"I don't regret that choice, producing less but doing better" – some key lessons learned in the international RETHINK project

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Abstract

Many farmers are very actively exploring alternatives in farm management, production systems, markets and supply chains, often leading to new configurations in resource uses and relations between different actors, both within the sector and at a territorial level. Experimentation with new approaches tends to create tensions with traditional systems, and institutions. However, often it leads to lasting improvement in economic success as well as the perceived quality of life and well-being of farm families and the wider rural community.

Our observations of reorientation are not surprising as European agriculture and rural areas as a whole are being confronted with enormous challenges and need to accommodate a variety of demands. Many of those pursuing alternative strategies tend to see these challenges and demands as opportunities for products with particular qualities, new services and new functions. A telling example is the necessary transition of industrialised country economies in particular towards resource-efficient and climate-friendly production systems and consumption. The necessary changes can provide completely new opportunities to farmers, up- and downstream businesses and rural areas.

The transdisciplinary RETHINK research programme connected the development of agriculture with the wider societal and policy goal of vibrant and prosperous rural areas. In this paper, I will use the 14 case studies of the RETHINK programme as illustrative examples when discussing conflicting goals and potential synergies between farm modernization and well-being in rural areas. I also put forward some of the main lessons learned with references to a set of research papers that present the comparative analysis.

1. Introduction

1.1 Towards a more far-reaching shift in orientations

"I don't regret that choice, producing less but doing better". This quote comes from a farmer in one of the 14 case studies carried out in the RETHINK research programme. In this particular case study, a transdisciplinary team from INRA Avignon has been examining transitions towards ecological production in the fruit and vegetable sector of Drôme Valley (Biovallée), France (Lamine *et al*. 2015). The quote is only one example but it signifies a more far-reaching shift in orientations that we found in almost all case studies. Many farmers are very actively exploring alternatives in farm management, production systems, markets and supply chains, often leading to new configurations in resource uses and relations between different actors, both within the sector and at a territorial level. Experimentation with new approaches tends to create tensions with traditional systems, and institutions, but sometimes it leads to lasting improvement in the perceived quality of life and well-being – or indeed, just *"doing better"*.

In today's post-industrialist world, the daunting claims of modernization are steadily eroded. Analysts emphasize the need for a 'reflexive' and 'reflective' approach to modernisation (Beck *et*

al., 1994; Borne, 2010). The argument is that technological achievements, material prosperity and consumption tend to be over-emphasized while ignoring other quality of life values, equity issues and long-term sustainability.

Jackson (2009) refers to the *"engine of economic growth* [that] *created jobs, avoided recessions and became a ubiquitous yardstick for progress in the 20th century"*. He emphasises that it's key measure 'GDP growth' does not capture many *"vital aspects of national wealth and well-being, such as changes in the quality of health, the extent of education and changes in the quality and quantity of our natural resources."* Even more importantly, Jackson (2009) questions whether economic growth is still a legitimate goal for rich countries, when *"huge disparities in income and well-being persist across the globe and when the global economy is constrained by finite ecological limits"*.

Stiglitz *et al*. (2009) point out that *"new political narratives are necessary to identify where our societies should go"* and that *"a shift of emphasis from a 'production-oriented' measurement system to one focused on the well-being of current and future generations, i.e. toward broader measures of social progress"* is needed. The same authors distinguish between an assessment of current well-being and an assessment of sustainability: *"Current well-being has to do with both economic resources, such as income, and with non-economic aspects of peoples' life (what they do and what they can do, how they feel, and the natural environment they live in). Whether these levels of well-being can be sustained over time depends on whether stocks of capital that matter for our lives (natural, physical, human, social) are passed on to future generations."*

The connection with sustainability points to the global scale of the problems we are confronted with: Current resource and emission-intensive lifestyles we are used to in rich countries can be neither sustained nor transferred to the world as a whole. A more equitable sharing of resources is therefore inevitable and overdue (Knickel 2013).[1]

1.2 Well-being in agriculture and rural development

The increasing attention paid to well-being and related redefinition of societal progress has implications for agriculture and its changing role in rural areas and society as a whole. Jackson (2009) refers to the *"ability of rural communities to flourish"*.

In the context of this paper, I define well-being as sustainable food production and access to food of good quality; the quality of life of farmers, consumers and society at large; environmental sustainability and resource use efficiency.

