

1 Setting the Frame: Environmental Perspectives in Farming and Rural Systems Analyses

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Rural and farming systems analysis is based on the systems philosophy and related to the development of farming as well as to rural development in general. The history of farming systems research shows increasing effort in taking into consideration farmers' conditions and development aspects. In spite of this, it can still generally be stated, that while rural and farming systems research deals with the philosophy, concepts and methodology development, testing and assessment, the development of rural and farming systems is the domain of extension, communication and policy application.

Historical development of systems research as well as specifically of rural and farming systems research also indicates clearly growing emphasis on resources availability, their long-term use and sustainability and strong movements into the wider field of environmental development. This is one of the most demanding challenges of today: integrating environmental perspectives into systems approaches. What are the potentials of the future in the following fields:

- Methodologies in systems research: where are their linkages and their integrative potentials?
- Can environmentally sound strategies of farming and rural development be designed and in which way?
- To what extent and in which way can local resources and local knowledge contribute to this?
- What role can institutions play in systems analysis and in defining and implementing environmentally sound strategies?
- What has been the experiences in applying the systems philosophy and approaches under conditions of marginality of farming development?

This was discussed in the Third European Symposium on "Rural and Farming Systems Analyses: Environmental Perspectives" in Hohenheim/Germany and is being presented in the following five Chapters. The introduction and overview will need to summarise the definition of the most dominating views and understandings in the Symposium as well to raise the specific topics of the individual chapters.

Features and components of Rural and Farming Systems Analyses

In defining what rural and farming systems are or what rural and farming systems analyses means one may get more different definitions than experts who provide definitions. This indicates the constraints and the potential as follows:

- It gives the impression, that there is no common basis for this type of systems analysis and research and therefore no commonly accepted methodology. Farming systems may be considered as an area in which many different voices destroy coherent concepts.
- It, on the other hand, provides a basis and forum for different views of different disciplines never offered by mono-disciplinary discussions and hence specifically allows a systems approach. The contribution of such a heterogeneity to real system thinking and research may not always be understood by mono-based disciplinary work and may also not easily be explained in theory.

Nowadays, Rural and Farming Systems Analyses (RFSA) as well as Research (RFSR) have a basis of common understanding, even neglected in many articles and other publications, which needs to be presented, discussed and adjusted to new developments.

RFSA: Open systems of interdisciplinary nature

A system is defined by its elements and their relations to each other. Transferring this abstract definition to the real world of rural and farming systems we see clear boundaries of the systems, but at the same time comprehensive and intensive relation to the outside world. This reaches often a level where it is not easy to define the real boundary of the system. Finally, problems and objectives will define the boundary and hence the type of system. The system at the family level as shown in fig 1 illustrates the need for considering farming systems as basically open systems. There are external relations which are centrally important for the survival of the system. Systems analysis as opposed to partial analysis is understood to especially deal with linkages and interrelationships within a defined complex system and its relation to outside world (open systems). Within a hierarchy of systems, the size of a system determines whether a system analysis is in the scope of one research discipline or of an interdisciplinary approach.

