

Investigating the potential of agricultural knowledge and innovation systems to support learning innovation networks in eight European countries

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Abstract

In this paper we investigate the organisation and functioning of the formal AKS and how it can support or inhibit innovative bottom-up approaches to knowledge co-creation and social/joint learning. We have investigated how the main actors interact within their respective innovation systems and how they are influenced by various institutional characteristics. Using an Innovation System Performance (ISP) matrix (Klein Woolthuis et al., 2005; van Mierlo et al., 2010) the main enablers and barriers with regard to collective action have been categorized. The paper presents a comparative analysis of the different types of Agricultural Knowledge Systems within eight different European countries (England, France, Germany, Hungary, Italy, Latvia, the Netherlands and Switzerland). Results show how the knowledge infrastructure, existing rules and regulations, network structures, innovation capabilities and market structures differ from country to country. And how these institutional determinants can both support or inhibit joint learning and bottom-up innovation projects.

1. Introduction

The relationship between collective stakeholder actions, social learning and rural innovation has become one of the pillars of rural development. In the last decades the linear and top-down perspective of innovation processes has given way to a more bottom-up perspective of innovation where a wide variety of actors participate and work on innovation in participatory processes of social learning. Innovations are no longer seen as the result of top-down knowledge transfer processes from researchers via professional extension workers to farmers. Instead it is recognised now that many innovations are the result of intersectoral collaborations between different types of actors. For specific innovation processes, flexible and dynamic innovation networks are formed that go under different names in the literature as 'innovation coalitions' (Biggs & Smith 1998), 'innovation configurations' (Engel 1995), or 'public private partnerships (PPPs)' (Klerkx 2008, Spielman & Von Grebmer 2006), Communities of Practice (CoPs) and Networks of Practice (NoPs) (Lave & Wenger 1991, Oreszczyn *et al.* 2010). Also the idea of a technological niche operating outside the mainstream socio-technical regime (Geels 2002, Schot & Geels 2007, Wiskerke & Van Der Ploeg 2004) can be brought under this umbrella.

In these collaborative networks, joint (or social) learning and negotiation takes place to shape an innovation (Leeuwis and Van den Ban, 2004). In our contribution to this conference we investigate the place these bottom-up innovation projects take-up in eight European countries. To enhance 'networking for innovation' the literature emphasises the need to come to shared visions, well-

established linkages and information flows amongst different public and private actors, conducive incentives that enhance cooperation, adequate market, legislative and policy environments, and well-developed human capital (Hall *et al.* 2003). However in reality the establishment of these networks within an existing Agricultural Knowledge and Innovation System (AKIS) is strenuous at best. Creating and fostering effective linkages between heterogeneous sets of actors (i.e. the formation of adequate innovation configurations) is often hindered by different technological, social, economic and cultural divides (Hall 2006). Such divides may be caused, for example, by different incentive systems for public and private actors, differences between local indigenous knowledge systems and formal scientific knowledge systems, social and cultural differences that cause exclusion of certain actors and ideological differences. Innovative approaches developed in innovations networks therefore have difficulty getting accepted by the established AKIS partners. Central question of this paper is therefore how do the institutional characteristics of the Agricultural Knowledge and Innovation Systems in eight European countries support or inhibit innovative bottom-up approaches to knowledge co-creation and social/joint learning?

This paper presents some of the (first) results of the European funded research project SOLINSA – Support of Learning Innovation Networks for Sustainable Agriculture in which this question has been addressed. Within SOLINSA eight different European countries participate: England, France, Germany, Hungary, Italy, Latvia, the Netherlands and Switzerland. The paper starts with an overview of the different concepts of the Agricultural Knowledge and Innovation System and how these have developed over time. Subsequently we will present our methodology of choice, the Innovation System Performance Matrix to set up our comparative analysis. The innovation system performance matrix systemically categorizes some typical institutional characteristics of an innovation system, its main actors and their interactions with each other (Klein Woolthuis *et al.*, 2005; van Mierlo *et al.*, 2010b).

In the results section we will present how the different institutional characteristics, such as the knowledge infrastructure, existing rules and regulations, network structures, innovation capabilities and market structure within the eight different countries differ. In the discussion we will subsequently think about how these differences may lead to differences in the way joint learning and bottom-up innovation projects are enhanced or inhibited by the AKIS in which they exist.