Agriculture, even if substantially changing, continues to represent the primary land use in rural areas, and it continues to have a very significant influence on rural economies, community life, social ties, local cultures, landscapes and environments (EC 2014, SCAR 2011). For the discussion in this paper, it is important to note that situations differ enormously and that the particular context matters tremendously. Farming related pollution is not everywhere a problem and sometimes the capital intensity in farming is still very low. Lifestyle farming is becoming more important in some regions, but not everywhere.

1.3 Empirical basis and structure of this paper

This paper is based on data and insights gained from the transdisciplinary RETHINK research programme 'Rethinking the links between farm modernization, rural development and resilience in a world of increasing demands and finite resources'. The European Commission and funding bodies in 14 countries supported the project under the umbrella of FP7 and the RURAGRI ERA-NET programme.[2] RETHINK was carried out at a time of potentially profound change - when the agricultural sector must finally respond to increasing resource scarcity and distributional

[1] Agricultural and rural development challenges are discussed in much detail in the assessments and foresight reports of the Standing Committee on Agricultural Research (SCAR 2011) and the background documents on CAP reform by the European Commission (2011, 2014b).

[2] For more information, all case study reports, a policy brief, etc. see www.rethink-net.eu.

demands, and when economies, production systems and lifestyles must be transformed. In the project it was tried to connect the development of agriculture with the wider societal and policy goal of vibrant and prosperous rural areas.

RETHINK used a holistic approach encompassing measures of productivity, value-added, income generation, natural resource use effectiveness, resilience, maintenance of ecosystem services, provision of public goods and, not least, well-being in rural areas. The conceptual and analytical frameworks applied build on the results obtained in a large number of EU-funded research projects: MULTAGRI and TOPMARD emphasized the multifunctionality of rural areas and the central role of farming in the provision of public goods (Cairol *et al.*, 2009; Bryden *et al.* 2011). In our analysis, farming is conceptualized as being part of a set of systems spanning several spatial scales and including agro-ecological, economic and political-social domains. Within such a complex system, farm sustainability can only be achieved through adaptability and change. The analysis explicitly recognizes the complexity of challenges, the diversity in situations and the multidimensionality of strategies and ways forward.

In the paper, I use the 14 case studies of the RETHINK programme as illustrative examples when discussing conflicting goals and potential synergies between farm modernization and well-being in rural areas. The examples focus on alternatives in farm management, production systems, markets and supply chains. They illustrate different ideas about progress, modernity and modernization. In the discussion, I emphasise that we can shape change in positive ways. When doing that I refer to some of the comparative analyses.[3] I conclude the paper with implications for future policy and research, emphasizing the important role of social capital and of more holistic, inclusive approaches in a more balanced development.

2. Key insights obtained in the 14 case studies

Table 1 provides for each of the 14 cases a brief characterisation of the way, that practitioners define agricultural and rural development in new ways. The information provided is just indicative of the key findings in the case study reports.[4]

Table 1

Key insights obtained in the 14 case studies related to the redefinition of modernisation

	Case study	**How practitioners (re)define agricultural and rural development**	**Key resilience and prosperity outcomes**
AT	Organic farming and resilience	Farmers in the Austrian case focus on economies of scope and niche markets. They search for new business models, and pursue ideas that allow them to use their skills and knowledge in creative ways. Farmers take responsibility for the economic destiny of their farms, which sets them apart from those that feel powerless in the face of global markets and resentfully dependent on direct payments. While the business might grow from 'micro' to 'small', they do not aim for further growth or mass production. They are more likely to network with others, search for social innovations and novel cooperation models for example with chefs in restaurants or hotels that emphasize the uniqueness of the region.	Reflective rethinking, questioning both tradition and modernity, seeking to go beyond both, while preserving those elements that serve their purpose are key features in the case study. Farmers follow a territorial understanding of their activities, seeking cooperation with others in the region.

[3] A set of papers with the comparative analysis will be published in the coming months.