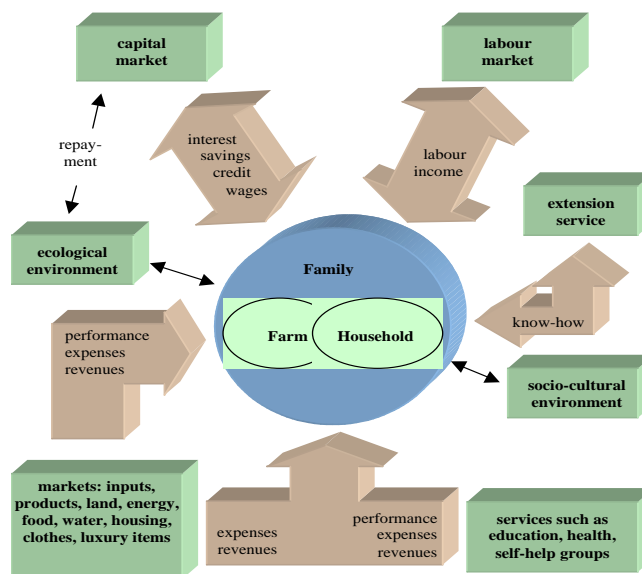


Figure 1: The family and the farm as an open system

RFSA: Systems hierarchy and vertical linkages

The flexibility of the definition of a system allows considering different systems according to the variation of problems, objectives and decision-making. Rural and farming systems are characterised by different problems, objectives and decision-making bodies and levels hence require different systems with relations to each other. This can be brought into an order of different types and levels of decisions. It can reach from a soil systems to a farm and a watershed as a system. Along this vertical line a hierarchy of systems can be seen as is been presented in fig.2. The higher the level of aggregation the more social sciences play a role, while the natural sciences become more dominant the farther down the hierarchy system is looked at. The vertical linkages between these levels and systems derive special relevance through the fact that the relations in decision-making between those levels involves individuals as well as the society as a whole. In the case of water resource availability, allocation and use, the nature of decisions at the watershed level, such as on resource development and allocation between farms and families, is of different to water allocation and use within a farm.

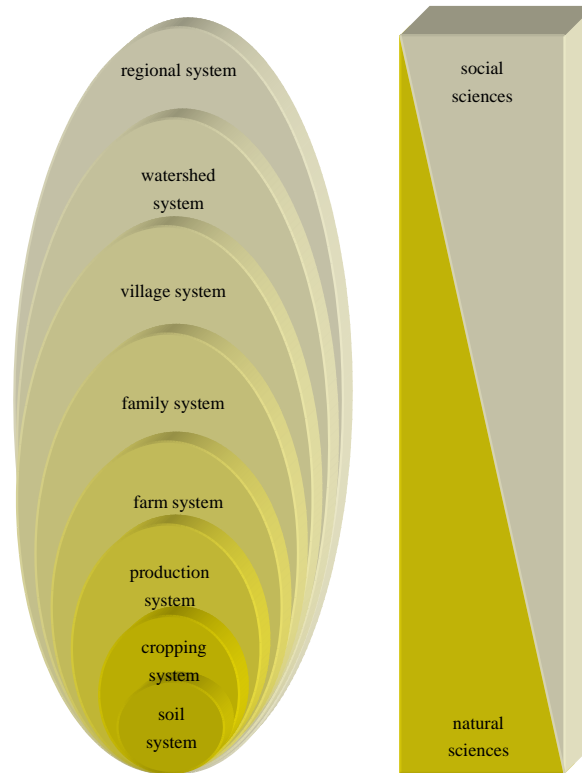


Figure 2: Vertical linkages and hierarchy in rural and farming systems

RFSA: Horizontal linkages at different levels

At the different levels of systems there is also a complex situation with respect to horizontal dimensions. At different stages of the hierarchy of the systems there are always several sectors which are horizontally related to each other (fig. 3).

Decision-making takes place where ever individuals or decision-making bodies of a society will decide following their objectives and needs. At the family level (the lowest social unit in a society) the family decides on the allocation of the family resources for the best mix of activities in those units of action for which families' are responsible for. Since the objectives of a family are not restricted to the farm only, but related to the needs of the family, decisions in a family with respect to resource allocation to improve living standard cannot be dealt with considering the farm only. Whether family labour or family capital goes into the farm, the household or into outside jobs depends on the expectation in each of the alternative and com-