2. From linear approaches to innovation systems

Agricultural Knowledge System (AKS) is a term used to define a set of public and private organisations dedicated to research, education and extension, and their interaction with knowledge

users, traditionally farmers. In Europe, these organisations traditionally have been linked in a linear way, aligned with the common goal of increasing agricultural production. Knowledge was thought to flow from (agricultural) universities through specialised extension services to farmers. Traditional agrarian players such as agricultural chambers and farmers unions had a strong influence on the research agenda and were able to shape agricultural policy. However, in the agricultural and rural innovation literature, as elsewhere, the linear view of innovation is being replaced by an innovation systems approach that include all persons or organisations who develop or contribute otherwise to economic activities in the rural areas: rural (micro)entrepreneurs such as farmers and others, as well as consultants, policy makers, supplier and processing industries, retail outlets, customers, NGOs and, financial service providers (Hall *et al.* 2003, Knickel *et al.* 2009, Sumberg & Reece 2004). The Agricultural Knowledge System therefore was turned into the Agricultural Knowledge and Innovation System, or AKIS.

In the last twenty years many European countries have (partially) started to reorganise their national Agricultural Knowledge and Innovation Systems. However, in many cases these changes have not occurred under the push of a clear strategy, but rather have been an adaptation to changing regulatory, social and economic environments. Thus, the changing political landscape in Europe after the fall of the iron curtain, the subsequent reform of the Common Agricultural Policy, and the decreasing economic importance of the agricultural sector in most European countries have led to a widely diversifying set of Agricultural Knowledge Systems in Europe.

The aim of this paper is to compare the organisation of the AKIS in eight European countries (England, France, Germany, Hungary, Italy, Latvia, the Netherlands and Switzerland) and derive some implications of these different types of AKIS for collaborative learning and innovation networks. As such this paper provides an update and expansion of earlier work done in this field by Garforth *et al.* (2003), Laurent *et al.* (2006), the current work carried out by SCAR, the Standing Committee of Agricultural Research (Dockès *et al.* 2010) and the results of the IN-SIGHT project (Brunori *et al.* 2008, Rantanen & Granberg 2008)

3. Methodology

3.1 Data collection

The investigation and assessment of the state and functioning of the agricultural innovation systems in each of the eight countries was done by eight different research partners, located within the country with close experience and overview of the functioning of the AKIS. Three different methods

have been used by each participating partner to collect the necessary data for these country reports:

- 1) a desk research of existing literature
- 2) interviews with key stakeholders
- 3) an interactive workshop

The desk research included a description of how the AKIS is set up and operates in the respective countries, with particular emphasis on the advisory systems in terms of actors, roles, governance, funding mechanisms and paradigms towards learning and innovation. The desk research was enriched with a number of interviews performed with some of the key actors within each country, see Table 1. Interviews were done using semi-structured interviews, in which the questions were used as a checklist of possible relevant topics being covered in the interview. Not all questions were addressed in every interview as interviews were adapted to the specific position and expertise of the interviewee. The questions themselves and the wording were adapted to local circumstances as the questions were formulated in academic language, and some concepts might not be applicable in all circumstances.

Table 1: *Overview of interviews*

	Total *	Farmers	Unions	Advice and Consultancy	Extension	Government and policy	Product chains/ agro-industry	Research	Education	Civil society and NGOs
Hungary	11					4		2		5
Italy	12		3	1	2	1	1	3		1
Latvia	11		3	1	2	1		4	2	
The Netherlands	11		1	4		2	1	3	1	
England	13	2	1	1		2	1		2	3
Switzerland	12			2	5	2	2		2	
France	3					1		2		
Germany	7									

**Number of interviews does not necessarily correspond to type of organisations, as some interviewees had double affiliations, or multiple persons from the same organisation were interviewed*

An interactive workshop concluded the investigation. During this workshop the results of were discussed in a broader audience of stakeholders and experts. The organisation and set-up of the

workshops differed per country. Some research teams thus did an interactive SWOT analysis (England), while other did other forms of workshop or a seminar (Hungary and Latvia). In Switzerland and the Netherlands, the Collective System Performance Analysis (Van Mierlo *et al.* 2010) was used to structure the session. The difference in the amount of people participating often also depends on the kind of workshop used, as some methods (seminars) allow for more people to partake in the discussion than other methods, see Table 2.