[4] All case study reports, short profiles and case study posters can be downloaded at: http://www.rethink-net.eu/case-studies.html

	Case study	How practitioners (re)define agricultural and rural development	Key resilience and prosperity outcomes
BE	New forms of governance in landscape development	Land used for agriculture is the only qualitative open space left and maintaining the quality of this open space is a priority for the quality of life in the area. The governance mechanism adopted allows farmers to be managers of high quality open spaces without compromising their incomes. With shared efforts, the farmers, companies and inhabitants collaborate in the development of 'their' landscape.	The voluntary cooperation of farmers, companies and inhabitants in this case is a key success factor.
CH	Sub-urban food production systems in a Swiss agglomeration	Most initiatives examined in the case study represent alternative systems or models of food production, paying stronger attention to social, human and community development processes. Relationship building with consumers and networks, participation and space for knowledge sharing are key. Capacity building for productive cooperation among farmers and processors is a key success factor as well as knowledge and experience sharing and mutual learning.	Social value creation and awareness among consumers concerning local agriculture, farming, farm household realities and territorial development.
DE	Opportunities for creating an eco-economy	'Rethinking' the modernisation of farms and rural areas in this case refers to valorising renewable resources in ways that are adapted to regional conditions. New forms of governance and new actor network constellations play a vital role. On-farm bio-energy activities and bio-energy villages aim at establishing smaller-scale distributed systems. Key determinants are the kinds of technology, the investment capital needed and suitable forms of governance for managing cross-sectoral linkages. Key actors prove to be capable of recognising regional potentials, and they are open for novel approaches to securing the future of 'their' region.	Bio-energy activities foster diversity at the level of farms, the agricultural sector and the regional economy. Local farmers and other rural actors aim at opening up a future perspective for their region. Pilot programmes were found to be important catalysts.
DK	Landscape strategy making and agriculture	For several decades, agricultural modernisation in Denmark has meant concentration, specialization and industrialization of agriculture. Production has as a result largely been concentrated on few, large farms that are increasingly separated from rural communities. The importance of non-agricultural residential, recreational and ecological functions is increasing in importance in territorial decision-making. Collaborative strategic decision-making and planning on a local scale can contribute to communities that are more resilient and counteract the decoupling of agricultural businesses from the landscape.	Local actors perceive learning as social capital building. Through a collaborative landscape strategy-making process farmers can learn to adapt to new knowledge about the functionality of landscapes as well as reshape their internal relationships.
ES	Innovation and social learning in organic vegetable production in the Region of Murcia	The Camposeven producer association is based on cooperation, trust and transparency, and on prioritizing quality over quantity. These pillars have allowed adapting to a complex and highly competitive market context. Camposeven is known for its good practices and for pioneering organic farming systems. The collaboration with other companies and the research group GESPLAN of the Technical University of Madrid aims at developing professional practice, connecting knowledge and action through joint projects. The case study stresses the value of experiential knowledge and joint learning.	Governance, knowledge and learning are perceived as tools for increasing prosperity and resilience. Camposeven members have become more autonomous, experimenting on their farms, sharing ideas and providing mutual assistance.

