

# Collaborative Working Group Agricultural Knowledge and Innovation Systems.

## WP1: Reflection paper on AKIS<sup>1</sup>

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## Preface

The Standing Committee for Agricultural Research (SCAR) advises Member States and the European Commission on research themes and research policy relating to agriculture, nature and food. One of the activities of this Committee is to take stock and jointly reflect on future issues, through reviewing published Foresight Studies.

The functioning of Agricultural Knowledge and Innovation Systems was one of the issues that emerged from this process. SCAR decided to establish a working group on this issue and the European Commission appointed three experts to support the thinking and activities. They wrote this reflection paper, in close interaction with the working group.

Members of the working group commented on draft versions of this reflection paper and contributed to the 'inventory of main areas for attention and discussion' included in the annex of this report. This reflection paper is step one in the project, setting the scene, sharing the context, identifying a common vocabulary and identifying the main areas for attention and discussion that will be addressed in the future activities of the working group.

The final version of the reflection paper was edited by Nick Parrott of 'TextualHealing.nl' in Wageningen.

The content of this reflection paper is the responsibility of the authors, with whom we enjoyed a fruitful and inspiring collaboration and whom we thank sincerely for their efforts.

Peter Keet  
Chair person SCAR working group reflection paper.

## Executive summary

This paper summarizes the current state of agricultural knowledge and information systems (AKIS) in Europe, placing particular emphasis on the contribution they make to agricultural and rural innovation and the potential for improving this. It argues the case for stimulating a transition towards AKIS that can more effectively support innovation and change in the farming, agri-food and rural domains.

The paper starts off by reviewing different definitions of Agricultural Knowledge System (AKS) and Agricultural Knowledge and Innovation System (AKIS) and other multi-actor networking and learning networks and systems. It reviews the current problems with AKS in Europe, the links between knowledge and agriculture innovation and examines the potential of existing and reinvigorated AKIS to provide more integrated and effective knowledge transfer systems between actors at a time of great change in the countryside and agriculture.

Most European countries have AKS/AKIS that operate at the national or regional level to support and advise agriculture and farmers. Yet, the review shows they are often fragmented and not sufficiently responsive towards changes and to new societal concerns and demands. For example, they have not fully engaged with the new actors who are entering the rural domain (bringing with them new values, solutions and opportunities) or with the increasing diversity of farmers' expectations. There is a perception among some actors that AKS/AKIS in the EU are unresponsive and overregulated and that excessive competition between actors in AKS/AKIS impedes collaboration between researchers and innovators.

All these factors have hindered the ability of AKS/AKIS to support the emergence of innovative responses to the challenges and opportunities facing the farming, agri-food and rural sectors in Europe. Many of these challenges and opportunities emerge from the conflicts that exist between the imperative for sustainability (maintaining agri-environmental goods and services) and the world's increasing demand for food and energy. The shifting balance between these two finds expression in the evolution of the CAP and other large societal scale changes that will affect the future of farming, the agri-food sector and rural areas in Europe.

The report stresses the importance of establishing AKISs that function as networks and are fully integrated with existing educational and other support systems. An AKIS needs to embrace many different actors/sub-systems, helping them to connect with each other, collaborate, exchange knowledge and engage in collaborative life-long learning. This is the most effective approach for delivering and supporting innovation in the agri-food and rural development sectors. It is an approach that reflects the manner in which innovation occurs today; often through diffuse networks of actors who are not necessarily located in traditional research and development institutes. . It argues the case for redefining the role of research in meeting these challenges.

The concept of AKIS (and the interest in innovation systems) has been emerging to varying extents, although often in a piece meal manner. This paper looks at current examples and argues the case for a much more co-ordinated and systematic development of an integrated AKIS at the national and regional levels. An effective AKIS is an essential component for delivering the vision of productive and sustainable farming, agri-food and rural systems in the EU and its Member States. The development of more focused, effective AKIS requires the EU and governments of Member States to review their role and adopt new governance approaches and regulations for AKIS that can better support and manage innovation in agriculture and rural areas.

## 1 Introduction and main message

At the December 2008 meeting of the Standing Committee on Agricultural Research (SCAR) it was decided to establish a working group to study the various Agricultural Knowledge Systems (AKS) in the Member States and how they relate to, and support, innovation. This move was informed by increasing worries about the ability of existing systems to support and stimulate agricultural innovation across the European Union. In June 2009 a Collaborative Working Group (CWG) was formed under the coordination of the Dutch and French Ministries of Agriculture.

The SCAR-CWG on Agriculture Knowledge and Innovation Systems (AKIS) in Europe was charged with making an inventory of different AKS/AKIS in Europe, their capacity, strengths and weaknesses, together with the relevant policies of Member States and the main influences, incentives and obstacles affecting them. This study looks at the existing knowledge systems, including advisory services, education, training and research that deal with agriculture and innovation.

The terms of reference for the task of the CWG-AKIS were expressed in the following terms:<sup>2</sup>

- To examine the challenges involved in maintaining / building links between knowledge and agricultural innovation in Europe in the coming 20-25 years
- To estimate the potential of AKIS to better the interactions between knowledge development and innovation – particularly in the light of the need to develop sustainable agriculture systems that are able to feed a predicted global population of 9 billion people by 2050;
- To identify main problems that are likely to exist in 2050 and the research required to tackle these challenges.

The work of the SCAR-CWG is structured into five work-packages:

- WP1 to produce a reflection paper in which the current status of different AKS/AKIS is described and their strong and weak points are identified (this report).
- WP2 to look more specifically into AKS/AKIS policies at the level of member states and the European Union.
- WP3 to look at the relevance and importance of social innovation for the food system, agriculture and rural development, including rural/urban relationships.
- WP4 to study how well the various subsystems within AKS/AKIS interact with each other and the degree interconnections and exchanges with other knowledge systems and actors.
- WP 5 to consist of a range of case-studies that demonstrate the strengths and weakness of AKIS to provide an illustrative context that might also function as a source of inspiration.

The work-packages set out the work plan for the SCAR-CWG. Their reports will also be used as an input for the final SCAR-CWG report on AKIS and innovation, which will advise SCAR on the need for a coherent and effective European AKIS policy and how this might be established.

This document summarizes the results of the first work-package. It is entitled “a reflection paper on AKIS” and it summarizes the current state of agricultural knowledge systems (AKS) and agricultural knowledge and information systems (AKIS) in Europe. In doing so it follows SCAR’s approach to ‘farm to fork’ approach to agriculture, which includes food industry. The scope of this document, however, is limited to a focus on agricultural and rural innovation. It is only concerned with how innovation in

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<sup>2</sup> For more information on the CWG-AKIS see the terms of reference and their first report (2010)

primary production can be stimulated. More detailed questions regarding innovation in the food system might be dealt with in the subsequent work packages.

This reflection paper is aimed at several different target-groups:

- For the members of the CWG it will serve to systematize the existing knowledge base and will be used to build a common point of departure. As such it forms the basis and guideline for the other work-packages.
- It is intended to inform European and Member State policy makers and administrators involved in the agri-food sector and rural development.
- It is hoped that it will provide a discussion paper for the Council of Ministers and the Agricultural Committee of the European Parliament.

### Main message

Knowledge and innovation for agriculture are developed along different lines, following different paradigms (e.g. productivist, integrated development paradigm, alternative and others). Each has distinctive ways of defining problems and offers different solutions. As a result, agricultural knowledge systems are built upon different definitions, meanings and organizational forms which are evolving in response to changing economic, social, political and environmental contexts.

AKS exist in most of the countries as the way organisations are structured to support and advise agriculture and farmers, although they are often fragmented and not enough responsive towards changes. The concept of AKIS (and the interest in innovation systems) has been emerging to varying extents, although often in a piece meal manner. This paper looks at these examples and argues the case for a much more co-ordinated and systematic development of integrated AKIS at the national and regional level.

The government-driven agricultural knowledge systems (AKS) approach has historically has been associated with the productivist paradigm and organized according to a linear model of knowledge transfer: from scientists to farmers through extension services. AKS are strongly institutionally embedded and have efficiently met farmers' needs. However, they are also currently fragmented. Their sub-systems are often disconnected, which hampers the circulation of knowledge and the research results being usefully applied to innovation. AKS have often been criticised as being unresponsive and overregulated. Competition for funding between AKS/AKIS actors impedes collaboration between researchers and innovators. AKS has also not been sufficiently responsive to recent rapid societal transformations and newly emerging societal concerns and demands. New actors are entering the 'agricultural domain', bringing new values, challenges, solutions and opportunities. Farmers' interests and perspectives are also changing. To date AKS have not responded well to these changes and have been slow in taking up these new opportunities, new ways of thinking and the increasing diversity of farmers' expectations.

There are several core subsystems within an AKS: research, education, extension, and support systems. The way these subsystems function and the outputs they produce have been changing over recent times, but often quite slowly. Institutional and political inertia lead to old paradigms, which are concretely embedded in actors, discourses, institutions, socio-spatial patterns, laws and technical standards, often being resistant to the changes implied by new demands and ways of thinking. Over recent years the complexity of issues surrounding agriculture (e.g. climate change, food security, the provision of public goods etc) has increased, as has the range of actors engaging in knowledge generation and use. These processes require a renewal of AKS.

The main purpose of this report is to explore how existing AKS can evolve into a more open, inclusive and co-ordinated system with a stronger emphasis on network approaches. This leads us to argue

the need for a broader concept: of AKIS (Agricultural Knowledge and Innovation Systems). Conceptually this involves an analysis of the complex relationships that currently exist within AKIS subsystems. It also involves looking at their (actual and potential) gradual transformation, ways of involving actors, developing new initiatives and the increasing role of LINSAs (Learning and Innovation Networks for Sustainable Agriculture).

This report does not seek to choose between AKS, AKIS or LINSAs or place them in opposition to one another. These concepts are influential cognitive and policy frameworks. AKS represents a more institutional approach to knowledge and knowledge transfer in agriculture, while AKIS represents a more interactive and participative way that is more focused on innovation and end-users. LINSAs is more focused on individual innovations and can be seen as part of the AKIS approach. The broader AKIS approach has much potential to contribute to supporting innovation in agriculture and rural areas, particularly when agriculture is moving more towards multi-functionality and/or is more integrated with rural development.

This paper envisages future AKIS operating through networks that are strongly integrated with educational systems. They will consist of different actors and sub-systems that are well connected, and collaborate together in exchanging knowledge and ideas, and sharing the learning needed to deliver and support innovation in the agri-food and rural development sectors. Such structures will allow AKIS to address emerging concerns and quickly take up new questions and opportunities, building “products” that are tailored to farmers’ needs.

An AKIS should be able to propose and develop practical ideas to support innovation, knowledge transfer and information exchange. Policy needs to reflect the manner in which innovation actually occurs today: often through diffuse networks of actors who are not necessarily focused on traditional research and development.

This message is illustrated in Figure 1 which shows the functional links that should exist between AKIS and the emerging actor-networks involved in different areas of agriculture and rural development (such as direct marketing, primary production, care farming, PDO/PGI, biofuels, new rural services etc.).

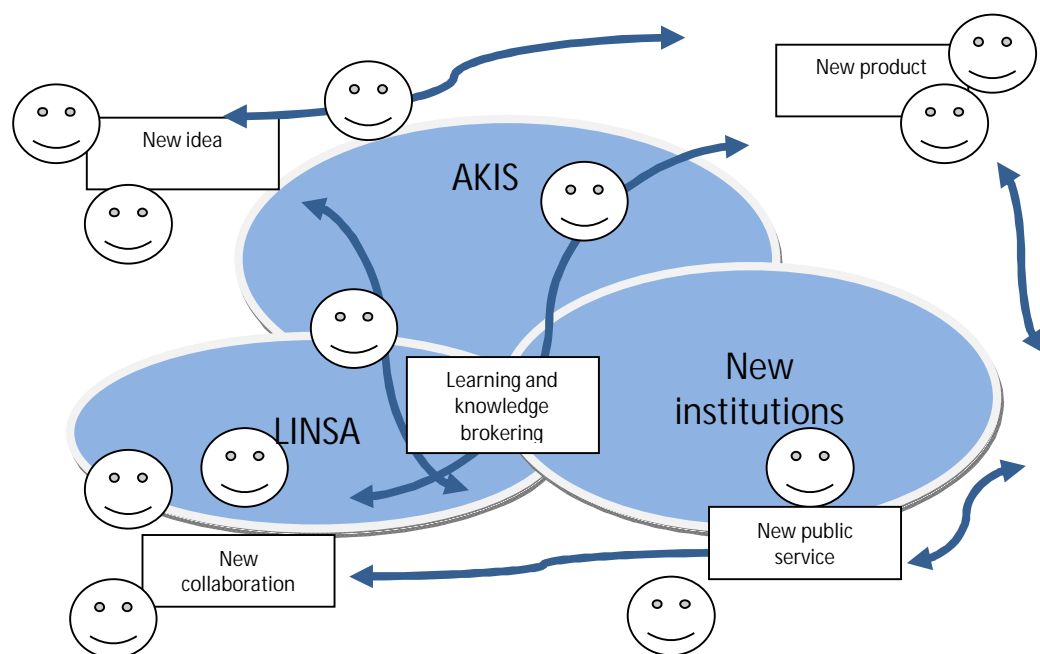


Figure 1: The relation between AKIS, innovative actors and networks

If AKIS is to be effective in helping to manage innovation in rural areas then there is a need for new governance approaches and regulations. AKIS needs to be responsive to the needs of different groups of farmers: intensive farms producing for world markets and more extensive farmers producing environmental goods and services, two groups that need to coexist within Europe's vision of a profitable and sustainable multifunctional agriculture.