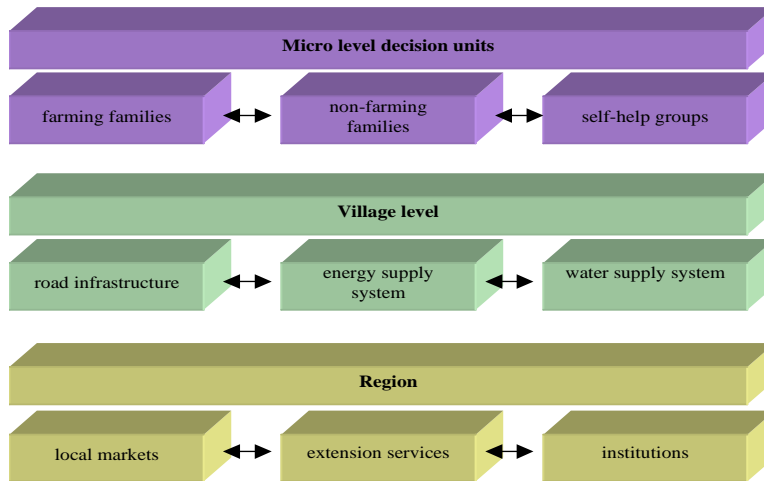


Figure 3: Horizontal linkages at rural and farming systems levels

peting sectors of a family and the respective contribution to family objectives. It is for that reason, that a system approach has to include the following sectors:

- the farm: production and agricultural resources use (e.g. land, irrigation water)
- the household: consumption and general resource use (e.g. capital, energy, water, services)
- the storage, processing and transportation sector: adding value to farm products (e.g. for better market prices) and preparing for consumption continuously over time (storage, processing)
- the off-farm/off-household alternatives: family resource in external use and cash income to family.

As a consequence, whenever the farming family and their problems, objectives and decision-making is considered, it is not enough to focus on the farm as the production unit only. At village level it could be the physical village infrastructure, social services and allocation of resources amongst families (fig.4). The same applies for watershed or regional levels.

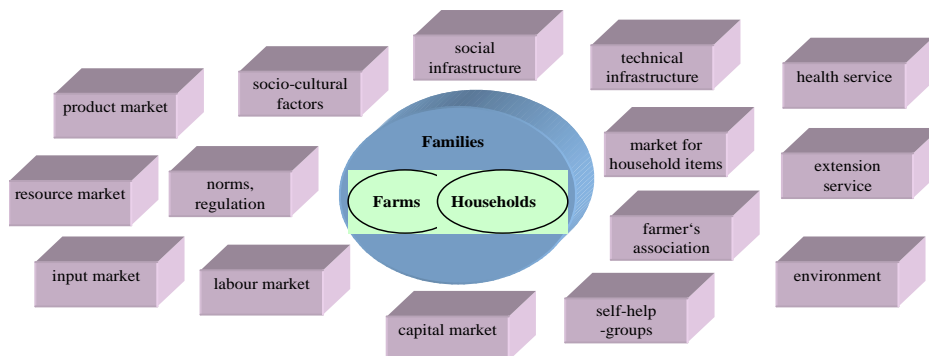


Figure 4: Sectors with horizontal linkages at village level

The natural and social sciences dimensions

Rural and farming systems research provides the basis for multi- and interdisciplinary work. This is of special importance since it allows natural sciences and social sciences to come together as required by the systems approach and the problems and multiple structure of objectives. Within the hierarchy of the systems (fig2) natural sciences are more needed at lower levels of the systems while with the increasing level decision-making and objectives of human beings (individuals as well as the society) social sciences are needed. While the soil system has its specific features in soil chemistry, soil physics and soil use and the soil-water-plant relation is in the sector of natural sciences, the family level is dominated by socio-economic problems and objectives. The complex structure of objectives in a family may illustrate this:

- | | |
|--|----------------------------|
| (1) Improvement of | (2) Reduction of risk in |
| - income | - production and storage |
| - liquidity, capital repayment capacity | - investment and market |
| - food, water, household good supply | - existence |
| - housing, health and education | - dependency on resource |
| - supply of luxury goods and services | owner: land lords, water |
| (3) Reduction of hardship | lords, money lenders, etc |
| (especially children, women) | |
| (5) Greater satisfaction of social and power | (4) Increase in wealth and |
| cultural needs. | |