	Case study	How practitioners (re)define agricultural and rural development	Key resilience and prosperity outcomes
FR	Transitions towards ecological production	The ability to combine long-term vision and short-term opportunism are strongly developed in the Drôme Valley. Stakeholders from farming, marketing, processing and retailing sectors, advisory services, public policies, civil society have a collaborative attitude and a long experience of multi-actors projects to foster the territorial agri-food system. Prosperity and resilience are both associated to diversity and diversification in products, in marketing channels and in production modes sometimes (organic, conventional, geographic indications etc.). Direct links to consumers and sometimes to school canteens are seen as rewarding by farmers.	Younger farmers connect prosperity much more than their predecessors with quality of life and well-being. Autonomy in their daily work and in their relationship to the market, coherence with their values and their personal 'project' are important.
IE	Farmer adoption of a new nutrient management technology	Ireland is the largest beef exporter in Europe and the 10th largest dairy export nation in the world. Approximately, 90% of beef output and 85% of dairy output are exported and there is a plan to increase milk production by another 50%. Achieving this expansion without compromising environmental quality poses a significant policy challenge. Efficient farm and field level management of nutrients has consistently been found to be an optimal strategy in the management of environmental risk from agricultural production.	Optimal use of expensive fertiliser has the potential to deliver a double dividend of reduced nutrient loss to the wider aquatic ecosystem while maximising economic returns thereby making farms more resilient to external shocks as well as regulation that is more stringent.
IL	Rural innovation in global fluctuation: The Arava region case study	The Arava case demonstrates the ambivalent correlations between farm modernisation, regional resilience and rural development. A decade ago, the Arava farmers thrived economically. However, over the past few years they had to experience a growing crisis as most farms grow pepper (capsicum) and world market prices collapsed. Overall, the region produces about 60% of the total Israeli export of fresh vegetables – mainly to Europe, Russia and the US with minor distribution in the local market. The recent crisis has placed a strong demand for finding either "the next pepper" or new economic directions altogether. One idea is to approach pharmaceutical and biotechnology companies that use certain kinds of plants that the region is especially suitable for growing and establish completely new regionally based supply chains.	Arava R&D looks for new ways to commercialize the region's unique knowledge in farming, to adopt new types of agricultural activity, to support new local entrepreneurships, and to bring in new investors that may help scale up the region's business activities. The aim is to create new partnerships that contribute to value-added generation and employment in the region.
IT	Extensive pig production systems	The Cinta Senese breed represents the Tuscan traditional farming, and its products are perfectly integrated in the regional gastronomic tradition. Unlike in intensive indoor farming, pigs are reared in open agricultural and/or forestland. Extensive and outdoor systems are also common in other European countries like Spain, Portugal, UK, France and Hungary. Successful initiatives for high quality pork products require an effective cooperation of all actors along supply chains, in this case pig farmers, breeders, fatteners, feeding companies, slaughterhouses, processors, advisors, butchers, multiple retailers and restaurants. Direct marketing, organized groups of consumers, agri-tourism farms and clear rules for the preservation of the typical landscape play a central role.	Quality of life in rural areas is linked to a social life characterized by networks, shared norms and expectations that facilitate the ability to get things done collectively and a sense of belonging. Multifunctional agriculture is perceived as the backbone of agriculture in Tuscany.

	Case study	How practitioners (re)define agricultural and rural development	Key resilience and prosperity outcomes
LT	Resilient farming systems and market differentiation	Nearly three-quarters (2010) of Lithuanian farms larger than one hectare are semi-subsistence farms with an economic output of less than €4,000 per year. Among small farms, a flexible use and re-use of resources, and strategies that are based on the available local social and natural resources prevail. Farmers' markets that promote the consumption of local products are becoming more and more popular. One of the reasons why farmers are only to a limited extent engaged in farm-based processing and direct marketing is the lack of technological, marketing and communication knowledge.	Food markets in Lithuania are becoming more differentiated and a fast growing number of consumers give priority to healthy, authentic and environment friendly produced food.
LV	Small farm development strategies	Small farms, which compose up to 90% of all farms in Latvia, are facing various long-term political, market and socio-demographic pressures, and their number is constantly declining. Diverse practices of small farmers ensure not only their own existence and development but, in their own interest, also aim at contributing to viable rural communities. Small-scale farming is seen as an alternative form of modern sustainable agriculture. Diversity opens up varied paths for modernisation, especially if contemporary societal needs and demands like a sustainable provision of food, the maintenance of rural livelihoods and environmental conservation and sustainable growth are considered.	The case study illustrates the multi-facetted and long-term character of prosperity, where farmer, farm, community and territory are interconnected. Farmers interpret prosperity in terms of family well-being, a sufficient level of income, the freedom to organise one's life and work, the reproduction of natural resources and the contribution to community well-being.
SE	Peri-urban agricultural transformations in Gothenburg	The transformation of and contemporary conditions for farming in a peri-urban area is an increasingly important issue. Gothenburg provides an illustration of the transformation from a rural agricultural landscape with mixed farming systems including livestock and arable production of food for the nearby urban market into a peri-urban landscape with strong imprints of urbanisation. Agriculture has to accommodate leisure demands and facilities for the urban population. The demand for land for housing increases pressures on farmers. A counteracting force is the municipality strategy of fostering sustainable livelihoods that includes agricultural activities for local food production and cultural landscapes.	The importance of different types of ecosystem services demanded in particular in peri-urban areas has changed from mainly provisioning services to mainly cultural services.
TR	Resilience and competitiveness of small ruminant farms in Isparta	The small ruminant sector is traditionally and socio-economically important for most of the western Mediterranean region in Turkey. Goat and sheep production is based on extensive grazing and the shepherds are generally the herd owners. Farms still use traditional methods, and the family workforce is the dominant resource. Most of the farmers have taken over from their families and they have been involved in farming since they were children. Recently however they do not want their children to take over their businesses, and young people tend to find jobs in urban areas.	The use of new technologies is expected to reduce workloads and increase the welfare level of families and their involvement in social life. Farms that use milking machines have a higher productivity with better milk quality, more leisure time and a higher family income.