Table 2: *Workshops and attendances*

	England	France	Germany	Hungary	Italy	Latvia	Netherlands	Switzerland
Method used	Interactive SWOT	World café	-	Seminar/ Interactive discussion on results	-	Seminar	Collective System Performance Analysis	Collective System Performance Analysis
Persons attending ^{a)}	10	42	*)	19	*)	31	11	12

a) *Including researchers and facilitators*

*) *In Germany and Italy no workshops were organised because the researchers felt that the German and Italian situations were characterised by a great diversity in the 20 autonomous regions (in Italy) and the 16 Bundesländer in Germany. A workshop on the nationwide situation with the presence of all the actors interested would therefore be very difficult. Instead, results of the analysis in these two were validated by discussing them with a number of experts by phone, or in person.*

3.2 Data handling and processing

The information from the literature review, interviews and workshops combined were used to fill out an Innovation System Performance (ISP) matrix detailing the main enablers and barriers of the different national agricultural knowledge and innovation systems. The innovation system performance matrix (Klein Woolthuis et al., 2005; van Mierlo et al., 2010b) systemically categorizes some typical institutional characteristics of an innovation system, its main actors and their interactions with each other. A typical ISP matrix is shown in Table 3.

The columns of this matrix contain some of the most important actors that make up the agricultural knowledge and innovation system. Since these actors differ from country to country, we have used a number of common types of organisations to be included in the matrix. However, it is important to note that not all categories are equally important in all countries.

Table 3: *Innovation System Performance Matrix (example)*

	Research Institutes and Universities	Extension (public)	Advice and consultancy (private)	Government	Agro-food industry	Unions	Agricultural Chambers	Cooperatives	Farmers and rural population	NGOs
Infrastructure										
Laws, rules and regulations										
Values, norms and culture										
Interactions and networks										
Capabilities										
Market structure										

The rows of the ISP matrix contain the different categories that may hinder (of facilitate) the performance of the innovation system. Below we will shortly describe these categories:

- **Infrastructure** concerns the physical infrastructure, such as roads, railroads and telecommunication. The absence of infrastructure results in constraints that require major investments that cannot be made by the actors of the system independently. With regard to the AKS, the infrastructure also concerns investments in knowledge infrastructure (R&D facilities) the financial infrastructure and funding of public and private research.
- **Laws and regulations** form the formalised rules of the system. A lack of them may hamper innovation. For example, lack of intellectual property regulation takes away incentives from innovators as they cannot protect their innovation. Absence of environmental regulation on radically different systems, having an institutional vacuum, may slow down certain developments. However too much regulation and red tape can also be detrimental for the innovative performance.
- The unwritten rules are formed by the '**norms, values and culture**', and they refer to 'the way business is done' between the actors in the AKIS. They affect how actors interact and the trust between them, but also relate to their (in)ability to change their norms and values to enable innovation to take place, for example, different worldviews of researchers and farmers on what constitutes 'good farming' may affect how they cooperate in innovation processes.

- **'Interactions and networks'** refers to the way actors are connected to each other, or the characteristics of the social networks they are part of. Strong network failure refers to a (small) number of actors 'locked' into their relationship with each other without links to outsiders, causing myopia and blocking new ideas from entering. 'Weak network failure' refers to a situation where actors are not well connected and fruitful cycles of learning and innovation may be prevented because there is no creative recombination of knowledge and resources (Håkansson & Ford 2002).
- **Capabilities** points to the technical and organisational capacity of the actors in the system to adapt to and manage new technology and organisational innovations. Examples are a certain level of entrepreneurship, adequately educated persons, time to dedicate to innovation, networking skills, also referred to as 'absorptive capacity' (Cohen & Levinthal 1990).
- Finally, **market structure** refers to the positions of and relations between market parties. Well known problems are formed by monopolies, or the lack of transparency in complex food supply, but also imperfections in the 'knowledge market' (Klerkx & Leeuwis 2008).

As a first step in establishing a comprehensive comparative analysis of the country reports, the different country reports were reworked into a single ISP matrix. Following a grounded theory approach (Glaser & Strauss 1967, Strauss 1987) the information in the different country reports was summarised and subsequently labelled. First broadly into the different categories of the ISP matrix (infrastructure, legislation and regulations, values norms and culture, interaction and networks, capabilities and market structure) and later more refined into detailed subcategories. The resulting ISP matrix was checked and adapted where necessary by the different national research teams in order to make sure the summaries and labels properly reflected the existing situation. Finally, the different subcategories of failures and successes within the ISP were systematically compared and evaluated.