Evaluating any improvement strategy, e.g. introduction of a new crop variety, based on all these criteria requires an interdisciplinary approach. Since reality indicates an urgent need for more comprehensive assessment, rural and farming systems research can contribute to the development and testing of respective methodologies. In developing and discussing such complex methodologies, mono-discipline oriented scientists may not always agree or consider such approaches as too supervision. Nevertheless, it is better to be closer to reality than quantifying parameters not relevant in reality. In addition, within the rural and farming systems scientists, the discussion amongst scientists with economic, sociological, participatory or local knowledge background should be understood as constructive and contributes to the common goal to come closer to reality.

Sustainability: the static and dynamic dimension

The development over time brings another dimension to the rural and farming systems approach. Like in disciplinary research, the understanding of past developments and current situations is basic to systems approaches to draw lessons to be learned for future impact analyses and potential developments. The inclusion of the dynamics of development in systems approaches makes analysis very complex and often reach the limits of the capacity. Changing multiple objectives and needs over time, changing bio-physical, socio-economic, administrative and legal as well as cultural environments are very hard to consider all together at the same time and even from the point of view of different disciplines. Nevertheless, even

if not all dynamic components and relations can be included, often some steps into this direction may improve a lot as compared to mono-disciplinary approaches.

A dynamic approach in rural and farming systems development is directly concerned with the short versus long-term availability and use of resources and the short versus long term benefit of resource use under changing resource allocation. This has often been discussed under the term "sustainability". There are different definitions of sustainability. It is obvious, that under consideration of the needs and objectives of families and societies technical sustainability (e.g. crop production, livestock production) is not enough to deal with the real problems of human beings. Since many disciplines use their own definitions, fig 5 gives a representation of the relations of different definitions of "sustainability". In a static view, sustainability cannot be directly included in the analyses. Often the static view (e.g. short term view from an economic point of view) present different results than a long-term view. It is for that reason, that with an increasing time span in the analyses economic results are closer to ecological results than in static analyses.

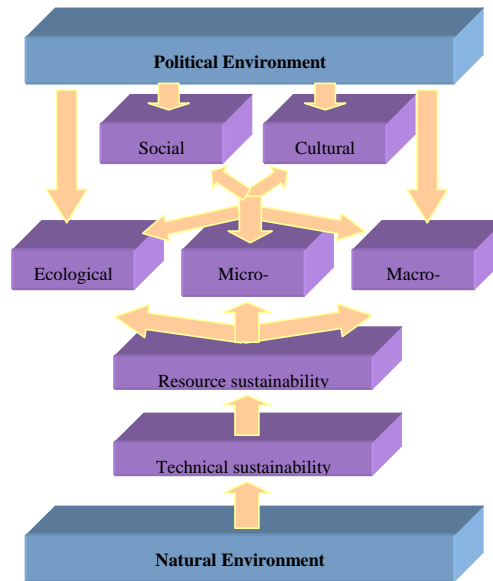


Figure 5: Relations between various types of sustainability

Links between research and farmers

Rural and farming systems analyses includes also the relations between classical research and farmers situation. This sector has much contributed to the inclusion of people's needs and objectives in the systems analyses. The limited impacted of the former more technical oriented approaches (researchers develop new techniques and offer them to farmers in the framework of development projects) has forced the development towards farmers' participation in the process of finding and preparing solutions to their problems. It is a logical consequence, that local knowledge towards problem solving has played an increasing role.