Source: Own compilation based on RETHINK case study reports (see: http://www.rethink-net.eu/)

3. Discussion: alternatives in farm management, production systems, markets and supply chains

Most of the 14 case studies feature incremental, socially embedded and localised forms of development. Almost all are different from the conventional capital-intensive and technology-driven model of agricultural modernisation that predominates in policy and in the formalised agricultural knowledge system. In all cases a more integrative systems perspective can be recognised that focusses on interrelationships and on interrelated change dynamics.

3.1 Progress, modernity and modernization

The idea of progress implies that advances in technology, science, and social organization inevitably produce an improvement in societal conditions. The discernible assumption is that a society can raise its quality of life and foster economic development through the application of science and technology. The role of the 'expert' is to help overcome hindrances that slow progress.

Modernization in this sense is perceived to contribute to 'progress'. The modernization of European farming in the 20th century freed up a significant proportion of the workforce and eliminated drudgery. It was also connected with major increases in productivity, leading to the satisfaction of European food demand and, at times, sizable surplus production. On the negative side of the specialisation, intensification and scale enlargement of agriculture are monotonous production landscapes, a disproportionate use of natural resources (in particular fossil fuels), an increase in emissions and a standardization of food qualities. At another level, we can see a concentration of farming in lowland plains and or regions with better access to (imported) feed, fertilizers or markets, and a marginalisation of other, normally less favoured areas.

Our observations of reorientation and change are not surprising as European agriculture and rural areas as a whole are being confronted with enormous challenges and need to accommodate a variety of demands (IAASTD 2009; SCAR 2011; EC 2011; Knickel 2013). Many of those pursuing alternative strategies tend to see these challenges and demands as opportunities for products with particular qualities, new services and new functions (Knickel *et al*. 2004). A telling example is the German case study that focuses on the necessary transition of industrialised country economies towards resource-efficient and climate-friendly production and consumption systems.

3.2 Interrelations between agricultural change, rural development and resilience

The last decades have – in spite of the particular support provided to less favoured areas – seen a very substantial polarisation of agricultural structures in Europe. Given the increasing demands for a more balanced regional development, both the intensification of agriculture in favourable areas and the simultaneous desertification of marginal areas are problematic.

How then can a different pattern of change contribute to more a more balanced development and well-being in rural areas? Cairol *et al.* (2009) emphasized the multifunctionality of rural areas and the role of farming in the provision of public goods. The findings of this research have been confirmed in a major IEEP study on the provision of public goods through agriculture (Cooper *et al.*, 2009). Olsson *et al.* (2011) showed that biological diversity is crucial for both rural viability and agricultural activities. The transformation of public goods in the rural economy was the focus of research led by Bryden *et al.* (2011). Von Münchhausen *et al.* (2010) and Milone and Ventura (2010) emphasized the central role of social capital and of less tangible factors in the dynamics of rural areas. From these different studies, it seems clear that rural prosperity is not just a question of economic performance, and that it is not only connected with agricultural production.

Agriculture in particular is characterised by close links between social and ecological systems. Technological change has therefore, probably more than in any other sector, major repercussions on the organisation of production, the natural environment and, in the long term, farm and rural structures. The introduction of tractors and of mineral fertilizer has both led to far-reaching changes in production systems and agricultural structures. Mineral fertilizer led to major increases in the productivity of land while increasing greenhouse gas emissions and the dependency from

fossil fuels. Both, the low cost of fossil fuels and the labour demand in other non-agricultural sectors have decreased a lot in the past years – maybe changing the game again.

3.3 Change can be shaped in positive ways!

Factors that will influence the further development of European agriculture and of rural areas include likely demographic changes, the further evolution of food systems and of urban-rural relations, anticipated trends and perspectives in biotechnology, biomass energy and bio-based products, and issues revolving around resource depletion. The concepts of multiple modernities (Fourie, 2012) and resilience pathways (Wilson, 2013) can help to explore alternative futures. For example, the bio-based economy has been suggested as a smart way to overcome resource constraints and to make production systems more sustainable. There is of course also the risk that the related structural changes might aggravate the concentration of power in up- and downstream industries and increase dependencies.