The structure of this report

Chapter 2 of this report explains what AKS/AKIS is, who the main actors are, how it is structured, the importance of innovation and how it is embedded in wider knowledge systems. Chapter 3 discusses recent changes and developments and the main issues and problems concerning the system's ability to support innovation. The chapter also discusses the issue of innovation and recent thinking about how to best support innovation. In Annexe 1 we give an overview of the main concerns that motivated the establishment of the CWG, and the problems and policy recommendations that were made in the studies used in preparing this report.

## 2 Agricultural knowledge and innovation systems

### 2.1 Definitions of AKS and AKIS

Definitions of the agricultural knowledge system (AKS) have changed over time, with changing ideas about agriculture. There is a history of changing visions of, and policies towards, AKS. Leeuwis and Van den Ban (2004) claim that the AKS concept originated in 1960s, driven by an interventionist agricultural policy that sought to coordinate knowledge and innovation transfer in order to accelerate agricultural modernization. In many countries this concept was implemented through a strong integration, generally at national level, of public research, education and extension bodies, in many cases under the control of the Ministry of Agriculture.

Since the 1970s, official organizations such as the OECD and the FAO have introduced the concept of "agricultural knowledge and information systems" (AKIS) in policy discourses. This acronym has since evolved to describe agricultural knowledge and innovation systems" a concept that seeks to encompass and influence the complexity of knowledge and innovation processes in the rural sphere. The recent OECD Innovation Strategy (OECD, 2010a) highlights both the economic and social roles of innovation, stating that the "objective of policy should not be innovation as such, but the application of innovation to make life better for individuals and society at large." The report lists 14 policy principles for fostering innovation. These fall within five broad categories: empowering people to innovate; unleashing innovations; creating and applying knowledge; applying innovation to address global and social challenges and; improving the governance and evaluation of policies for innovation. Another key message in the report is that policy needs to reflect the manner in which innovation actually occurs today; i.e. often through diffuse networks of actors who are not necessarily focused on traditional research and development.

The 2<sup>nd</sup> SCAR Foresight Report (SCAR, 2009) identified the shortcomings of existing AKS and called for a renewal and strengthening of them. In this spirit, this paper reviews existing AKS and their subsystems and relationships and elaborates the AKIS concept and its potential. AKIS can take several forms and have several meanings. For example, AKIS can refer to formal institutional links between public and private institutions and/or informal knowledge networks among farmers. These components have flexible linkages and boundaries.

In this report we use AKIS as an operational term – not as a fixed and unchangeable definition or modus operandi. The AKIS concept contains elements that are both constructivist and proactive. It is intended to help explain how information and knowledge flow (and how innovation takes place) and

how these processes can be strengthened. AKIS has the potential to be an important tool for change management and helping agricultural systems become more compatible with broader societal goals.

Below we provide a glossary of terms that characterizes the evolution of thinking about AKS/AKIS: a process that has seen the gradual contestation of linear approaches to knowledge transfer and towards a more complex and network-like vision of knowledge, learning and innovation. These new concepts try to address the more complex reality of innovation, as well as the emergence of a new paradigm based on sustainable development rather than on productivism.

**AKS (Agricultural Knowledge System):** a collection of actors, such as researchers, advisors and educators, working primarily in agricultural knowledge institutes. The emphasis is on these actors and the role of formal knowledge production in national agricultural research systems (NARS). This knowledge is then transferred to the agricultural sector through agricultural extension services and education (Rudman, 2010).

**AKIS (Agricultural Knowledge and Information System):** The original formulation described “a set of agricultural organizations and/or persons, and the links and interactions between them, engaged in the generation, transformation, transmission, storage, retrieval, integration, diffusion and utilization of knowledge and information, with the purpose of working synergistically to support decision making, problem solving and innovation in agriculture” (Röling and Engel, 1991). This concept develops the notion of AKS, emphasizing the process of knowledge generation and includes actors outside the research, education and advice sectors. More recently the AKIS concept has evolved as it has acquired a second meaning (innovation) and opening up AKIS to more public tasks and to the support of innovation (Klerkx and Leeuwis, 2009).

**AIS (Agricultural Innovation Systems):** these are defined as ‘a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect the way different agents interact, share, access, exchange and use knowledge’ (Leeuwis and Ban, 2004).

**LINSA (Learning and Innovation Networks for Sustainable Agriculture):** this concept is derived from the network approach of AKIS. It describes thematically-focused learning networks that are made up of different actors, within and outside the formal, institutionalized, AKS. Members can include farmers, extension workers, researchers, government representatives and other stakeholders (Rudman, 2010). LINSAs are similar to ‘coalitions’ (Biggs and Smith, 1998), innovation configurations (Engel, 1995) and Public Private Partnerships (Hall, 2006). The emphasis is on the process of generating learning and innovation through interactions between the involved actors. The difference between AKS and LINSAs is connected to how knowledge is conceptualized: AKS sees knowledge as a “stock to be transferred”, whereas LINSA emphasizes the processes needed to make knowledge useful and applicable to other actors. The LINSA concept helps to illuminate and extend some forms of AKIS, which may be otherwise hidden or marginalized.

**Learning:** knowledge is an interactive (social) process that takes place within cognitive frames (paradigms, cognitive rules and regimes) in response to problems, opportunities and challenges. Individual and/or collective learning occurs in various ways: learning by doing, social learning, transdisciplinary learning, transformative learning, etc and is a necessary precondition for change.

Rivera and Zijp (2002) have recently sought to broaden the AKIS concept to include rural development, renaming this as AKIS/RD. Their model looks at four main actors with an interest in agricultural/RD innovation:

- Research
- Extension services
- Education and training
- Support systems (all the organizations providing credit, inputs and producers’ associations, etc.).

In this model, all these four sets of actors act upon the knowledge of farmers and rural actors and generate innovations in response to problems and opportunities, desired outcomes, system drivers and regulative policies and institutions (Figure 2). However as (the left-hand side of) Figure 2 shows, problems are not simply given by the context. Rather, they are framed in different ways by specific paradigms. The same is true of material inputs and knowledge, which are also shaped by paradigms.



This aspect is explored in more detail in section 3.3. Such differences are important in framing research priorities, societal choices and public accountability.

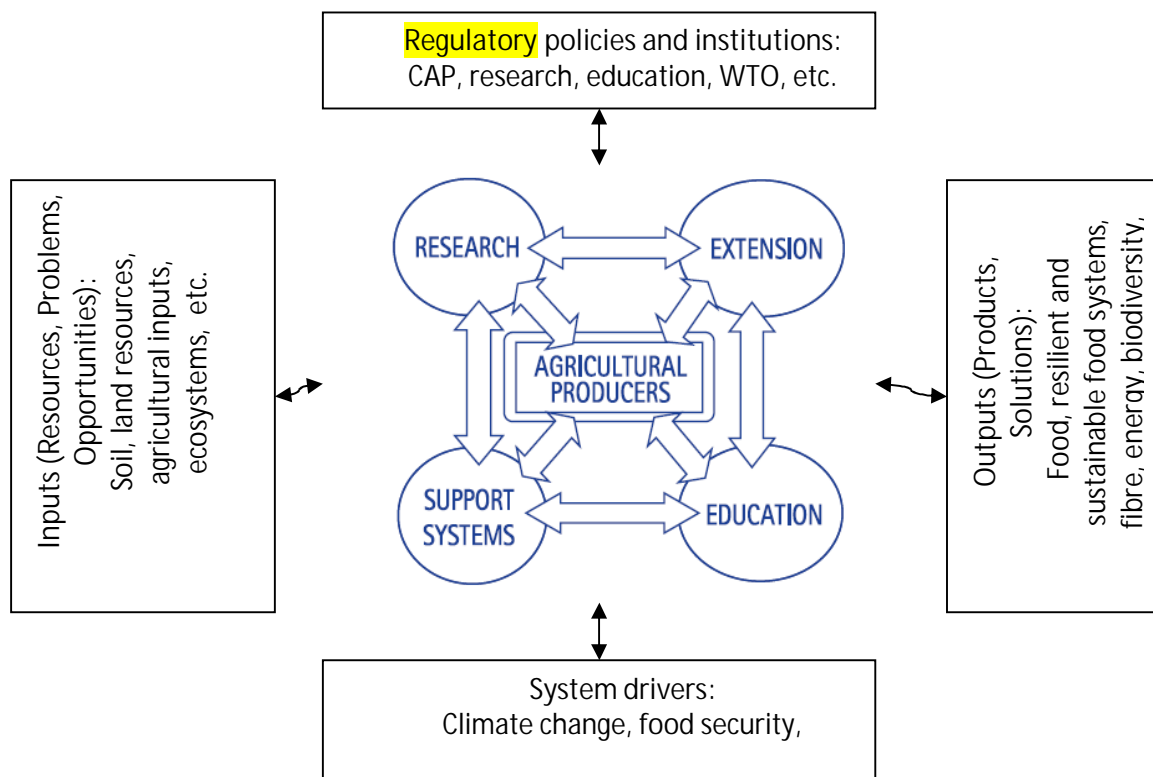


Figure 2: A model of an Agricultural Knowledge and Innovation System undergoing transformation (– Adapted from Rivera and al. 2005.

## 2.2 The need for a transition from AKS to AKIS

When it emerged in the 1960s, AKS was a government driven initiative to teach farmers new skills, such as how to handle tractors. The original orientation was to diffuse knowledge to farmers and thereby unlock the knowledge embedded in products (tractors, chemicals, etc.) so as to increase productivity in food sector. AKS was not intended to promote breakthrough innovations or rural development. Over time some came to view AKS as too rigid or expensive. The policy reforms of 1990s and the privatization of advisory services in many countries saw a move away from government driven AKS and towards multi-actor systems, in which private actors, (such as input industries and private advising firms) came to play a larger role. The AKS in EU member states are now very diverse: some have mainly private systems, while others have multi-actor systems with governments or professional organizations as the driving force. The new emphasis on AKIS is introducing technical and social innovations into the model and is influenced by paradigm shifts (that parallel those that are occurring in research and innovation policies) towards network driven multi-actor innovations and even a step further – towards Life Long Learning.

A number of factors have led to the erosion of the traditional concept of AKS that were based on a strong integration, at national level, of public research, education and extension bodies, under the control of the Ministry of Agriculture. They include both theoretical and empirical factors.

1. Research, extension and education have undergone a deep restructuring. They have been radically transformed by the trend towards liberalization, which has led to privatization of

service delivery or to public/private partnerships, the multiplication of extension organizations, farmers contributing towards the cost of these services, competitive bidding for research and extension contracts and tighter evaluation procedures.

2. The policy agenda has been modified by an increasing concern over the environmental impact of industrial agriculture, the quality of life of rural populations, rural employment and the need to support the positive externalities linked to agricultural production. This has led to new emphasis being placed on balancing and integrating agricultural policies with rural development.
3. The linear model of innovation has progressively been replaced by a participatory or 'side by side' network approach, in which innovation is 'co-produced' through interactions between firms, researchers, intermediate actors (input providers, experts, distributors, etc.) and consumers.
4. The growing disconnection between farmers' knowledge and research and extension systems.

The 2<sup>nd</sup> SCAR Foresight Report (SCAR, 2009) draws attention to the alarming challenges posed by the increased speed of climate change (the vulnerability of food systems, food security threats, the loss of biodiversity, the acceleration of water and soil scarcity, etc.) that creates a completely new context for the future development of AKS. The report argues that AKS in Europe need to be redefined (and eventually reorganized) in order to respond to these highly complex and urgent problems. This is a key to maintaining resilient and sustainable food and farming systems. One of the central messages of the Foresight Report is that a 'renewed' AKIS can respond to these challenges by mobilizing new types of knowledge and enabling new forms of cooperation between knowledge generating institutions (such as universities, research institutes and laboratories), farmers, other resource users and consumers.

### 2.3 The main actors involved

In most countries, very many actors are involved in AKS/AKIS and this can lead to fragmentation. This can be a problem, as it creates many coordination issues. Yet, on the other hand it also provides an opportunity for innovation. In the In-Sight project, we categorized actors into 4 groups (figure 3).

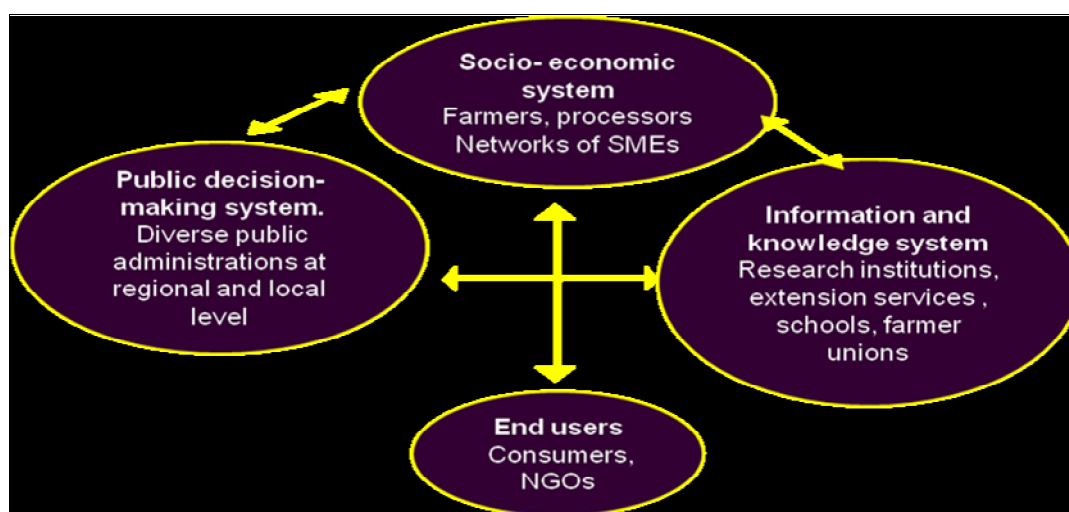


Figure 3: The main categories of actors within AKS/AKIS

## a- Information and knowledge system

In almost all countries the information and knowledge system is traditionally composed of research, extension and educational organizations, structured and governed by the government through a sectoral agricultural policy. In all cases the historical goal was to increase the productivity of the agricultural sector, by making farmers more professional.