Definition of farming and rural systems approaches

A Decision-Oriented Farming Systems Approach

The decision-oriented farming systems approach is an holistic and behavioural approach. It is an holistic approach for the following reasons:

- a) since the central focus is on human beings and the society and their needs and objectives (farms, households, off-farm sectors, markets, services etc. are considered as tools and instrumental without own objectives)
- b) farm, household, off-farm/household sector and the interrelationships between them are equally considered in the micro analyses (horizontal linkages)

- c) the hierarchy of systems (vertical linkages) differentiates in the decision-making process between families, villages, project, the tribal and regional levels
- d) it includes the dynamics of systems development by giving special emphasis to sustainability of natural resource use, living standards and social development as well as on the long-term impact of innovations and regulations

It is a behavioural approach for the following reasons:

- a) it deals with decision-making at the families' and societal level and gives special emphasis on gender role and cultural impact in decision-making processes
- b) includes participation of target groups and people concerned when defining their objectives and finding and assessing solutions for them

A Village Livelihood Systems Approach

The village livelihood systems approach is part of the farming as well as the rural systems approaches (fig.5). Aggregation from the family to village level and inclusion of resources and decisions specific to communities or small societies show the following characteristics (fig. 4):

- Includes farming and non-farming families (all social groups in a village)
- Considers the families and the village society as central and consequently takes into account the individual (family) objectives and the objectives of the society in the village
- Integrates not only farmers / job activities but also households and social organisations in the village. Considers social and cultural regulations and norms as factors influencing farmer's decisions
- Gives emphasis to village infrastructure and regulations on resource availability and use at the village level.

Following the vertical linkages of the different levels, the family level deals with the living standards of individual families, the village level gives emphasis to village livelihood which includes the living conditions and living standards of people and social groups in a village.

A Rural Systems Approach

The rural systems approach focuses on resource availability, allocation and long-term use and the decision-making processes involved as well as on the socio-economic and welfare impacts from the individuals and social groups point of view. This leads to a complexity of the rural approach which can be characterised as follows:

1. The approaches at the family level are differentiated according to social groups or farming features and are aggregated at the regional level.
2. The approaches at the village level including the non-farming society are aggregated at the regional level.
3. Considers the impacts on living standards, the environment and the national level.

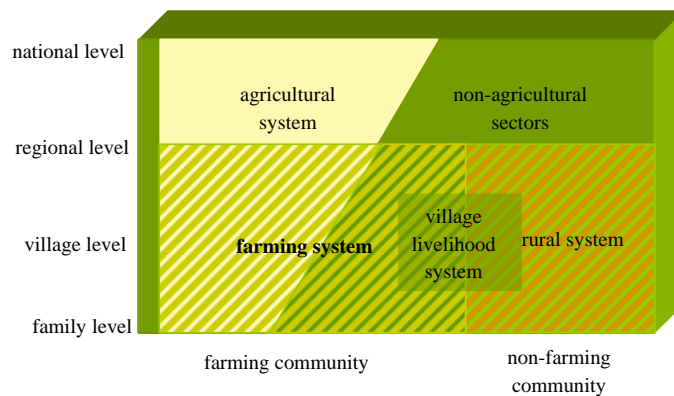


Figure 5: Systems and systems terminology

The environmental perspective of rural and farming systems analyses

The dimensions of the rural and farming systems approach discussed in the previous chapters are the constitutive elements and the rationale of farming and rural systems concepts and approaches. The transfer of this philosophy into practical research and development activities requires first the discussion of a systems methodology which specifically takes into consideration the environmental perspective. This has been dealt with in *Workshop A of the Symposium (Chapter I)*. The specific issues presented, discussed and concluded in Workshop A are as follows:

- (1) How can discipline-oriented concepts and methods be integrated into an interdisciplinary approach of a system analysis and what are the advantages of applying an holistic approach instead of a set of partial analyses?
- (2) What are the consequences of including different technical and decision-making levels in the definition of problems and selection of methodology?
- (3) How can the methodology and philosophy of natural sciences be related to those of social sciences?
- (4) In which way and to what extent can the different concepts of evaluation of environmental systems be related to and integrated into the traditional methodology?