4. Results

It's clear that the structural characteristics of the agricultural sector differ from country to country and that the place of agriculture within a society also differs. Table 4 gives an overview of some of the most important social, economic and geographical characteristics of the place of agriculture within the larger economy of the eight countries. It shows the percentages of the rural population compared to the total population, the economically active population in agriculture (A.EAP), compared to the Total Economically Active Population (T.EAP) within a country, the share of

agricultural lands on the total surface area, and the ratio of agricultural imports and exports (in Euros).

Table 4: Structural characteristics of agriculture and rural development

	Rural pop./ Total pop.	A.EAP/ T.EAP	Agr. land / Land area	Agr.imports/ Agr. exports
France	14.75%	2.02%	53.44%	0.781362
Germany	26.15%	1.57%	48.44%	1.171508
Hungary	31.90%	7.45%	63.88%	0.617552
Italy	31.64%	3.25%	47.28%	1.209352
Latvia	32.28%	9.22%	29.48%	1.398954
Netherlands	17.14%	2.45%	56.85%	0.626752
Switzerland	26.38%	3.18%	38.14%	1.511327
United Kingdom*	20.52%	1.47%	71.61%	2.33508
European Union	26.08%	4.44%	45.05%	1.030038

* No separate data available for England (source: <http://faostat.fao.org/> accessed Nov. 2011)

The existing arrangement of the national Agricultural Knowledge and Innovation Systems are therefore also a reflection of these historical developments, geographical and economic contexts. The comparative analysis of the eight European countries shows that the countries are experiencing a number of similar trends in the developments of their respective AKIS's. The common trends that the different countries are experiencing will be presented in section 4.2

4.1 Main differences between Agricultural Knowledge and Innovation Systems

There is such a variety at the country level that it is impossible to discuss all the particularities of the different countries in this short paper. Therefore we will limit ourselves by presenting a rough typology of the most important characteristics that lead to the biggest differences in the organisation of the Agricultural Knowledge and Innovation Systems. In Appendix A presents an overview of these main differences is depicted. Below we will discuss some of the most remarkable results.

Extension and advisory services: privatised vs. public extension and advice

The most obvious difference between the countries studied pertains to the role and place of the public extension services vis-a-vis privatised advisory and consultancy services. The Netherlands

and England have completely privatised their public extension services and almost all advisory systems are operating on a commercial basis. France and Hungary form the other end of the spectrum. Here the extension service is still strongly present although the extension service itself is fragmented over many different organisations. In the case of Hungary these government funded actors provide their services almost free of charge, driving out any commercial consultancy agencies.

The implementation of the Farming Advisory System (FAS) that was a major component of the 2003 reform of the European Common Agricultural Policy (CAP) also reflects this diversity. Every EU member was required to implement the FAS in its AKIS, however the specifics of the organisation of the FAS were left open. As a result, the wide variety of implementations is directly related to the general organisation of the AKIS in a country. In England and the Netherlands, where extension is completely privatised, the FAS is also outsourced to private consultancy firms. Farmers were encouraged to make use of these advisory services using a voucher system. In other countries, like Italy, the FAS was used to streamline the existing regional extension services, sometimes replacing national funds for extension services with these new EU funds.

Interactions and network characteristics: horizontal and vertical fragmentation

There is a large difference in reported characteristics of AKS not only between different countries, but also within some countries themselves. If there is one thing that most countries have in common, than it is that they all report a fragmented AKIS. However, the reasons for this fragmentation differ from country to country. For some countries the reported fragmentation is the result of a process in which the traditional roles of the AKS actors (research, extension and education) have slowly dissolved and became more entangled. These countries, of which the Netherlands and England are the most extreme examples, have moved towards a diversified landscape of formal and newly emerging informal organisations that each cover an overlapping part of these traditional roles. NGOs, government agencies and research institutes, farmer funded organisations and cooperatives, commercial advisory agencies and consultancy as well as some successful farmers themselves are now new suppliers of information in the agricultural sector and traditional categories between fundamental and applied research or between commercial and non-profit advisory systems are disappearing. In these countries, government intentionally gave away most of its instruments to steer developments of the AKIS directly and the reported fragmentation is therefore an expression of the lack of vertical steering mechanisms.