The structure of this system, its organization and governance (e.g. under a public or private structure) differs greatly between countries, as does the level of centralization or decentralization. Diversity can also be found within different regions and federal states in the same country (e.g. Germany). In general however the systems are highly fragmented and subject to a dynamic process of emerging new structures and actors. We can identify several different models according to the level of fragmentation and sources of funding – whether central or regional administration or other sources and funding (Laurent et al, 2006).

- Mainly privatized systems (e.g.: the Netherlands and some states in Germany) where the funding mainly comes from direct payments from farmers and where the AKS/AKIS is managed by private bodies. (In the Netherlands the extension system is privatized but research and education is not. A 'knowledge voucher' system has been introduced for farmers and SMEs which provides a subsidy to 'buy' knowledge).
- Co-management between farmer organizations and the state (e.g. France, Finland and some states in Germany), with public funding, partial payments by farmers and farmer organizations.
- Semi-state management (e.g. Teagasc in Ireland which has a board with representatives from the state, industry and farmer organizations);
- Management by the state through regional organizations (e.g. Switzerland, Italy and Finland).
- Uncoordinated individual innovation nucleuses.

The educational system often has very strong links with the agricultural information system. Openness to innovation within the educational system is therefore a key factor in enabling actors to understand and transform knowledge and thereby to build projects.

Generally, the public systems face similar problems, including a lack of capacity, a conflict between the various roles (e.g. the same organization acting as an inspector and as an advisor), management and motivation issues, methods and staff qualifications. The private systems face a different set of problems, including unstable employment opportunities for advisers and people having unequal financial means to take advantage of extension services, which generally favours large holdings or more profitable farms. Private extension systems and training courses rarely focus on public goods, but are more focused on realizing the private aims of companies. For example, In Ireland extension, research and education services are provided by the semi-state organization Teagasc, and inspections are conducted by a separate state department.

The OECD Innovation Strategy (OECD, 2010a) emphasizes that science continues to be an essential ingredient of innovation, even though innovation now encompasses much more than R&D. The SCAR workshop in Angers (SCAR, 2008) identified several negative aspects in the way that science influences AKIS. For example research agendas, priorities and evaluation criteria are set within the academic domain, which places great emphasis on peer reviewed publications. But the (diverse) users of knowledge and innovators need more adapted knowledge that is better translated to their understanding and needs. Therefore the concept of a broadened AKIS requires various forms of knowledge brokerage (e.g. the dissemination of applied research results in 'grey literature', farmers'

magazines, specialized websites, posters, seminars etc.). One way in which this can be achieved is to put more emphasis on networking, transdisciplinary research and cooperation between the worlds of academia (universities and research institutes) and practice (farmers, field extensionists, knowledge brokers etc). Innovation rarely occurs in a vacuum; it is generally a highly interactive and multidisciplinary process and this implies the need for researchers to collaborate much more closely with farmers and end users.

In several countries there are challenges in transferring results from research into practice - and vice versa –channelling practitioners' demand for knowledge into research and advisory agendas. Different approaches are used to try to ensure coordination within the system, as shown in the examples below.

- § In France, funding is given for special projects involving consortia of research, extension and education organizations. These projects foster exchange between the different organizations and can increase responsiveness and communication, but they are also more time consuming and costly because of the higher transaction costs. "Poles of competition" are being built at local level, with the idea of creating networks between firms, research centres and universities, around identified innovative projects.
- § In Switzerland, platforms are in place involving actors from research, extension and education as well as committees of different farming and other organizations. This strengthens interactions between different stakeholders.
- § In Baden-Württemberg (Germany), agricultural universities cooperate with governmental research units and extension services and farmers' associations. Education and extension services are supported by modern techniques and methods of knowledge sharing and by exchange platforms. Cooperation in research and innovation is adjusted to the decentralized infrastructure and increasingly done in cooperation with international partners. There is a recognition that institutional research priorities (at the European, national and the federal-state level) are not giving enough support to less formal knowledge generation and that they need to be fine-tuned to foster knowledge transfer and extension.
- § In the Netherlands, the privatization of extension service has created competition. As extension organizations are competitors they are sometimes reluctant to share their knowledge. To bridge this gap and the gap between the demand and supply sides of the knowledge market, there are intermediary brokerage structures, often publicly funded. Extra incentives (funds) are needed to promote interactions between different AKIS actors (involved in education and research, extension and practitioners) to stimulate the innovation chain in different directions (not only research-driven innovation but also innovation-driven research, integrating innovations into production and the use of knowledge).
- § In Latvia, the AKS/AKIS is fragmented with many actors (public-private, local-national, agricultural-rural, research-extension) involved. Recently the Latvian Rural Advisory and Training Centre and Latvia's University of Agriculture, two of the central actors, have been seeking closer cooperation and farmers' organizations, cooperatives, professional associations and commercials becoming increasingly involved in knowledge exchange, training and advice. New models of cooperation are emerging to bridge the gap between the demand for and the supply of knowledge.
- § In Ireland, Teagasc, the government funded organization, provides an integrated research, advisory and extension service for farmers and stakeholders in the agri-food and rural development sectors. Agricultural extension (and education) services are jointly financed by farmers and state subsidies, while research activities are funded by the state and funds won from competitive external research funding schemes. Interactions with stakeholders are organized through formal groups of commodity stakeholders (e.g. dairy, beef, sheep, crops, environment, rural economy and development etc). Strategic partnerships for innovative extension activities between farmers, the private sector, and the media are fostered by targeted programs such as the BETTER (Business, Environment, Technology, Training, Extension and Research) farm programme. There is also informal contact between Teagasc staff and stakeholders, which is made possible by the relatively small size of the country and Teagasc's network of applied research centres, advisory offices and agricultural colleges. Knowledge management services are also provided by consultants operating in the private sector. Tertiary level education and research is also conducted by University College Research partnerships with Irish and European

universities and fostered by a post-graduate funding scheme designed and administered by Teagasc (e.g. Teagasc's Walsh Fellowship Scheme). However, the links and coordination between the main players of the system are not always transparent.

## b- Socio-economic actors

Farmers can be categorized and differentiated according to several criteria: professional/part-time, old/young, men/women, conventional/organic, specialized/diversified as well as according to their main motivations (entrepreneurship, ethics, innovation etc.). Farmers in these different categories have different attitudes towards innovation. In general, there is a bias among extension services towards professional, specialized, conventional and male farmers. As a result, not all farmers have equal access to support services from AKS/AKIS. There are various reasons, for this, including:

- Some farmers cannot afford it
- AKS/AKIS does not answer to the needs of all farmers
- Some farmers (for example: part time farmers).do not qualify for support

Generally, smaller farms, those engaged in extensive farming and those below certain output thresholds find it difficult to qualify for government support and extension programmes, which are largely designed for more intensive modes of production. These groups of farmers also find it too expensive to use the services of private extension providers, so they are effectively excluded from every kind of extension service. In the same way, in some countries (e.g. Germany) areas with more marginal production conditions, multifunctional farms and farm households engaged in farm-based processing and direct marketing or with non farm sources of income can find themselves outside the official extension system because they are engaged in innovative activities in areas that do not enjoy sufficient interest and support from the state. Farmers' innovations are often ignored by the general systems, on the grounds that they are merely incremental, non-technological or not appropriate for the advisory system (Van der Ploeg, 2008). Thus there is a real challenge to develop tailored "advice products" that are appropriate for the needs of different types of farmers.

Rural entrepreneurs and SMEs are involved mainly in rural tourism, resource based activities (wood, water, etc.), food processing and social services. In most cases they have few links with the official AKS/AKIS, even though social services and care agriculture are growing in importance (Di Iacovo and O'Connor, 2009).

Actors involved in agri-food production chains: relationships between producers, processors and retailers are increasingly being formalized into codes of practice that are linked to quality schemes. Actors in this group are among the major drivers of innovation, because they have to adapt their internal organization and technologies to comply with rules and standards.

Input providers: the providers of technical inputs (usually manufacturing enterprises in foods, fertilizers and machinery) are increasingly turning their commercial networks into knowledge systems. There is a strong tendency to strengthen customers' loyalty by giving advice to farmers. This is particularly relevant in countries where extension services and cooperation are relatively weak, such as Italy and Latvia, and in animal production and agro-food processing.

Cooperatives and producers' organizations: these are often a major conduit for the flow of knowledge and information. Producers' associations and cooperatives often provide inputs as well as input-related technical advice. To this end they carry out product related research and training and provide advice related to products. For the larger cooperatives, which tend to concentrate on, and

compete in, global markets, innovation is increasingly promoted through top-down approaches. In France and Switzerland inter-professional bodies play an important role. These consist of producers, processors, other professionals and consumer representatives working together. In Ireland, institutional innovations such as farm partnerships, share farming, and federated cooperatives have been developed through cross-sectoral public/private partnerships. These cooperative institutions aim to facilitate collaboration between private farmers/producer groups and industry partners through pooling knowledge, resources and innovative capacity.

Processing and retailing companies: these are among the most important drivers for innovation. In particular, retailers tend to control producers through labelling schemes. Retailers see themselves as the interpreters of consumers' needs and motivations. They pursue a top-down approach to innovation, reducing the possibilities for farmers to follow independent innovation paths.

The media and journalists: professional journals and, increasingly, web-sites are important fora for the exchange of information and ideas in the farming community. The mass media shapes food discourses in society at large and mobilizes consumers' attitudes in terms of food safety, values, alternative food networks and new production and consumption patterns. The media is also a potentially effective tool for disseminating information on non-proprietary innovations for the agri-food sector developed by R&D activities. In Ireland, Teagasc collaborates with the media to track and profile case-studies of on-farm technology adoption (through the BETTER Farm Programme).

#### c- End users

Consumers are increasingly recognized as active players in innovation, especially with regard to green technologies and sustainable lifestyles. NGOs also play an increasingly important role in innovation. They often provide ideas, motivation and help develop the capacity to innovate. They are particularly well suited to acting as knowledge brokers, as is happening in Latvia (in the organic and in the rural tourism sectors) and in Italy (mainly in the local food sector, but recently also in the energy sector).

Besides all these types of actors it is worth stressing that, at the micro-level of innovation, leading personalities, with very specific knowledge skills and networks that can support or champion an idea or a project, play a crucial role in the success of projects, especially in the emergence stage. Their personal skills and networks and their capacity to unite and motivate other actors is often essential in getting the ball rolling. While their role can diminish over time, when other skills and knowledge may be needed to further develop an initiative, these individuals often continue to play an important role in the group process. These leading personalities are often socio-economic actors (farmers) or consumers (possibly involved in NGOs). Leading personalities, vibrant networks and novel project groups often stimulate innovation focused research.

At the meso-level municipalities, cities and regions are becoming increasingly important players on food scene and in stimulating innovation. In the last decade alternative food networks have steadily gained ground, often with support from public authorities (Watts et al, 2005). Quality food production systems are being re-embedded in local ecologies (Murdoch et al, 2000) and many municipalities are orientating the public procurement of food for schools and hospitals towards organic and regional produce and using their purchasing power to support urban gardening and community supported agriculture (Morgan and Sonnino, 2008). Thus municipalities' food strategies and endeavours to promote sustainable production and consumption patterns can create positive connections between food, health, the economy, the environment and culture and become important drivers for innovation.

## 2.4 AKS/AKIS: the main issues, challenges and drivers of the sub-systems

AKS/AKIS must now relate to a broader world than just agriculture, as it has been narrowly conceptualized in the past. New actors are entering the AKIS domain with new interests, new values and new expectations. As such AKIS has to transcend the traditional borders that have defined AKS. Figure 4 graphically maps the specific issues, concerns, recent developments and drivers of AKIS, distinguishing between research, extension, farming, society and education.

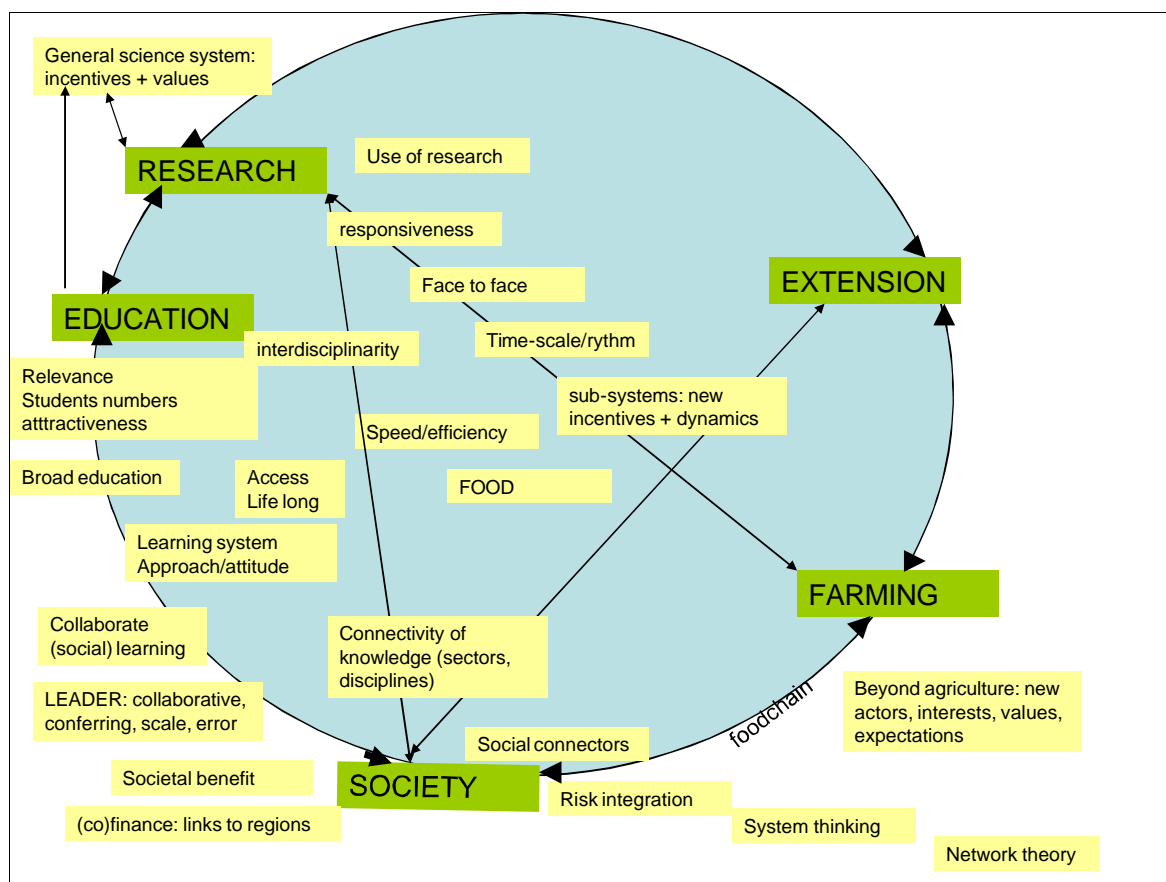


Figure 4: Dynamic of AKIS (Source: CWG meeting discussions, June 2010)

In an ideal world AKS/AKIS would function as interconnected system or network. However, in reality, existing AKS/AKIS is often fragmented. This section explores some of the causes and consequences of this.