New opportunities can easily be missed if not planned and implemented in beneficial ways. Peter *et al*. (2015) emphasise that the necessary transition towards climate-friendly production systems can provide completely new opportunities to farmers and rural areas – if shaped accordingly. The authors contrast the highflying bioeconomy concept with the vision – and reality! – of an eco-economy that might be characterised by the principles of a steady-state economy, new multi-actor networks, and embeddedness and value capture at local and regional level thus providing new income sources and jobs at farm-level and within rural areas (Marsden *et al*. 2011, Knickel 2013).

4. Conclusions

4.1 Implications for policy

Policy can have a major influence on agricultural structures and production patterns. An example is the increasing capital-intensity of farming that has at least partly been supported through policy, for example agricultural investment support. An unintended side effect is that it has made many farmers more vulnerable. Indebtedness and dependencies from banks and agro-industry are very high in countries where agriculture is perceived as particularly 'modern' (Knickel 1994). Many farms have become highly path-dependent because of the large amounts of money invested in particular lines of production, production systems and technologies, and the resulting narrowing of management options. Adaptive capacity, the efficiency of the use of natural resources and favourable higher-level system combinations like between low-intensity farming systems and landscape amenity, in contrast, appear very much undervalued.

Agricultural and rural development frameworks need to be more flexible leaving more space for very different structural, natural, social, cultural and economic conditions. The disparities between countries with different background and traditions are an example. Some countries like the Netherlands, Belgium or Denmark have for a long time had very high levels of agricultural investment. Other countries like Lithuania and Latvia and most eastern European member states lack investments. Present EU support is trying to rebuild earlier structures based on the assumption that private ownership is going to take care of everything. The problem is that policy instruments that proved effective in the old EU member states might not provide the kind of support needed in these very different situations (Dwyer *et al.*, 2012; Davidova *et al.*, 2013) and in consideration of future challenges (Knickel 2013).

Currently, there is a lack of more appropriate, future-oriented development frameworks. Traditional and local knowledge tends to be undervalued in current innovation systems and policies. Inappropriate policy instruments sometimes diminish the role of local knowledge. Von Münchhausen *et al*. (2010) and Koopmans *et al*. (2016) argue that new forms of governance and collaboration are needed in order to face the multiple crises to production, consumption and sustainability. I like to add that these new networks should be understood as learning vehicles towards more sustainable production systems and consumption. Brunori *et al.* (2013) rightly argue that the goal of sustainable agriculture implies a systemic change: Learning and innovation networks can develop innovative patterns of production by generating new knowledge. Innovation

partnerships and development networks must be motivated by a common cause and need to involve practitioners on a par with researchers.

The challenge for administrations is to find ways how to enable motivated individuals and civil society action. Focus should be on supporting future-oriented investments that maximize added value *within* agriculture and rural areas. Rediscovering the value and potential of smaller-scale structures and boosting collaborative innovations is in many areas an important part of that. Administrations need to level the playing field where capital-intensive sectors dominate. Many grassroots initiatives have relevant experiences. The main challenge for the formal knowledge and innovation system comprising education, research and advisory services is to be open-minded and responsive.

4.2 Future research challenges: shaping (agricultural) development

RETHINK emphasises the need for more holistic and more inclusive development concepts. Each case examined can be seen as an expression of innovative development trajectories, highlighting potential synergies between farm modernization and sustainable rural development.

In the last years, we can actually see new relationships evolving among state, business, civil society and the individual. The more recent agricultural, rural and research policies encourage institutions and networks that are able to combine different types of knowledge and experience, and learn. Šūmane *et al*. (2016) emphasise that these new networks tend to be more effective in shaping future development. Other attributes favouring a positive development are responsive governance structures, and flexibility in decision-making processes and problem-solving (Koopmans *et al*. 2016).

Future research needs to focus on more effective support mechanisms for alternative modernization trajectories and resilience pathways. Issues like the role of agency and of enabling institutional structures, the factors that encourage the creation of synergies in agricultural and rural development are to be explored. Local capacities for transdisciplinary research need to be strengthened to support local-level decision-making in public and private sectors. In an ideal situation, the agricultural knowledge and innovation system is well connected with local knowledge and farmers networks (Röling and Jiggins 1998, Moreddu and Poppe 2013, Šūmane *et al*. 2016).

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