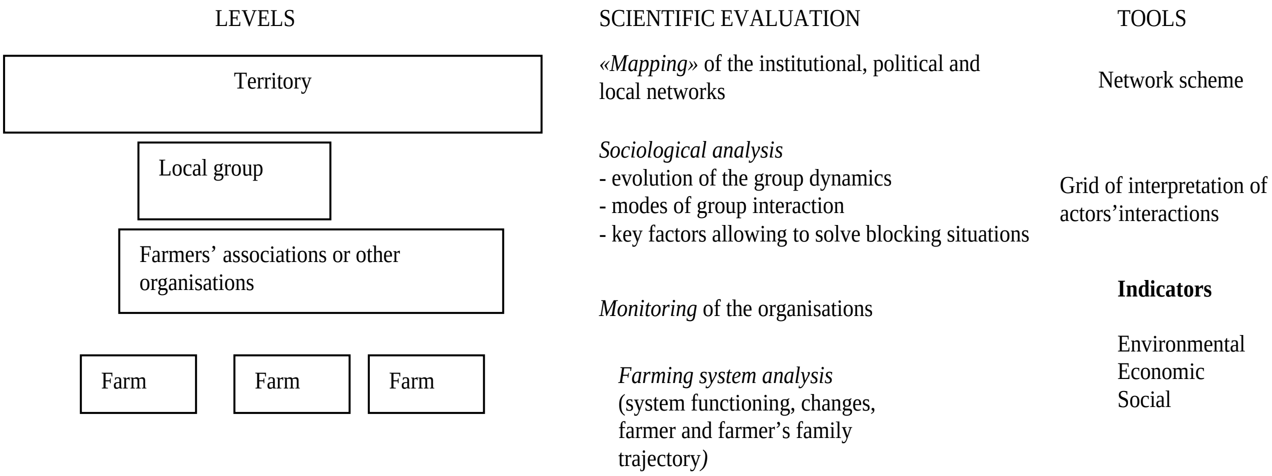
- a farming system analysis : assessment of farm sustainability according to (i) farmer's objectives, constraints and assets (characterisation of farmer's strategic choices) and (ii) territorial objectives; characterisation of the process of change on the farm (links between strategic choices, actions, context and consequences).

The on-farm survey is conducted as a semi-directive interview with room for the farmer to express himself and explain his practices and choices.

- sociological analysis of actors processes in terms of governance and sustainability at local and territorial level. The objective is to evaluate the capacities of the local group members to negotiate in a collective way a broad agreement about the goals, the rules, and the means of change towards sustainable agriculture.

2) Development of a set of indicators as a quantitative or semi-quantitative measure in terms of sustainability of the local agriculture.

The objective is to track sustainability progress through a set of indicators that will be interpreted in relation with the analysis of processes.



Results of the study

In the poster, we will present several examples of results and tools elaborated to evaluate sustainability and multifunctionality of alpine agriculture.

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Communal Land Use and Management Systems in Northern Portugal

Sónia Ribeiro, Artur Cristóvão and João Galhano

1. Introduction

The participation of communities in the management of the local resources has an important role in rural development. This study characterises the participation of a local community in the process of managing common lands, namely the motivations and the involvement of the commoners (members of the user group) in decision-making, and the degree and nature of participation. We focus on types of participation and we describe how the local community uses the territory and how the commoners act in order to intervene on resources management.

The commons in Portugal

The common property in Portugal has existed since ancestral times. Actually the management of the commons in Portugal are based on legislation established in 1976 (laws 39 and 40) and the law 68/93. The law from 1976 represents an important shift in the history of the common lands in Portugal. After this period, the state gave the possibility of management and ownership to the commoners. In this law, the commoners can choose between two types of management, one with direct intervention of the government (modality B), and other with responsibility of management exclusively by the commoners (modality A).

In Portugal, there exists about 819 commons that are managed according to the different systems.

2. Methodology and objectives

This case study takes place in the common land unit "Baldio da Ermida", located in the Gerês mountain of northern Portugal, inside Peneda-Gerês National Park. The *Conselho Directivo de Baldios* (CDB) is the structure that has management responsibility and the chosen modality A. The management of this common land is exclusively by the CDB, even if this unit is located inside a National Park. We have interviewed (5 qualified informants) and questioned the commoners (43 families) with the following objectives:

1- Characterise the community and their uses in the common land
2- Characterise the participation
3- Identify the organizational problems and issues.

3. Results and conclusions

1- Community and their uses in common land

The commoners are people living in Ermida rural village that have about 60 houses. They work in services like, construction, tourism and forest exploration. The village is surrounded by common land and the improvement of their natural resources directly affects their lives.