Research is often not sufficiently related to farm praxis. This is partly related to the lack of connection between the different disciplines in agricultural research. 'Translational research', valorization of research results, the responsiveness of research to its own content and access to results are all issues that need to be addressed. But there are positive examples of these problems being overcome. The Dutch Dairy Academy, in which farmers and researchers collaborate as a network and jointly develop new research and new knowledge, is one notable example. Similarly, in Ireland Participatory Action Research (PAR) involves inputs from social scientists, extensionists and farmers to jointly devise effective knowledge transfer processes that are accessible and acceptable to

farmers. PAR has also led to the adjustment of existing technologies, so as to enhance their usefulness and acceptability to farmers, and to the development (co-creation) of new technologies. It is important to verify the extent to which research and innovation result in actual change and what happens to the knowledge produced. One important indicator of AKS/AKIS is the societal benefit of the knowledge that it generates.

Education / Learning: AKIS (and especially the research and education sub-systems) should be an effective learning system, rapidly and responsively taking up new issues and ideas and integrating them in education plans, course outlines and research projects. Collaborative social learning is an important aspect of this but is currently not well embedded in the institutional settings of AKS/AKIS.

Farmers and other vocational actors are important drivers of innovation. Farmers have always been inventors, but they are not keen on others earning money from their inventions. Rural women are often mentioned as drivers of innovation, because they are often outward looking and stabilize the farm by generating diversified sources of income. Food is a unifying concept for society and for AKS/AKIS – and a new set of concerns, beyond traditional agricultural discourses, is entering the arena. These include: food security, public health, new/alternative supply chains, the vulnerability of globalized markets and the search for territorial food resilience. Social connectors such as teachers, consultants, innovation brokers, organizers etc. are important in transferring new knowledge and helping to generate induced / embedded innovations.

Transfer of knowledge: as mentioned above, there is a gap between research and praxis. One reason for this is that there is not sufficient available funding for the transfer of knowledge. Research generally ends with the publication of results with little further involvement of stakeholders or target groups. There is a need for more and stronger face-to-face contacts between researchers and farmers. Extension is important in relating new knowledge to praxis (and vice versa) and there is a need for both private and public interests to be involved in extension work. Innovation: the institutional elements of AKS/AKIS need to be drivers for innovation. But this does not always occur and we need to ask how this can be achieved in practice. Innovation is by definition risky, developing and applying new knowledge always implies risk and risk avoidance can be a barrier for innovation<sup>3</sup>. A properly functioning AKS/AKIS can help to reduce risk.

#### Overall

As shown there are many disconnections between the various sub systems within AKIS. Actors in the subsystems are driven by different incentives and there are often no, or insufficient, incentives for them to connect with each other. To overcome this it is important to conceptualize AKS/AKIS as a network with non-hierarchical nodes; much thinking about AKIS and innovation is still linear or at best, circular/cyclic. At present there are major barriers between different parts of the system/network and hesitance and resistance among different actors to share their knowledge.

These disconnections impede learning and hamper effective research and innovation. AKS/AKIS is often perceived as being unresponsive and overregulated. Competition between the AKS/AKIS actors (researchers and institutes) for funding impedes collaboration between researchers and innovators. AKS/AKIS is part of (and partly driven by) the wider system of education, science, research and innovation, which are driven by incentives that are not directly related to innovation outcomes. These include funding that is based on student numbers, academic excellence and publication in peer reviewed journals. These factors act a disincentive for undertaking applied research and interacting with other systems. The existing incentive structure makes it difficult to link research with praxis.

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<sup>3</sup> The EU project RUDI contains interesting results about the mainstreaming of LEADER and will soon be available.



The shortcomings of AKS/AKIS are also partly a result of societal transformation and new societal concerns and demands. New actors have entered the agricultural domain, importing new values, new approaches and opportunities. So far the AKS/AKIS system has not responded adequately to these changes and has been slow to take up new opportunities and adopt new ways of thinking. There are also problems with funding for innovation. Until recently LEADER was a useful source of funding for innovation, but its recent mainstreaming has reduced its previously important role in stimulating innovation. LEADER is now over-regulated and it is very complicated to get projects approved.

The reorganization or up-dating of AKIS requires governments to adopt a new role and make changes to the current governance and regulatory conditions surrounding AKS/AKIS. In so doing it is important to balance regulation with governance, be wary of the danger of over-regulating and of the importance of leaving enough space for innovation to happen.

## 2.5 AKIS as a system, network or hybrid?

In discussing contemporary AKS/AKIS the CWG wishes to avoid discussing the two systems as polarized opposites. All systems have a certain extent of fragmentation. This is reflection of societal conditions, including the state of the economy, the size (and homogeneity) of the territory, population density and education level, the size and embeddedness of the AKS/AKIS, cultural attitudes towards knowledge sharing and innovation and political and governmental influences on peoples' behaviour and attitudes.

A knowledge system is an open construction. Each field of activity can be seen as a subsystem with its own identity, rules, actors, behaviour, institutional infrastructure, type of relationships etc. At the same time a knowledge system is rooted within a broader system that includes human relationships, conventions, communication infrastructure, rules, public concerns, etc.. For example, in Baden-Württemberg (Germany) the AKS/AKIS is engaged in the fields of activity depicted in Figure 3, but also includes public communication, which involves knowledge transfer between farmers and society, consumers and politicians. Consequently it is not easy to define the outer boundary of the AKS/AKIS, which depends on the point of view from which it is being analyzed.

Both system and network approaches can be useful in understanding and describing AKIS. System approaches focus more on institutional aspects and network ones look at the relationships between individual actors. While knowledge systems are institutionally embedded they are not static. The most important aspects of knowledge systems and of actors' behaviour within them are connectivity, heterogeneity and plurality. The transformation of existing AKS into a future AKIS should not neglect parts of old system (research, extension etc), but encourage them to interact and be more open. The Baden Württemberg experience shows how the "system" can be turned into a "process" with AKIS acting like a thinking motor (or heuristic device) that helps actors to understand what is happening in farming and the food sector and identify available and missing resources. The Irish experience also shows an 'opening up' of traditional systems, by promoting interactive extension methods such as 'Monitor Farms' and adopting Participatory Action Research (PAR) in collaborative social and biological science and extension programmes. The shift towards AKIS also implies a change from attempting to transmit a single message to farmers (e.g. "improve efficiency") towards multiple tasks and complex innovations. Methods such as PAR allow and encourage such multiplicities and complexities in the innovation process. Learning and interaction between actors with knowledge comes to the fore in this shift from more system-centred towards more network oriented and hybrid knowledge systems. These networks are needed but they are not going to spontaneously appear. They need to be stimulated and facilitated while also nurturing and transforming the merits and capacity of the old AKS so that the different parts of system are better able to collaborate. Leeuwis

stresses the importance of replacing the concept/term of “system” by that of “networks” since “ the (first) term does not have in-built connotations of a common purpose and clear boundaries, and hence serves better to describe what happens in most situations” (2004)

The CWG’s discussions on the transformation of AKS can be delineated as followings: Complex problems ↔ changing AKS and its sub-systems ↔ collective solutions ↔ the emergence of a network-type AKIS ↔ learning processes (practical + social + transformational learning) ↔ the governance of innovative farming and rural development ↔ innovation ethos and values and policy incentives to stimulate this ↔ breaking down the walls ↔ training, education and facilitating networking and study groups (which develop network skills) ↔ funding these innovation and learning networks.

## 2.6 AKIS and innovation

Innovation not only involves a technical or technological dimension. It also, and increasingly, involves strategy, marketing, organization, management and design. Farmers do not necessarily apply or develop ‘new’ technologies: their novelties emerge as the outcome of different ways of thinking and different ways of doing things and in recombining different pieces of knowledge in an innovative way. Innovation is both problem solving and opportunity taking as a response to internal and external drivers. Each innovation is characterized by a combination of technical, economic, organizational and social components. The development and application of technological or economic innovations often involves organizational innovations, breaking barriers, bringing actors and competences together and socially redefining the identities and roles of actors.

Approaches based on socio-technical networks enable a better understanding of innovation processes. Innovation occurs when the network of production changes its way of doing things. This implies that innovation is mainly related to the patterns of interactions between people, tools and natural resources. This, in turn, implies that learning is at the core of innovation processes, as any change that brings about improvements in social or economic organization also increases the available knowledge. Geels and Schot (2007) elaborate this multi-level perspective, emphasizing the importance of societal struggles in influencing innovation choices. “When new technologies emerge,... social groups have different problem definitions and interpretations, leading them to explore different solutions. This variety of meanings is eventually reduced through ‘closure’, an inter-group process of negotiations and coalition building..... In this socio-cognitive institutionalization process actors directly negotiate about rules (belief systems, interpretations, guiding principles, regulations, and roles). This dynamic is played out at conferences, in journals, at workshops, struggles for research grants, etc.” (p.405). This implies the need to better understand social-institutional dynamics, through which “actors try to make sense, change perceptions as they go along, engage in power struggles, lobby for favourable regulations, and compete in markets” (ibid.).

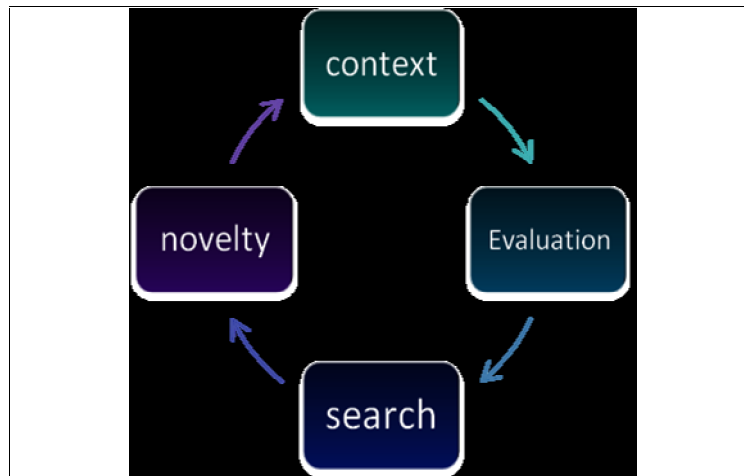


Figure 5: Innovation as a learning process, Source: Insight project

### The dynamics of innovation

Figure 5 illustrates a cyclical learning process in which the subject perceives the context through the available information. Evaluation of this information leads to an assessment of a given situation. If the context is seen as the source of a problem or an opportunity, the subject may start a search process, which may eventually generate a novelty. This production of this novelty may have an impact both on the context and on the cognitive frameworks used by the subject to evaluate the context. This paves the way for a new cycle.

As innovation cycles are repeated, interactions between people, tools and natural resources become more and more structured. Four levels of structuration of the socio-technical network can be identified (Geels, 2004; see figure 6).

- Novelties are localized 'breaks with routines'. They are limited by external constraints, such as laws, actors and norms.
- Niches are the result of an aggregation of different smaller systems. They are the places where new paradigms emerge as a result of learning processes. They are governed by paradigms that differ from those of the dominant socio-technical systems. The norms, rules, routines of production, distribution and consumption are looser and subject to rapid evolution. Niches activate learning and societal embedding processes.
- Regimes represent the stage when paradigms are turned into practices and are incorporated into concrete socio-technical systems. Networks are structured and coordinated by rules. In the period of transition period leading towards a regime change, many contradictions can emerge, as well as strong resistance to the innovation.
- Landscapes can be changed as an effect of supranational policies or the scaling up of radical changes, but more often changes in socio-technical landscapes are important drivers for radical innovation. We may include into this category situations and events beyond the reach of national policies: global climate change, north-south divides, international trade or banking regulations, etc.