The opposite situation can still be found in Hungary and Latvia where the organisation of the AKIS is still aiming at directly improving the productivity of the subsistence farmers. Publicly funded

extension services still hold an important position in the AKIS to perform this task. The reported fragmentation in these countries is not so much the lack of steering mechanisms, but it is more the result of a lack of political interest combined with limited funds.

Finally, the third category of fragmentation can be found in Germany and Italy where the reported fragmentation is the direct result of the organisation of the state. Because of their strong federal and regional forms of government, there is also a wide variety of rules, regulations and institutional interactions from region to region. As a result the national AKIS has very high horizontal fragmentation which may be accompanied by a vertical type of fragmentation (depending on the specific region). However, the reported success in Switzerland making a nationwide transition to integrated pest management within a couple of years, shows that this does not necessarily have to be the case. A federal system can still be effectively managed, even at the national level if the country is small enough and actors can still communicate with each other on a regular basis. As a potential explanation was mentioned that Switzerland is quite small, so people can travel easily therefore meeting each other all across the country more easily. Also with only one central university for agricultural science, many actors involved in the AKIS know each other from there.

Interactions and network characteristics: open vs. closed networks

The downside of an AKIS typified by a tight network is the possibility of the occurrence of the closed network. A closed network is characterised by a group missing connections to outside groups, leading to group think and the dismissal of new information and actors. The cosy relations between existing AKIS partners in Switzerland that deflect some of the vertical and horizontal fragmentation that Italy and Germany experience is therefore also a potential threat to the potential of outsiders to enter the network. Italy seems to suffer from both problems at the same time: high fragmentation due to a regionalised AKIS and at the same time having a fairly closed formal network that has difficulty in allowing new actors with alternative ideas to enter the formal policy making process. The more open systems of England and the Netherlands see a more diverse group of actors involved in the AKIS, the problem here that this easily leads to a fragmentation of visions for the future and competition between groups.

Sometimes the tendency of a network to select the same type of people works more subtle. In Switzerland, Germany and the Netherlands it is impossible, for several practical reasons, for an outsider to become a farmer. Because of the high investment costs in land and machinery, a job as a farmer is only possible for those persons who come from a farming family where these economic assets are already present. This makes farming different from other economic activities where 'outsiders' are often the source of innovations (Van de Poel 2000).

Market structure: homogeneous vs. non-homogenous farming populations

Market structure for innovations refers to the positions of and relations between market parties, however here we will look more specifically into the place of the producers within the market. In the new member states of Latvia and Hungary, and to a certain extent even in Germany we see a structural difference between in the type of farms and farmers, from a small number of very large, technology intensive and international operating farms to a much larger number of small scale, sometimes even subsistence farmers. This structural divide means that there are very large differences between types of farms, with a small number of extremely large farms competing on the international markets and a much larger amount of very small to subsistence farms. This makes the interests of the farmers to diverge widely and also makes it more difficult to come up with policy measures that benefit both these categories. Other countries, like the Netherlands and also France see a smaller variance in farms and a more homogenous population of farmers.

Capabilities

Differences in capabilities within the different countries is mainly related to the differences in of their respective farming communities and particularly the education of farmers. Small subsistence farmers in Latvia and Hungary often hardly have any formal agricultural training, while farmers in Switzerland and The Netherlands are among the highest educated of Europe, many of them have followed a form of higher agricultural education. However, this doesn't mean that farmers in the Netherlands and Switzerland have no difficulties in making changes. The shift to more entrepreneurial types of farming styles in Switzerland is for many farmers difficult. Similarly, in the Netherlands and England not all farmers possess the necessary qualifications in information acquisition services or formulate their specific knowledge demands properly.

4.2 Common trends

In this section we present some of the common trends that we have observed and that apply for the majority, if not all, of the countries involved. These results shed some light on the major on-going trends that are currently shaping the different types of systems in the eight countries. Appendix B gives an overview of these trends per country.