Managing rural and farming systems by using the respective methodologies requires environmental sound strategies of management. This has been dealt with in *Workshop B of the Symposium (Chapter II)*. The specific issues presented, discussed and concluded in Workshop B are as follows:

- (1) What are the environmental needs and possible conflicts with other objectives?
- (2) How can objectives and decisions of individual families, the decision-making bodies at community, tribal, project and regional level meet environmental needs of the society?
- (3) Do different research disciplines and different decision-making bodies apply different strategies towards sustainability and environment and if so, how can these strategies come closer together?

- (4) Are there differences in the assessment of environmental impacts between men and women?

Managing rural and farming systems may draw from the experiences from other areas and other problem solving strategy. The use of local resources and local knowledge for rural development will need special consideration to better adjust to local conditions and to better integrate those whose problems are in the centre. The use of local resources and knowledge has been dealt with in *Workshop C of the Symposium (Chapter III)*. The specific issues presented, discussed and concluded in Workshop C are as follows:

- (1) To what extent is a proper use of local resources a pre-condition to sustainable rural development?
- (2) What are the reasons for and consequences of changes of availability, quality and local values of farm and social resources over time?
- (3) What management strategies would offer best opportunities for sustainable improvement of living standard and environmental stability?
- (4) In which way and to what extent can local resources and knowledge contribute to sustainability and ecologically sound development?
- (5) What is the contribution of organic or environmentally adapted farming to living standard and sustainability?
- (5) What are the relations between land and environment, capital and environment and labour resources and cultural perception including gender differences?

The management of ecosystems is heavily determined by the impact of local, national and international institutions. Regulations in providing funds, expertise, training opportunities, institution building, conditions in the provision of resources are most relevant sectors of influence. There is a need to know what philosophy, targets and concepts are behind institutional actions and strategies with regards to the management of ecosystems and what implications at farm family and rural level follow out of this. These issues have been dealt with in *Workshop D of the Symposium (Chapter IV)*. The specific issues presented, discussed and concluded in Workshop D are as follows:

- (1) How can local, national and international institutions influence an ecologically sound farming and rural systems development?
- (2) To what extent have policies incorporated environmental objectives and how does policy contribute to the management of ecosystems?
- (3) What role do environmental aspects play in extension services?
- (4) How and to what extent can regulations in resource use, land tenure and state and project interventions influence a development towards ecologically sound and economically profitable systems?
- (5) How and to what extent can joint learning and collective actions influence a development towards ecologically sound farming and rural development?
- (6) How can this knowledge be used in training and teaching activities?

Overuse, inadequate use or even unused resources influence the environment and the socio-economic development in rural areas. This is especially pronounced in land use in marginal areas. Overuse of land through farming activities in e.g. mountains, forests, inadequate

farming practices as well as reduction of (unprofitable) farming with increasing unused land may lead to environmental problems resulting in loss of fertile land, loss of areas for recreation and tourism, degradation and loss of high quality. These issues have been dealt with in *Workshop E of the Symposium (Chapter V)*. The specific issues presented, discussed and concluded in Workshop E are as follows:

- (1) What are the main reasons for overuse of resources in farming systems and how do farmers evaluate this?
- (2) To what extent can inadequate use of resources influence the environment and the socio-economic development in rural areas?
- (3) What strategies can reduce the overuse of land and water resources (especially in agriculturally marginal zones like mountain areas, steppe, forests) and what are suitable alternatives to inadequate farming practices?
- (4) What strategies can be offered to reduce environmental problems resulting in loss of fertile land, loss of areas for recreation and tourism, degradation and loss of high quality resources for rural and urban households (e.g. drinking water) and even loss of biodiversity?

In the Third European Symposium on "Rural and Farming Systems Analyses: Environmental Perspective" these questions have been discussed based on papers presented. The contribution through papers follows in Chapters I to V.

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