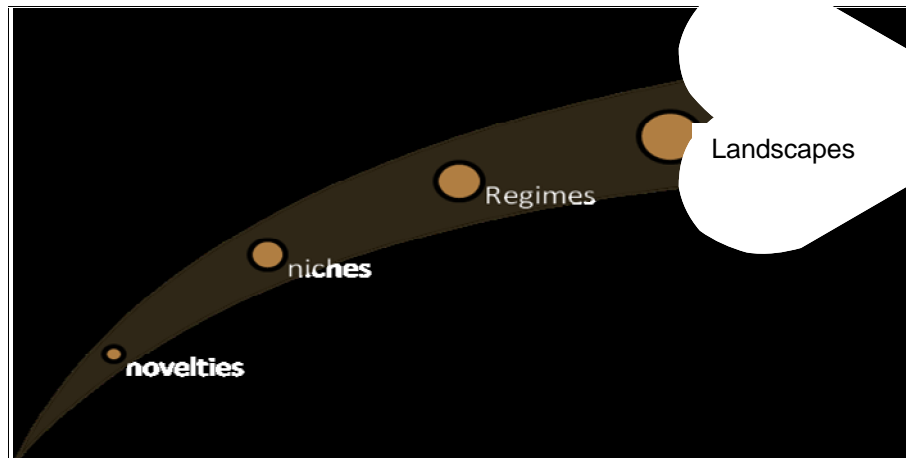


Figure 6: The dynamics of second order innovation

The line in the figure suggests a logical and inevitable transition from one stage to the next. However, not all novelties develop into niches; nor is every regime supportive to novelties or new niches. Transitions are difficult to manage and may require brokers and policy support. While regime shifts can be explained after the event they are very difficult to plan in advance. A change in landscape may facilitate a regime change. Socio-technical landscapes do not determine outcomes, but they do provide deep structural 'fields of force' that make some actions easier than others. Landscape changes only exert pressure if they are picked up and acted upon by regime actors. Social movements may voice protest and demand solutions. They can mobilize public opinion and lobby for tougher regulations. Outsider firms, entrepreneurs or activists may develop alternative practices or technologies (Geels and Schot, 2007: 403, 406). Efforts to change the landscape and to develop regimes correspond to specific paradigms; (see section 3.3).

## 2.7 How AKS/AKIS relates to broader knowledge and innovation systems and policies

Innovation systems and innovation policies are complex. Support for innovation may be the responsibility of several different ministries and there may be several (overlapping or contradictory) policies to foster innovation, (e.g. in the domains of research, technology and education). More recently (since the 1990s) innovation also became an objective of regional development policy, particularly in rural areas, through the LEADER programmes as well as in national policies.

Innovation policies are implemented at several decision making levels: European, national, regional and local. Many actors are involved and their number is increasing as interest in innovation diffuses into other policy arenas. This high level of fragmentation within the system, as well as the fragmentation of incentives in different parts of the system, means it is often a challenge to achieve vertical and horizontal coordination.

Actors in innovation systems are very diverse: policy makers and administrative bodies (who are sometimes perceived as "external", out of the system, actors by other participants), universities and research institutes, innovation agencies, private firms with their own R&D arms, industrial research centres etc. Some are private or public and some mobilize both public and private money. The governance of innovation systems is changing as a result of the increasing move towards public-private partnerships and the tendency for research or innovation agendas to not only be defined by the government and universities but increasingly also by private and public stakeholders. At the same time, government, universities and research institutes maintain a strong influence over innovation systems, although the degree to which they do so differs between countries.

Government bodies mobilize different financial instruments and create the right conditions, to support innovation through:

- Funding public or private organizations and institutions
- Funding projects, for example through the LEADER programmes
- Funding networks (or platforms in some countries)
- Distributing vouchers to private firms that they can use to buy knowledge from public knowledge institutes or large companies with an R&D department (e.g. the Netherlands and Ireland)

A general trend can be observed in most countries towards the creation of innovation agencies at the regional level that aim to support and further develop innovation. These may be incubators, facilitating the development of innovative enterprises with infrastructures, business support, R&D. They may also take the form of technology transfer and contact points facilitating coordination and cooperation between enterprises and R&D providers and peer-to-peer exchange. These organizations usually work as intermediaries, brokers and facilitators. However their main focus is not on farmers and agriculture, but on technological innovations and SMEs. As such these organizations have limited influence on agricultural and rural innovation. They also tend to operate under the linear paradigm and it can be a challenge for them to adopt a wider vision and establish links with AKS/AKIS. These general innovation systems are also often urban centred. Agricultural or rural innovation systems often operate quite autonomously from general innovation systems, except through specific mechanisms, such as LEADER projects.

In Wales the Regional Innovation Strategy provides an example of an interactive model of innovation with multi-stakeholder participation, which is being implemented in the form of the Learning Region Programme (Morgan, 1997).

In Ireland, a Memorandum of Understanding between Teagasc and the National Irish LEADER Network facilitates mutually supportive collaborations in education, facilitation and research activities, with the specific aim of fostering proprietary innovative entrepreneurship in farm business diversification.

In Germany the Federal Ministry of Education and Research has a programme, "Learning Regions – Providing Support for Networks" which promotes regional co-operation and networking. The objective is to bring together players from different educational sectors to jointly develop new opportunities for Lifelong Learning that are linked to the regional strategy. The actors include general and vocational schools, institutions of higher education, funding agencies, institutions offering out-of school and off-the-job or inter-firm training, adult education centres, companies, chambers of commerce and trade, trade unions, business development organizations, education guidance institutions, youth authorities, employment offices, teachers, learners and other actors. This decentralized approach allows each network to adapt itself from the regional point of departure and develop a locally appropriate strategy. Through regional cooperation these regional partnerships develop into learning regions (Contzen et al, 2004).

In Baden-Württemberg evaluations of the implementation of measures in the framework of the ELR programme suggest that success is linked with learning between totally different groups in rural areas, and that this learning process is the most important effect of the programme, more than the formal aspects of project implementation. In some cases the projects are building bridges between rural areas and the city.

Enterprises in rural areas are often small and physically distant from knowledge organizations (universities, research institutes). This often means that they have less access to the innovation system than enterprises located in urban areas. At the same time, national innovation policies tend to focus their support at larger and more commercial enterprises. Enterprises in rural areas may be involved in different activities at the same time, because of risk-spreading or seasonal influences. They are often multifunctional, producing a combination of commodities and non-commodity outputs, such as environmental services, landscape amenities, social care, leisure and cultural

heritage. These latter outputs are often 'public goods', and the markets for these goods may function poorly or be non-existent (IAASTD, 2008).

2.8 It is the intention of the European Commission that the 2013 CAP reform will focus on providing more support to the provision of public goods. Dynamic models of innovation: some examples

In recent years agricultural and rural innovations have increasingly been driven by multi actor networks, which consist of combinations of stakeholders (knowledge actors, socio-economic actors, end-users, policy actors). There are various forms of multi actor networks: learning groups, marketing networks, producer-consumer associations, communities of practice, partnerships etc. These networks are often formed outside the realms of the 'official' AKS/AKIS, especially in new areas of agricultural and rural activity, such as multifunctional farming, environmental technologies, rural services, etc. As shown by the IN-SIGHT study, AKS/AKIS institutions, research and educational institutions, regional and local governments and development agencies often get involved in these hybrid networks once they have developed to a certain point, become established and offer the potential for developing innovations.

These hybrid and complex processes of multi-actor innovation give rise to new institutional arrangements: coalitions, partnerships, common stakeholder platforms, territorial alliances etc. These arrangements might be called knowledge-and-praxis complexes. They involve circular and multidimensional flows of knowledge and multiple interactions. They adopt different roles and organizational structures. Actors assume different roles in the innovation process, working as initiators, followers, facilitators, brokers, consolidators, supporters etc. New institutional arrangements are built around these roles in order to create and promote knowledge chains. Some examples of knowledge chains (based on main driver / initiator) are:

- Research + extension > practitioners, farmers.
- Municipality + research + professional association > farmers / rural enterprises.
- Rural enterprises + cooperatives + professional association > research laboratory / university.
- Research institute + professional association + food chain actors > farmers, consumers.
- Farmers + research > farmers.
- Multifunctionality: rural women's organizations + multipliers + extension > income stabilization in farms.

The following box describes several examples of new institutional arrangements in agricultural and rural innovation, looking at the different principal actors and drivers.

Research driven innovation: in the Holz Knüll Bioregion in Germany, the regional universities and research laboratories have played key driving role in introducing new technologies for wood processing for communal heating as part of a renewable energy project. However, the full potential of the innovation cycle was only realized when the research institutes, local farmers, forest owners, energy companies, users and citizen/consumer groups joined together in coordinated action, supported by regional authorities. This collaboration illustrates the importance of all actors being engaged.

Farmers networking driven innovation: in Latvia farmers from the Abava river valley had to diversify, or even break, from traditional agricultural production as local processing facilities closed. A group of farmers got together and sought assistance from professional associations, establishing a process of networking, exchanging ideas and discussing alternative ways of business. They came up with a set of novel environmental tourism and recreational services (nature walks, country guest houses, accommodation facilities, farm based services, sport, cultural, leisure and recreational activities) that valorize the natural and cultural assets of this natural protected area. The informal exchange of ideas and mutual learning among rural entrepreneurs were crucial for the development of these services. Gradually the group began to cooperate economically and created an informal businesses cluster (Tisenkopfs et al, 2008). Similar examples have occurred in Ireland,

where 'federations' of local rural businesses that provide tourism services and locally produced food have been facilitated to cooperate and work together for greater market impact (Downey, 1994; Macken-Walsh, 2010)

**Producer and consumer driven innovation:** In agricultural direct marketing schemes many initiatives have been started by small groups of farmers seeking to improve their income. As innovation develops, links with consumers are established and producer–consumer networks formed. Networking helps to bring in new participants, improves the circulation of knowledge and stimulates the building of a distribution channel. It also increases social capital and trust among producers and consumers. In Ireland, the formation of federated cooperatives is facilitated by inter-agency effort that includes Teagasc, the Irish Cooperative Organization Society (ICOS), and Bord Bia (the Irish Food Board). The aim of the federated cooperative structure is to facilitate small artisanal food producer groups to cooperate so they can leverage industry expertise and services in areas such as marketing and distribution, while retaining their small individual brand identities and authentic producer/product/consumer relationships (Gray, 2009).

**Territorial partnership driven innovation:** In Germany regional governments coordinate and facilitate links between individual initiatives and territorial development plans. Regional innovation support organizations work in close relationship with regional government and administrative actors. One example is "3N-Centre of Excellence" in Lower Saxony which aims to support and further the development and use of marketable products, production processes and services in the field of "renewable resources" (including bioenergy) through the active cooperation between research agencies, public authorities, extension services and private enterprises. 3N has become the central point of contact for innovation, knowledge transfer and information about renewable resources and bioenergy in Lower Saxony. In the Netherlands there is a move towards establishing open territorial platforms for various rural and regional innovations. For example, the Laag Holland Programme fosters cooperation between rural stakeholders within the area and beyond. In Latvia institutional capacities for cooperation are still developing, and regional development agencies are only weakly connected to emerging local innovation platforms.

**Coalition driven innovation:** The Innovation Platform for a Sustainable Meierij (IDM) in the Netherlands works with the multi-local knowledge network Regiowaarde (the Region's Value) and is a good illustration of the role of partnerships and coalitions. Together they form a collective organization that enhances the synergies between natural values and a dynamic regional economy. A strong sense of community helped to establish a social-cultural exchange between the rural population and people in the surrounding urban area. The organization develops projects that combine the three aspects of sustainability: people, profit, and planet. Using these resources and the region's natural and cultural assets has enabled the group to harness a distinctive image and identity that is valuable in enhancing economic competitiveness. IDM also provides a platform for discussion about regional development, thinking about diversifying, re-vitalizing and repositioning rural areas.

It should be noted that in complex innovation networks and knowledge chains the Internet and new communication technologies are important tools for the exchange of information, training, providing online education, organizing networks and communicating with consumers.

### 3 Recent developments

#### 3.1 Developments, trends and drivers for changing AKIS

The reorientation of the CAP and the increasing importance of a wider rural policy agenda have significantly altered the overall context in which agriculture is practised (OECD, 2006). The diversification of agricultural and rural activities has become a more important goal, which is embodied in the notion of the 'European Model of Agriculture' and explicitly supported by recent and anticipated CAP reforms. The Rural Development Regulation for the period 2007-2013, adopted by the Council of Ministers in September 2005, sets out three clearly defined economic, environmental and territorial objectives of the CAP: agricultural restructuring, environmental concerns and the wider needs of rural areas. In other words, the main rationale of CAP is steadily

shifting away from directly supporting farmers' for producing and towards supporting public goods, often provided by farmers.

Cross compliance links the provision of CAP subsidies to compliance with several regulations about the environment, animal health and welfare and good agricultural practices. To help farmers to meet these conditions of cross-compliance, the 2003 CAP reform introduced the obligation for Member States to establish, by 1 January 2007, a Farm Advisory System (FAS). This is intended to provide targeted support to ensure the implementation of cross-compliance standards. Support for rural development activities can be provided to help farmers to meet the costs of getting advice on improving the overall performance of their holding, so long as farmers satisfy cross-compliance and occupational safety standards. This support can amount to up to 80% of the cost of the advisory service, up to a ceiling of €1500. All the EU states have implemented this system, mostly based on their existing advisory system. A few countries have chosen to use the rural development fund for this purpose.

This reorientation reflects the conclusions of the Salzburg Conference on Rural Development (November 2003) and the strategic orientations of the Lisbon and Gothenburg European Councils, which emphasized the economic, environmental, and social dimensions of sustainability. As early as 2001 the Gothenburg European Council clearly stated: 'During recent years, European agricultural policy has given less emphasis to market mechanisms and through targeted support measures become more oriented towards satisfying the general public's growing demands regarding food safety, food quality, product differentiation, animal welfare, environmental quality and the conservation of nature and the countryside'.

This reorientation corresponds with the prevailing situation and trends in rural areas. Over half of the population of the EU-25 (excluding Bulgaria and Romania) lives in rural areas, which cover 90 % of the territory. Rural development has become a vitally important policy area, while farming and forestry remain crucial for land use and the management of natural resources.