This common land, in 2001, was used by 218 commoners from 43 families. The most representative activities performed by these families were: ruminant grazing; shrub gathering; firewood collecting and water use. The grazing is the most important activity for the commoners for this unit. In Ermida, there are 616 goats, 61 cattle and 2 horses. The firewood is also important, 32 of the 43 families say that firewood is collected very often. The findings indicate that the commoners collected 100 tonnes of firewood per year.

2- Participation

The commoners have a strong sense of stewardship regarding the "baldio" and participate in different ways, more or less actively depending upon the situation and decisions at stake. In addition, it is clear that some individuals have been more permanently involved in the leadership positions and access to such leadership has been closed to others, due to various factors.

3- Organizational problems and issues.

In Ermida village, the property rights for the common property regime is very well specified and, by definition, exclusive to the commoners. The commoners have their rights assured because they receive appropriate legal support from the government and, normally, they try to regulate the access to the natural resources. This communal organization establishes rules and punishes the members that neglect the "logical use" performed by secular rules. This approach prevents an overuse, but also promotes conflicts. The existence of these rules attempts to avoid "the tragedy of the commons", but this organization has other issues.

One important issue is the **new-users** of the common land. A recent problem associated with the new-users is the grazing of horses grazing, they are not a traditional livestock and, in most cases, they don't belong to the commoners of Ermida. Another problem is the new motorized leisure vehicles (example 4x4) that are being used, but do not fit the traditional rules. For these new issues, the commoners lack the ability to improve and implement new rules by consensus.

The **decision-making** is another issue that can affect the success of the communal organization. In general, the decision-making depends on the immediate necessity of funds to improve village infrastructures. For example, when the commoners need funds to build a new road, they decide to harvest some trees in order to get the necessary funds. This logging decision normally is made without technical preoccupations and dismisses woodland characteristics.

Another problem in the context of decision-making is the inertia of some elements of the community, namely the time for the decision. This important phase of community organization depends on a few commoners. This fact increases the lack of transparency and can justify that some members don't trust the community management. The inertia of commoners can be identified as a main factor that may lead to tragedy.

This communal system of resource management will persist if both; the "logical use" is consonant with the commoners rationality and able to generate direct benefits for the commoners. For continuity of this system, the management should have one systemic vision.

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Disentangling marginalisation processes in rural Portugal

Teresa Pinto Correia and Bas Breman*

Introduction

This study has come forth out of the European EUROLAN-project which focuses on the processes and the consequences of marginalisation of agriculture and rural areas in various European countries. One of the countries where such an analysis of the situation concerning marginalisation took place was Portugal.

Although marginalisation is not a new phenomenon it is believed that nowadays, partly also as a consequence from changes in the Common Agricultural Policy, the extent and the speed of the process in Europe, as well as its socio-economic and ecological consequences, are being strengthened. At the same time though, the concept of marginalisation can also be confusing due to the fact that it is used to describe a wide range of processes with often very different origins or outcomes.

During the ´80s and the ´90s there have been several attempts to disentangle the concept of marginalisation by describing the process on different scales, in different regions of Europe and with different outcomes. We believe that such a disentangling of the concept is crucial in the sense that it leads to more detailed understanding of the various ´faces´ of marginalisation and can thus help to influence the process and its consequences.

Based on the outcomes from the Portuguese analysis for the EUROLAN- project we would like to add a new element to the discussion on the concept of marginalisation.

Methods

To get to grips with the concept of marginalisation in Portugal, the first step in this study has been a thorough analysis of the existing information and discussion on the topic of marginalisation, first of all in the Portuguese discourse but also in a wider European context. During the next step, several indicators (both bio-physical and socio-economical) have been selected to help to clarify the status of the marginalisation in Portugal. The difficulties in the interpretation of those indicators, together with the outcomes from the foregoing analysis, asked for a more detailed description of the concept of marginalisation. Based on existing information, four different processes have been disentangled, three of which can somehow be related to the concept of marginalisation (see figure). Each of the processes reflect very different realities.

The interpretation and adaptation of a recent study by the Portuguese Ministry of Agriculture, entitled ´Portugal Rural: territórios e dinâmicas´ (2003), has made it possible to quantify and visualize the occurrence of each of those four processes in Portugal.