Rural areas and rural communities are increasingly seen as a platform and starting point for economic diversification and sustainable development. While farmers still are important social, cultural and economic actors in rural areas, the non-agricultural population generally represents the majority of inhabitants, especially in areas that are within commutable distance from peri-urban and urban centres. In such areas the rural economy is mainly based on activities other than farming. This broader integrated and multi-sectoral praxis is embodied in the concept of the 'living countryside' (Wilson and Rigg, 2003; Knickel et al, 2004). An important facet of this development is the emerging 'turn to quality' in the agro-food system and the new alternative agro-food networks that are linked with it. Brunori, Rossi and Guidi (2010) argue that the pace and intensity of changes in agriculture and rural areas signal a 'second-order change' which is challenging widely shared assumptions and reframing agricultural and rural relations.

Different RD paradigms influence different approaches to innovation. In recent decades there has been a partial shift from the modernization paradigm towards one that promotes integrated, sustainable and multifunctional development (see Figure 7). This new rural paradigm promotes optimal and balanced use of local resources and community engagement in development projects. This implies a broadening of the concept of innovation from something that is primarily economic and technological to include social innovation. It extends the scope of innovation to include new fields (the organization of food chains, environmental management, services etc). The shift towards the new rural paradigm also implies a shift in emphasis away from the adoption of non-proprietary innovations originating from state and private sponsored R&D activities and towards proprietary innovations, which depend on individuals' own creativity. This 'endogenous approach', requires facilitation, capacity-building and the mobilization of local resources (Sumane, 2010).



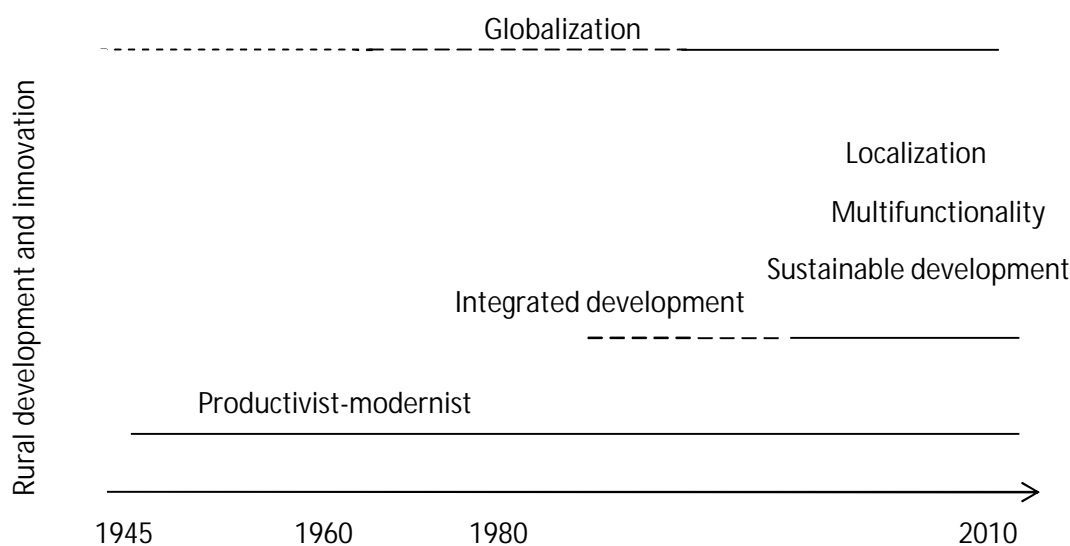


Figure 7: Shifting rural development paradigms (Source: Sumane, 2010)

This second order transition implies the need for a radical shift in policies for innovation. They need to move beyond a framework dominated by the conventional paradigms of economies of scale, specialization and concentration. The new models imply focusing on agro-ecology and multifunctionality (as opposed to productivism and green revolution approaches); complex social, organizational, institutional and technical innovation (as opposed to technology transfer); achieving a balance between public and private goods (as opposed to an orientation towards private economic goals). All these changes will stimulate a new model of endogenous development.

The current transformation of European agriculture and its farming sector towards multifunctionality, the growing importance of sustainable technologies that rely on more efficient use of natural resources and the reorientation of agricultural production towards non-food markets (such as energy crops) and service provision, involve 'vision creation'. This involves farmers and rural actors at large making strategic choices that take into account the societal transformations that are restructuring rural areas. While it is growing, this type of production currently represents a relatively small proportion of the value of agricultural output. The government should play a special role in supporting these types of production, as they create and protect more public goods and help farmers who are stepping off the treadmill of the productivist food chain. However this should not blind us to innovations that come from retailers and the food business, especially things such as contract farming, biotechnology and biofuels, etc.

The transformation of Europe's rural regions is also being driven by a number of exogenous factors (Knickel et al, 2008). Within Europe these include socio-demographic changes, counter-urbanization, the flow of some knowledge-based industries from cities to rural areas (for example, the increasing tendency of creative industries and new technology companies to locate in rural areas), the construction of new spaces between towns and country (e.g. city regions and metropolitan countrysides) and the increased demand for quality of life based on rural amenities. At the same time there are also global trends at play that are affecting European farmers and rural communities at both the micro and meso level. Examples include climate change, the increasing scarcity of fossil fuels, the instability of financial markets and the influence of distant regional conflicts. The

complexity of all these forces involves making informed and strategic choices to move towards economic and social sustainability.

Value creation is an approach to agricultural business that has largely been developed and consolidated outside the conventional knowledge systems. It is an approach that has been adopted by an increasing number of farmers in recent years. The revised CAP opens up new spaces for strategies related to value creation. It recognizes that European agriculture can only compete on global commodity markets to a certain extent. More importantly, it acknowledges that endogenous resources – human, natural and social capital – are central to increased competitiveness at a time when markets are far less protected and levels of subsidies much lower. Furthermore, it opens the way to a broader and more integrated approach to farming, understanding it as one among a number of activities employed by rural actors in their pursuit of sustainable livelihoods.

These reorientations have implications for the kinds of innovation required as well as for entire innovation systems and processes. They imply a significant transformation of agriculture and the rural sphere. Farmers and rural actors have always been part of a continuous process of restructuring. More recently this has involved fundamental changes in their roles in rural areas, which are linked with changes in urban-rural relationships. These changes are redefining 'the job' of farmers and other rural entrepreneurs. In many regions farmers are beginning to diversify their income stream by acting more as rural entrepreneurs, developing new services and exploring new markets. Often, however, there is a gap between, on the one hand, the need for change and farmers' willingness to adjust and, on the other, the ability and capacity of innovation agencies and advisory services to effectively support these changes.

It is evident that contemporary agricultural and rural development practices embody different paradigms that coexist alongside one another. The new paradigms have met strong resistance from the old ones, which are consolidated in concrete actors, discourses, institutions, socio-spatial patterns, laws and technical standards. Innovation policies should be sensitive and responsive to the coexistence between different paradigms. The central features of the AKS have often remained largely unchanged yet the issues they need to address are now far more complex. They require a wider range of responses, both in terms of the processes employed and the 'product range'. The coexistence between intensive farms producing for world markets and more extensive farmers producing environmental goods and services and the European vision of a profitable and sustainable multifunctional agriculture can give rise to conflicts. These should be recognized, clarified and, where possible, resolved.

### 3.2 The role of innovation policy

The changes described above should be reflected in the way rural innovation is perceived as well as in the principles underlying innovation strategies and innovation policies. Demand-driven approaches primarily follow the market to identify or prioritize which problems should be addressed. However, if we acknowledge the divergence between private and societal interests, we must then ask how innovation policies can accommodate both in a balanced way. Societal interests (or public goods related demands) tend to be – by definition – not adequately addressed through market demand and demand-driven approaches.

Clearly there is the need to make a distinction between private interests and public interests (table 1). We classify them here on the basis of public/private interests and on the basis of the predominant paradigm. New actors bring new interests and this can lead to a divergence and conflict of interests. However the productivist and integrated paradigms are not always in conflict with each other. As Figure 7 (on trends) illustrates, the two approaches coexist, although they are often effectively segregated. While productivism still plays the larger role in terms of land use, production value and research and innovation funds, this is not the case for the number of farmers involved or the share of the rural population. Though this dualism may be very real today, one challenge for AKS/AKIS might be to break down these boundaries and to mobilize resources for multifunctional agriculture and rural development in a broad sense.

Table 1. Different orientations for rural innovation policy goals: a structured overview

	Public	Private
Productivist paradigm	<ul style="list-style-type: none"> <li>• Reduction of negative externalities</li> <li>• Non trade-distorting support</li> <li>• Efficiency of public spending</li> <li>• Food hygiene</li> </ul>	<ul style="list-style-type: none"> <li>• Growth and productivity</li> <li>• Compliance with public standards</li> <li>• Fulfilment of customers' requirements</li> <li>• Orientation towards larger markets</li> </ul>
Integrated development paradigm	<ul style="list-style-type: none"> <li>• Sustainable use of natural resources</li> <li>• Transition to a low carbon (bio-) economy</li> <li>• Co-production of public goods</li> <li>• Active creation of synergies between different activities</li> <li>• Equity</li> <li>• Food quality</li> </ul>	<ul style="list-style-type: none"> <li>• Competitiveness through sustainable practices</li> <li>• Emphasis on value added</li> <li>• Active exploration of new markets and alternative supply chains</li> <li>• Transition to smart, sustainable technologies and renewable energies and resource use</li> <li>• Diversity of farming styles</li> </ul>

(Source: Own compilation, based on Brunori, Rand and Proost, 2007)

The 2008 SCAR foresight report included three different binary typologies of paradigms. This report draws them together to create a single typology. The SCAR report uses its typologies to highlight societal choices about the future of agriculture. These challenges demand not only a good understanding of the interactions between drivers but also a stronger appreciation that adaptation involves making choices between these different 'food and farming paradigms' (SCAR, 2008). These paradigms interpret the same key terms, such as vulnerability and resilience, in different ways, as indicated in the report. Each paradigm guides knowledge production and innovation along different lines. The productivist paradigm remains strong in many countries and the challenge here is to make

it more open to new ideas, values and novelties to allow the “old” paradigm to incorporate new products, processes and developments.

Innovation policy can effectively support the exploration of these ‘new’ ways, the related adjustment processes that need to occur in various socio-technical constellations and the necessary collaborations. It can provide a key to competitiveness, the sustainable use of natural resources and integrated development of rural areas, and, more specifically, the structural changes required for the development of a low-carbon bio-economy and the adaptation of (agricultural) production systems to anticipated changes in climatic conditions. Implementing an effective and successful innovation policy involves renewing existing knowledge systems and knowledge brokerage processes and giving institutional support to novel approaches. Innovation services and agencies need to encourage the active development of new value-added markets, products and services. Innovation brokers need to have the skills to facilitate effective processes of learning among farmers, other rural actors and entrepreneurs.

The OECD Innovation Strategy (OECD, 2010a) identifies five interrelated priorities for government actions in promoting innovation:

- Empowering people to innovate
- Unleashing innovation in firms
- Creating and applying knowledge
- Applying innovation to address global and social challenges
- Improving the governance of policies for innovation.

The work of the foresight process launched The Standing Committee on Agricultural Research (SCAR), which aims to identify possible scenarios for European agriculture over the coming 20 years. The issues that drove this initiative – the human impacts on the environment that have emerged in the past decades, the major challenges related to climate change and its potential impacts on agriculture, forests and fisheries and the aim of enabling agriculture to cope more effectively with the complex and interlinked challenges related to rapidly increasing globalization – have also been driving the IN-SIGHT project and its analyses. The Foresight Analysis stresses the need for a new strategic framework for the planning and delivery of research (SCAR, 2007).

The Foresight Expert Group identified a new strategic framework which cater for several lines of action related to:

- the sustainability challenge, addressing climate change in the knowledge-based bio-economy,
- the security challenge, safeguarding the future of Europe’s food and energy supplies, its biodiversity, agriculture and rural areas,
- the knowledge challenge, user-oriented knowledge development and exchange strategies,
- the competitiveness challenge, positioning Europe in relevant markets, and
- the policy and institutional challenge faced by policy-makers in synchronizing multi-level policies.
- 

The key aspects referred to in this follow on report have been taken on board the findings of the IN-SIGHT project. One such aspect is the need to develop a ‘regionally focused demand driven approach to research and innovation’ in order to ‘increase the capacity of rural regions to generate, absorb and integrate research developments into economic growth.’ (Foresight Expert Group, 2007)

### 3.3 The diversity of actors currently involved in innovation

Rural innovations are guided by different paradigms. The sectoral, social and territorial context all provide different drivers for innovation. A wealth of human and social capital, networking, supportive knowledge and communication infrastructure all contribute to novelty production (Van der Ploeg et al, 2008).

The evidence about the complex nature of rural innovation provides a stimulus for adopting a systemic, network-oriented vision. Complex socio-technical systems and hybrid networks are required to stimulate rural innovation. Multi-actor participation and collaboration are preconditions for success. The IN-SIGHT project developed the notion of co-production of rural innovation (Tisenkopfs et al, 2011, forthcoming). The concept of social innovation is particularly relevant here. It underlines the interrelations that exist between societal transformation and agricultural innovation. Social innovation describes the responsiveness of innovations to new societal needs and expectations and the development of new social relations, such as those that are emerging in the relations between producers and consumers. The concept of social innovation will be discussed in more detail in work package 3.

An examination of national innovation systems (Proost et al, 2008) suggests that a systemic vision of innovation is not yet well institutionally embedded. At the same time case studies (Dockès et al, 2008; Rand et al, 2008a; Rantanen and Granberg, 2008a) have affirmed the multi-actor model and multidimensional character of innovations and their dynamics. These studies confirm that novelties, niches, regimes and landscapes are not necessarily sequential steps in the evolution of an innovation. Not all innovations follow a uniform pathway of up-scaling or vertical development. In some sectors, such as direct marketing, care farming and rural tourism, innovations remain small-scale. In rural welfare services (health care, elderly services) innovations may consolidate at the niche or regime level and foster transformation of the social welfare system. Vertical development or up-scaling is more characteristic of innovations in environmental technologies, especially in biofuels, where energy crop producers have shifted their orientation from local farming systems to regional and international markets.

According to the IN-SIGHT study, innovation starts with actors and evolves through hybrid networks. Although most innovations require the participation of many different actors, their roles at different innovations stages and fields varies. End users are recognized as playing an increasingly active role – they provide signals about new societal demands, bring about changes in production and consumption regimes and verify the results of innovation. Innovations cannot be complete without consumer/ citizen involvement. For instance, urban demand for recreation in the countryside stimulates innovation in rural tourism; the needs of ‘new rural dwellers’, such as second home owners, foster innovations in the market and in social services (Rantanen and Granberg, 2008); in agricultural marketing new ways of consumption stimulate novel forms of direct relations between producers and consumers, such as selling via the internet and solidarity purchasing groups (Couzy and Dockes, 2007); in bioenergy increased citizen awareness about energy issues has stimulated the development of locally organized renewable energy chains. For example in Denmark bio-energy production from manure is emerging as a side activity for conventional, large scale, productivist farmers.

Networks of innovation typically grow as an innovation develops. During the up-scaling process networks become more complex and hybrid, as new actors become engaged. Especially at the niche and regime the range of participant increases and actors in the policy and knowledge domains play a more visible role (Figure 8).

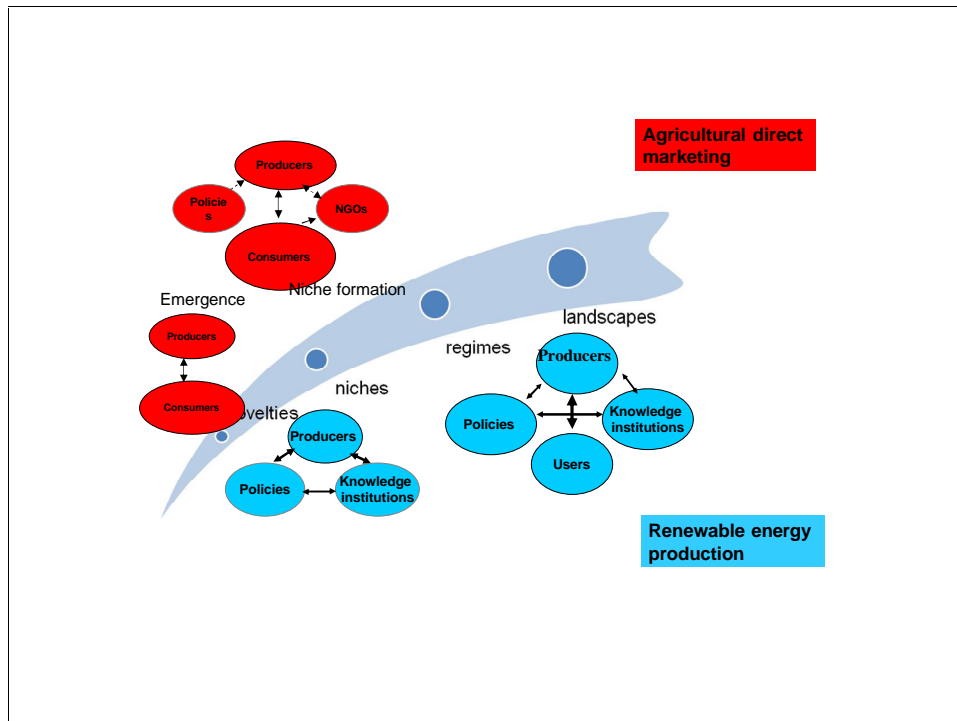


Figure 8: The increase in actor diversity as innovations develop

As shown by the literature on innovation and transitions, a regime change (the second order or radical innovation) is associated with a change in the set of rules and norms that govern economic or social activity. The IN-SIGHT project suggested that a regime shift is closely tied with a 'saturation' of actor networks, an enlargement in the range of involved stakeholders and more intense interactions between them. The basic mechanism through which innovations unfold and start to bring results in terms of economic, social or environmental gains can be seen in theoretical terms as the structuration of actor networks and the consolidation of interactions. In everyday language this can be expressed as– cooperation.

Radical innovations can create new regimes in agriculture and RD and provide a response to a range of critical challenges (competitiveness, sustainability, public goods, new production and consumption patterns, multi-level governance etc.). The transition studies literature (Rip and Kemp, 1998; Rotmans et al, 2001; Geels, 2005) emphasizes that the move towards regimes requires institution building. Regimes are involved in power struggles and can often be hostile towards novelties and niches. Regimes often also compete with each other. "Niche-actors strengthen themselves by cooperating and forming networks, thereby actually exercising innovative power. Regime-actors react by trying to 'absorb' these niches and looking for a 'synergetic' relationship with niches, in which their innovative power enforces the regime's constitutive power. If the regime 'succeeds' in absorbing niches, a so-called 'lock-in' occurs. A lock-in is a 'reverse transition path'. If, however, niches are able to resist such absorption by the regime, they become a 'threat' to the current distribution of resources (Avelino and Rotmans, 2009: 560-561). Such tensions in niche-regime relations are a necessary condition for transition to continue. Landscape transformations, or macro-level changes, involve even higher stakes and a greater number of contested interests.

### 3.4 Cooperation between actors, partnerships and the co-production of innovation

The clue to radical innovation is cooperation between actors. Cooperation and establishing formalized partnerships becomes more critical as an innovation evolves. Niches result from an

aggregation of different small systems into a coherent actor network. Innovators get in contact with partners, knowledge providers, clients, financiers etc. The IN-SIGHT research identified several forms of innovation partnerships:

Clusters of businesses and network companies are an efficient organizational form in rural tourism and welfare service innovations (Rantanen and Granberg, 2008b; Tisenkopfs et al, 2008b). Companies share information about clients, organize collective training, develop a common marketing strategy, coordinate investment and lobby political bodies.

Multi-actor partnerships are a universally used organizational form of innovations, used in rural services, agricultural marketing and renewable energy projects. The partnership principle emphasizes the involvement of various stakeholders (farmers, industry actors, research institutes, etc.) and often requires that a network become formally organized.

Territorial partnerships and alliances are complex networks organized on a territorial basis. They can be sectoral or cross-sectoral. Examples can be found in renewable energy projects, regional branding initiatives, sustainable food production and consumption programmes, community supported agriculture, care farming and more. Territorial partnerships aim to mobilize and sustainably use a variety of territorial assets and the inclusion of key stakeholders (knowledge institutions, municipalities, entrepreneurs, specialists with different backgrounds etc.). LEADER groups are one example of rural territorial partnerships that have actively contributed to the improvement of the quality of life through their activities in education, training, environmental action, social integration etc.

Public-private partnerships between entrepreneurs, local governments and state institutions are particularly visible in new rural services, such as care farms and day care services, as well as in the renewable energy sector. Although they are effective way to organize and provide public services, several bureaucratic obstacles have been identified, including excessively complex procedures for managing public investments.

Learning partnerships are established for learning purposes. Managing competing interests (productivity growth, environmental preservation, societal expectations etc.) requires knowledge that can more effectively be accessed through collective learning and knowledge construction. The IN-SIGHT Project showed that learning partnerships usually include grass-root innovators and their professional associations. Sometimes they are effectively assisted by agricultural knowledge and extension services. Many successful innovations have started out from small communities of practice where people learn by doing, enhance their skills and set common rules. Communities of practice often are a useful way to start open-ended innovations when there is a common goal but where skills, practices and new partners have to be acquired.

Partnership-building leads to the implementation of innovation, a consolidation of the organizational structure and the mobilization of various resources. Two examples of rural innovation (in Eastern Finland and Tuscany) suggest, not only the importance of cooperation between various stakeholders, but also the value of skilful coordination and formalized governance structures.

The development of rural services in Finland (Rantanen and Granberg, 2008b) shows how an innovation in the rural welfare service sector, initiated by a group of welfare-entrepreneurs in Eastern Finland, has grown to the regime level by amplifying its interactions with other networks, which provide financial, learning, marketing and consulting support. A network of companies has contracted the delivery of elderly and day-care services from local municipalities. The Federation of Finnish Enterprises provided consultations for these new welfare companies, and the Employment and Economic Development Centre arranged educational courses. The role of municipalities was transformed from one of providing services to one of arranging them. The joint company used EU structural funds to build professional capacity. The Ministry of Trade and Industry provided crucial funding and support. The network of companies, together with 20 other entrepreneurs from the health and social fields founded a regional association for health and social entrepreneurs, which took over the supervision and training and started to influence the legislation for the operation of welfare companies. Thus the networks were amplified and the innovation diffused. There are now about 20-30 similar networks of service companies in Finland, providing about 200 service products at 1200 service points. The dissemination of

this innovation has been a consequence of the multiplication of networks and cooperation between various stakeholders.

Another example of broad cooperation and co-produced innovations can be found in the experience of Camporgiano village in Tuscany which established a small-scale collective heating plant (Brunori and Neri, 2008). This initiative began because the municipality needed to heat some new buildings and replace the old diesel heating plant. Round table discussions began to explore the possibilities of sustainable energy provision from local sources, using locally available woody biomass. This would offer new opportunities for local forest owners and heating operators and would also help fight global warming, save energy and money. A local action group (LAG) "Garfagnana Ambiente e Sviluppo" was formed and together with the Municipality of Camporgiano made contacts with ARSIA (the Tuscan Regional Agency for Development and Innovation in Agriculture and Forestry) the regional government and environmental organization which agree to provide support. The LAG provided funding for the biomass project and involved local actors. ARSIA coordinated the project and provided training about biomass use to those involved (public administrators, farmers and suppliers). The Italian Agro-forestry Energy Association took care of the technical side. Through network enlargement and building coalitions and partnerships a local energy supply chain was established. In this case, the co-production of innovation generated new rules for forestry and energy use, new solidarities among the farmers and the village community and new technical competences for local energy companies. The local development effects included new jobs in the area and improved energy security at the local level that also helped to tackle environmental problems. The innovation reflected a transition from reliance on fossil fuel to use of renewable woody biomass.

### 3.5 Some ideas to support innovation

The emergence of an innovative project often relies on a few individuals drawing on their own skills and social capital. Often need to find ways to cope with a complicated and sometimes obstructive regulatory framework. Often they do not receive much support at the start. The following aspects are recommended as ways to support innovation in rural areas (figure 9).

#### Openness

- Innovations often represent a challenge to the existing way of doing things and can generate resistance. These barriers can be overcome if actors have an "open attitude" and are supportive of an "innovation culture".
- Sectoral and territorial barriers often restrict individuals and institutions. Innovation is often considered to be just technological. The social and organizational aspects must also be taken into account.

#### Flexibility and adaptability of public decision-making

- Public decision makers (policy makers and administrators) who are responsible for legal frameworks and financial support can provide incentives or deterrents for innovation. Extensionists can also have difficulties in accepting and supporting novelties. Innovators often face difficulties in obtaining support from administrations, especially if their practices don't fit well in the regulatory framework. The mechanisms and procedures for getting support are often too complicated. It is important that the legal and administrative frameworks are transparent and accessible to innovators.
- Public decision makers need to be proactive in supporting innovation: in the creative phase, flexibility is needed in order to allow novelties to appear. When partnerships are required and norms challenged, decision makers can play an important role in adapting policies and regulations.

Adapted and adaptive support:



An AKIS needs to be able to adapt its delivery services to innovations and innovation networks that are at different stages of development.

- During the early growth stages of an initiative, networks should be able to get financial support from local policy makers. Similarly the regulatory framework should be open for adaptation. In this phase, an AKIS should play the role of a broker or facilitator. Associations and non-profit organizations can also take on this role. New networks can be built outside the traditional extension organizations or to agricultural networks.
- Once the network becomes more structured and there are available funds and a supportive regulatory framework services such as project management, coaching, trainings and exchanges become important ways of supporting innovators.
- In a situation where an innovation is diffusing or spreading, specialized expertise, including detailed technical and economic information, and communication skills are important development factors. Extension services are an important part of an innovation network and can take an important role in up-scaling local and isolated initiatives. They could pay more attention to LINSAs and provide better calibrated and targeted support activities.

The governance of innovation:

The governance of innovation, at the local, regional, national and European levels can provide significant challenges for any network.

- More effective connections should be created between European rural networks and innovation networks. These interfaces can be reinforced by new forms of coordination between policies for innovation and those for agricultural and rural development.
- The strategic orientation of innovation towards new challenges should be encouraged through the establishment of platforms, communities of practice, training programmes and exchanges. This challenge should be taken up by existing extension systems.

Linear model:

This linear model of knowledge transfer is still relevant and can work efficiently. However, it needs to be implemented in a more collaborative way. The respective roles of knowledge suppliers and users need to be reassessed and, where necessary, redefined

New institutional arrangements for knowledge circulation and innovation:

These new models should be studied carefully and supported by extension services, with an emphasis on ensuring broad participation of all stakeholders.

Reinventing tradition:

The reinvention of tradition can be a key aspect of innovation. This can involve drawing on the values and practices of traditional agriculture, embedding and re-embedding production chains in local situations and fostering a living countryside.

- This strategy is already evident in direct marketing schemes, short supply chains and local products. It is also visible in attempts to reconnect small-scale farming to local processing and regional retailers.
- Tradition also invigorates the cultural affiliations and identities of contemporary consumers, an inherent aspect of modern marketing strategies.