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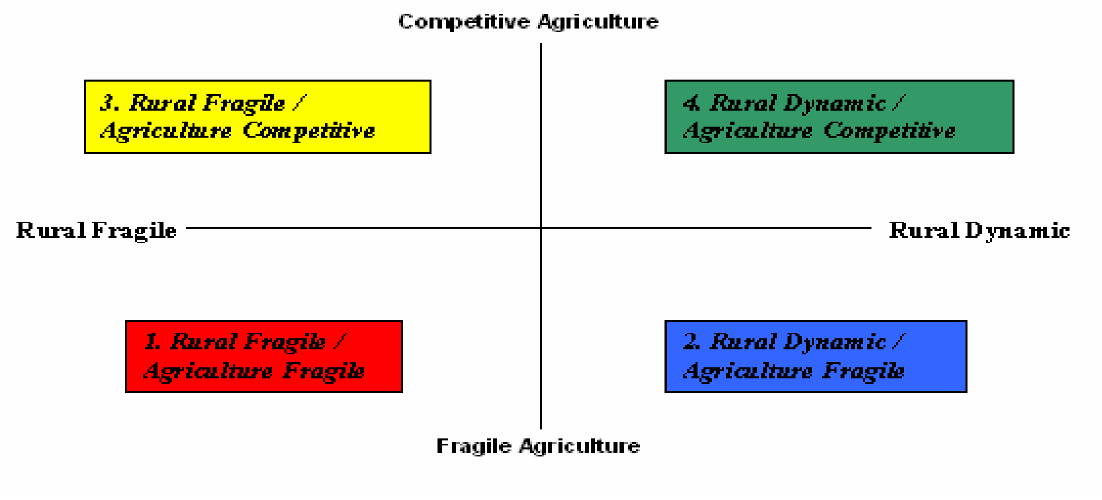

Results

The main outcome of this inventory has been the analysis and description of different realities of marginalisation in the Portuguese context. As Baptista (1995: 316) already described:

> *Agriculture no longer unites rural society with the whole of non-urban space. There now arises an issue of space which is no longer part of agriculture and which also no longer guarantees the vitality of rural society. The paths of agriculture, space and rural society are now dissociated.*

As a consequence of such a dissociation, the marginalisation of agriculture and the marginalisation of rural areas are not necessarily interlinked either. This idea is strengthened by our own analysis of a range of indicators and by the data from the Portuguese Ministry of Agriculture. These data have been translated into maps and tables, visualizing distinct realities of marginalisation throughout Portugal. The most relevant of these figures will be shown and discussed in the poster.

The areas where both agriculture and rural areas are considered to be marginal can be found mostly in the interior mountain regions of the centre and the north. Together these areas occupy around 25% of the national territory and there is a strong correspondence with the outcomes of an earlier study on the probability of land abandonment.

The combination of a productive agricultural sector in marginal rural areas is very characteristic for the extensive areas of the Alentejo and to a somewhat lesser extent also for Trás-os-Montes. All in all this type of marginalisation affects about 44% of the country´s surface. The more dynamic rural areas, either with or without a productive area, can be found mostly in the coastal areas and around the larger urban centres. About 10% of the country is seen to be dynamic whilst agriculture is only marginal. The remaining 21% of the territory is characterized by a productive agriculture in a dynamic environment and can thus not be considered marginal from these perspectives.

Discussion

The outcomes of this study illustrate the existence of various processes of marginalisation of agriculture and rural areas in Portugal. Together, these different processes affect large parts of the Portuguese territory but the consequences are far from uniform.

Marginalisation of agriculture, for example, does not necessarily imply the loss of rural dynamics or abandonment of land and at the same time a productive agriculture can not always prevent rural areas from getting marginalized. Similarly, the loss of rural dynamics might be problematic from a social or cultural point of view but does not necessarily have to be so from an economic or ecological perspective.

In the light of new CAP reforms such as ´decoupling´, there will undoubtedly be significant changes in land use strategies. The outcome of those changing strategies also depends on the character of the marginalization processes. Therefore, diverse instruments will be needed to be able to deal with those outcomes.

Clearly, the results from this study cannot be seen as final outcomes as it is still necessary to continue research and discussion on the definitions and indicators that have been are used.

What does become clear though, is that marginalisation of agriculture and rural areas in Portugal cannot be considered as one single process where the dynamics of land use and of social and economic indicators all follow the same trend.

It is believed that this diversity of marginalisation processes does not only account for the Portuguese situation but also for other rural areas in Europe. At the same time, there might also exist other types marginalisation in these areas which have not yet been detected in Portugal. A look at different processes, with sometimes divergent trends concerning agriculture, social factors and rural areas might be the required approach to better understand marginalisation and to cope with policy impacts and management challenges for the future. Almost implicitly, this also

Although one can find an increasing consciousness about the seriousness and the consequences of marginalisation, there is still little sign of a large scale, coherent scheme to deal with it in Portugal. Multifunctional forms of land use are sometimes presented as a useful instrument to stop marginalisation processes but we believe that the preconditions for these activities are often lacking.

The start of new activities requires agency, entrepreneurship and local resources. Especially in situations of rural marginalisation it is precisely those socio-economic dynamics that are missing.

There is an increasing demand from modern society for new functions such as recreation, identity and cultural and life quality functions that can possibly be offered by rural areas. From this perspective it might be crucial to focus first of all on processes of rural marginalisation and the ways in which these can be influenced.

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