Radical creativity:

Radical creativity is another strategy that is evident in emerging models of the economy in a 'post-productivist' and 'post-globalized' world. It is visible in approaches such as the eco-economy, the life-style economy, sign-value driven production, consumption and marketing.

- Changes in urban and rural life styles, mobility and migration open up new opportunities for rural innovation. In some remote areas second homes have increased remarkably, opening up markets for new services.
- Ecological patterns of consumption are not restricted to food consumption but can also be found in clothing, cosmetics, housing and energy. These areas all open up opportunities for environmental innovation.
- Traditional rural cultural heritage (folk music, dance, literature, crafts, rituals, local food, architecture etc) can be intertwined with economic activities to contribute to a cultural economy. Various forms of modern arts and creative industries – publishing, design, video, performing arts, advertising, festivities etc. can also thrive in the countryside.

In such ways rural areas can become experimental locations, where new forms of cultural representation, technology, communication and economy can be developed.

#### Resilience:

- Resilience can be seen as a response to excessive technological innovations and liberalizing policies that have contributed to the financial and economic crisis, environmental problems and the food crisis. Some technological innovations have had disembedding effects and encourage the adoption of policies and practices that are aspatial. Some forms of innovation have emerged as an expression of resistance to the forces of globalization, through the deliberate re-localization of production systems and their embeddedness in territorial and social contexts.
- Resilience also means the capacity to develop alternative socio-economic arrangements, such as short supply chains, public food procurement, community supported agriculture, local farming systems etc.

#### Cooperation:

- Cooperation is central to an integral innovation strategy. It requires overcoming cognitive, sectoral, and disciplinary barriers and replacing them with structures of cooperation - networks, territorial partnerships, communities of practice, innovation alliances etc.
- Collective innovation requires skills in negotiation, conflict management, compromise, mutual learning, building inter and transdisciplinary relations and working in teams.

#### Values:

It is important to that rural innovation pays attention to societal values: sustainability, responsibility, health, security, social cohesion, public goods, integrated territorial development, etc. Support for innovation needs to include the production of public goods. This brings us back to earlier questions about achieving a fair balance between public and private interests in rural innovation, which in turn requires that innovation policies are responsible and transparent.

#### Orientation to possible future agricultural and rural policies

- Radical challenges require novel responses. European agricultural and rural policy and associated practices are already making a shift towards being more supportive of societal objectives including multifunctionality, sustainability, management of ecosystems and the quality of life.
- Contemporary conditions are favourable for a second order innovation towards a knowledge-based rural economy, bio-economy, and new emerging ways of organizing economic and social life.
- Co-produced innovations have a strategic potential to respond to emerging problems and generate promising economic solutions. Management of such innovation is a key to the future of the rural economy and society (Figure 9).

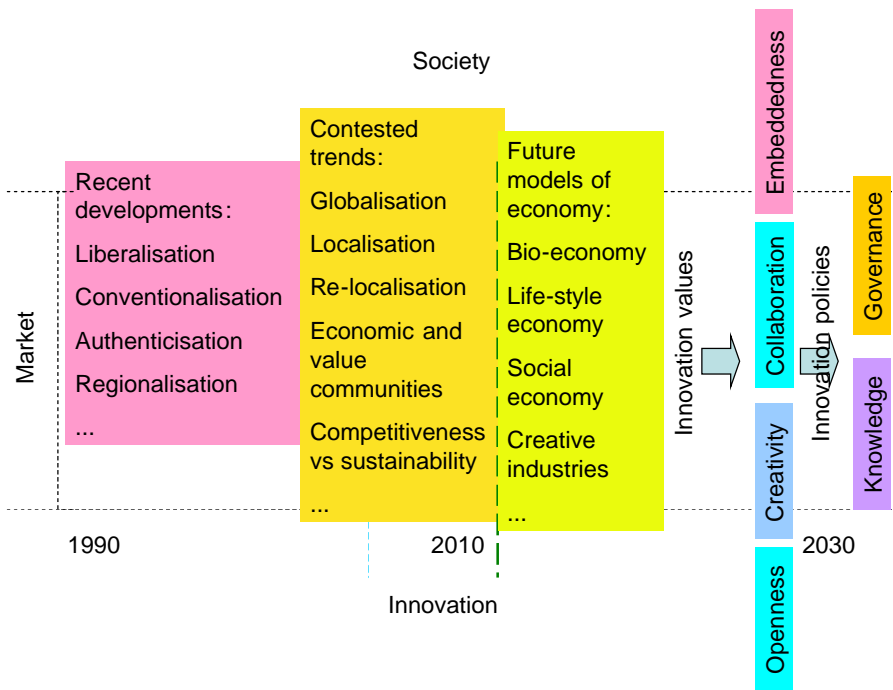


Figure 9: The strategic stewardship of innovation

## Annexe: Main areas for attention and discussion

This table translates the points of concern identified by the CWG into problems needing to be solved and opportunities for doing so. The opportunities can be classified according to the state of innovation (novelty, niche, regime etc.) and the actors concerned (public decision system, knowledge system, economic actors etc.). The opportunities and solutions will require appropriate measures to be taken at European, national, regional and local levels.

Table 2: AKIS: points of concern, problems and opportunities (based on brainstorming sessions on May 4<sup>th</sup> and June 30<sup>th</sup> 2010 at the SCAR-CWG meeting and on written contributions from SCAR- CWG members).

	Points of concern	Problems to be solved	Opportunities, propositions, promising solutions, recommendations...
Definitions	<p>AKIS definition, relations between actors.</p> <p>Critical Control Points (CCPs) in the system, and how to address these in order to implement a well-functioning knowledge system.</p> <p>Address the ambiguities surrounding the concepts of AKIS, innovation and sustainability.</p> <p>Rural- urban polarization.</p> <p>Internationalization of knowledge streams</p>	.	
Management of actor networks	<p>Coordination, exchange of information, incentives.</p> <p>Investment is needed in social relations as well as in ICT.</p> <p>Complexity and fragmentation of actor systems.</p> <p>The most pressing question is – how to bring actors together?</p>	<p>New actors : new non-agricultural and, urban interests</p> <p>Conflict /competition of interests.</p> <p>Different values and interests.</p> <p>Distrust, lacking solidarity/ support ‘at home’</p> <p>New sectors coming in: commercial dominance of the retail sector.</p>	<p>Horizontal networks to connect people with similar interests.</p> <p>New actors should be accepted and be involved in existing networks, processes etc.</p> <p>Social capital has proved to be one of the central elements of innovation that plays several key functions: it ‘lubricates’ social activity, invigorates networks and improves access to information. Innovators use contacts to access external knowledge and bring support. Social capital has two elements: bonding (to increase solidarity within a group) and bridging (to connect innovators to wider social, market and policy networks). Both types are necessary.</p> <p>Hybrid networks and multi-actor platforms appear to be better stewards of innovation and catalysts of change processes than formalized institutions.</p>

	Points of concern	Problems to be solved	Opportunities, propositions, promising solutions, recommendations...
Scale	<p>Global/European/national/regional/local.</p> <p>Role of languages and culture (most information is in national language).</p> <p>Internationalization of knowledge streams.</p>	<p>Successful innovation depends on embeddedness in social, territorial, natural and cultural contexts.</p> <p>Different levels: local/regional, national, international:</p> <p>Fragmentation and discontinuity</p>	<p>First level (regional actors) and second level (national actors) of knowledge support system should be linked in order to guarantee circulation of knowledge.</p> <p>Organizational and political arrangement of innovation along territorial lines helps to break cognitive and sectoral barriers and to establish regional partnerships with multi-actor participation.</p> <p>This gives rise to the need for a mediating institution at the regional level (e.g. an innovation platform or a forum for diverse stakeholders) that coordinates innovation networks.</p>
Innovation	<p>Innovation is not necessarily based on (new) research.</p> <p>How to understand, influence, facilitate and manage innovation?</p> <p>Which drivers make it happen?</p> <p>Innovation is strongly commodity oriented. How to address horizontal issues?</p> <p>Innovation is not only technical but also social and organizational.</p> <p>Open and closed innovation and knowledge bases.</p> <p>Innovation driven research vs. research driven innovation.</p>	<p>Technological interpretation of innovations still dominates; technological innovations are supported more than social and organizational ones.</p> <p>Successful innovation depends on embeddedness in social, territorial, natural and cultural contexts.</p>	<p>Innovation should not be thought of solely in terms of economic and technical aspects but should also include social and organizational ones.</p> <p>Social innovations are important because they help redefine the identity of farmers and build new relationships between them and the general public, including new solidarity between producers and consumers.</p> <p>Certain cultural values such as openness, cooperation, positive attitudes towards innovators favour novelty creation.</p> <p>The initial phase of innovation is not normative but constructive, and actors and purpose play a central role. Novelties are greatly dependent on the personal capacities of innovators to vision, create, take risks and network.</p>

	Points of concern	Problems to be solved	Opportunities, propositions, promising solutions, recommendations...
Education and skills	<p>Dynamic and attractive educational system.</p> <p>Teacher qualifications and practices</p> <p>Schools as knowledge centres.</p> <p>Skills: openness, project management, networking and social skills.</p>	<p>At each phase specific competences are critical: visioning skills at the novelty phase; technical, economic and social competences at the niche phase and; organizational and political competences at the regime phase.</p>	<p>Strengthen interactive learning and innovation networks and skills.</p> <p>Innovation often requires a combination of various types of knowledge: tacit and coded, informal and formal, local and global, traditional and advanced. It is important to achieve integration of the knowledge pool. Innovators need other innovators' knowledge – which means that learning is an inherent part of innovation.</p>
Research	<p>Priorities.</p> <p>Knowledge chain, role of applied research.</p> <p>Public Private Partnerships.</p> <p>Absorptive capacity</p> <p>Balance between stability and flexibility.</p> <p>Tacit vs. scientific knowledge.</p> <p>Universities as catalysts for innovation</p>	<p>Information and knowledge actors often are not connected with grass-root innovations and lack the skills to support novelties.</p> <p>The combination of science and practice</p> <p>Sharing of knowledge and competition</p> <p>Privatization of knowledge and advice</p> <p>Discrepancy between knowledge supply and demand.</p> <p>Weakness of organizational solutions for efficient knowledge circulation.</p> <p>Disrupted knowledge chains</p> <p>Barriers in research</p>	<p>Potential of interdisciplinary research to generate innovations.</p> <p>Novelties can emerge in areas where research has not yet been active. Researchers can collaborate with innovators within a participative framework. New outcomes can be combined with existing know-how.</p> <p>Strengthen and study links between regional universities, research centres, extension organizations, farmers' organizations, municipalities, market actors and other stakeholders.</p> <p>Profiling of university expertises in agriculture, food and rural development.</p> <p>Stimuli to offer research expertise in user friendly ways (research briefs, summaries of findings, consultations, idea shops, seminars, grey literature etc.)</p> <p>Use of Internet technologies to identify typical knowledge flows in sectors and across sectoral boundaries</p>

	Points of concern	Problems to be solved	Opportunities, propositions, promising solutions, recommendations...
Extension/ AKIS	<p>Different extension actors and incentives.</p> <p>Private / public / product related.</p> <p>Funding.</p> <p>Lack of trust between farmers and advisers.</p> <p>Drivers sometimes inappropriate.</p> <p>Farmers ask advice on administrative issues and how to qualify for a subsidy rather than on technical issues.</p>	<p>Institutional support systems for innovations are still quite rigid, and lack coordination and flexibility.</p> <p>Administrative and innovation support. Institutions' strict approach to innovation projects (in terms of time-line, focus, progress) does not correspond well to experimental, creative nature of innovations and their dynamics.</p>	<p>AKIS and other knowledge systems should be able (time, capacity) to anticipate novelties and overcome resistance. AKIS should be able to build capacity (analyse novelties, acquire know-how etc.).</p> <p>Novelties, positive examples and successful projects, have to be analysed and described and this information has to be disseminated to other actors in an appropriate way ('codifying' new knowledge). Indirect support measures, such as making a business plan, coaching, support to find funds etc. should be provided to support and facilitate innovative persons. Advisory centres need to be able to provide neutral, comprehensive and reliable support.</p>
AKIS as part of other systems and policies - Legal framework - Funding	<p>Policies for education innovation, science and research.</p> <p>Absorptive capacities.</p> <p>Sectoral isolation, vertical funding.</p> <p>Funding of different elements.</p> <p>Links between regulation and innovation (i.e. regulation driven innovation)</p>	<p>Funding rules, support, regulations, exemptions, room for experimentation.</p>	<p>Public policy actors have to recognize novelties that do not fit in the existing framework; they have to learn to be supportive, not restrictive.</p> <p>The policy goals and legal framework should be transparent, easily accessible and adapted at the right time to make novelties successful.</p> <p>Public administration (state, regions and communities) must provide flexible and accessible support (finance, eligibility...).</p> <p>They should provide authorizations for new projects, even if they are not consistent with current rules and frameworks.</p> <p>An innovation fund could facilitate novelties, so long as the conditions of accessibility are not restrictive. Financial support must also be accessible for small scale initiatives.</p>
Agricultural models and paradigms	<p>Global/regional.</p> <p>Big difference between subsectors (e.g. forestry-ornamental sectors).</p> <p>Different farmers, different needs.</p>	<p>Innovations often don't fit clearly in one of the paradigms. The paradigms and respective innovations can sometimes be compatible, but they also be at conflict, too. For instance, bio-energy crop production aims at creating new energy chain and contributes to new rural functions; in the meantime it</p>	<p>Multi-actor governance of innovation is needed. Innovation Consensus Committees could balance different economic interests, political discourses, cultural values, societal demands and public agendas.</p> <p>Farmers should be able to make their own choices (way of production, range, products etc).</p>

		continues to follow the conventional agriculture path.	
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