Reduction of public research funding

The knowledge infrastructure for fundamental research is threatened by a decrease of research funds, both public and private. The economic crisis has resulted in reduced research budgets. The competition for scarce financial resources is dealt with differently in different countries however. In some countries (Italy) the national research budgets are being replaced by a stronger dependence

on European funding. In other countries (England, France and to a certain extent The Netherlands) see a concentration of research institutes and universities.

Agro-food industry moving into research and advisory services

The decrease of public funds leads to a shift to other types of research financed by the agro-food industry. At the moment the agro-food industry does have the funds to put into research and they are actively seeking to form alliances with research institutes and universities to do research for them. These alliances can go beyond the national borders and for a country like Hungary this means that contract research of this type is moving outside the country. A disadvantage is this type of finances is that it only favours short term near market research in commercially viable products: fertilizers, genomics and seeds.

The results of this type of research is often quickly transferred to farmers. For farmers the free advice given to them by their suppliers is often a major component of how they obtain new information.

Agricultural education is in bad shape

Agricultural education seems to be currently the weakest part of the traditional formal AKS triangle of research, extension and education. Problems facing agricultural education come in two, sometimes interrelated, categories. Some countries report problems with the quality of agricultural schools due to lack of funding (Latvia and Hungary) . The Netherlands, on the other hand, suffers from a lack of students. The agricultural sector has a bad image that a lot of potential students, especially at the vocational level, do not find attractive. Agricultural education is especially vulnerable because of its lack of interaction with other parts of the AKS. Switzerland, the Netherlands and Hungary report that the interaction between businesses and schools is difficult to establish.

An exception however are privately financed education and training facilities. Professional (adult) education and training for farmers and other agricultural professionals is thriving. Successful professional education programs for farmers are often established in close cooperation with unions, or cooperatives.

New actors entering the countryside

New actors are entering the countryside. These new actors do not share the same ideas about conventional agricultural production. The urban population seeking refuge in the countryside for rest and recreation have a completely different vision on the future of the countryside compared to some of the more conventional agricultural actors. With the inflow of new actors in the countryside the

new perspectives on agricultural production gained increasing importance. This has led to a fragmentation of the common vision on agriculture. This process has been named the 'contested redefinition of the countryside' (Frouws 1998) and can be observed in many places. This has also led to a variety of discourses on sustainable agriculture to emerge (Hermans *et al.*). The fragmentation of visions leads to conflicts between various actors within AKIS. Farmers feel undervalued and misunderstood by the general public and politicians, having to deal with what they feel are unrealistic demands of society regarding their ways of production. The decline of trust and social capital is reported to be decreasing among several of the most important partners in the AKIS.

However even within the farming community differences exist with regard to the preferred future. The membership and involvement of farmers in different types of interest groups is in many countries high. Traditional agricultural actors like unions have difficulty adapting to the new situation. Even though many of these organisations are well established and professionally run, they increasingly have difficulty in adapting their roles to changing circumstances. The fragmentation of visions among their members makes it difficult for them to represent their members properly. New unions and cooperatives are being founded, leading to further fragmentation and a dissolution of bargaining power of the traditional players in the AKIS.

Bureaucracy and overregulation of innovation policies

The regulation regarding the support policies for innovation are not well regarded. The first common complaint regards the bureaucracy of many innovation programmes, not only among farmers but also among researchers and companies. Innovation policy is often characterised by an overabundance of 'red tape' and overregulation. Sometimes the situation is worsened by bureaucratic infighting and rivalry between ministries.

Another set of complaints has to do with funding criteria that are used. Firstly there seems to be a lack of stability in funding criteria and innovation tenders. Shifts in political coalitions will also result in political attention for certain areas to suddenly come up or disappear. As a result there is an increase in discontinuity and a lack of concerted action by the various interested players in the knowledge system. Secondly the criteria of innovation funds are not always well suited for collaborative innovation networks. Often the criteria pay insufficient attention towards 'soft goals' as improved stakeholder relations and joint/social learning.

This leads to a remarkable paradox. On the one hand many innovation and subsidy programmes require a detailed description of the expected results that must be provided before any subsidy is

given. However on the other hand many countries many countries also report a lack of monitoring and evaluation tools to measure the success or failure from specific innovation programmes. Italy, Hungary, Switzerland and the Netherlands report that innovation policy and projects are not properly evaluated and that feedback mechanisms of lessons learned are missing. Often government's interest in innovation projects runs out as soon as the official duration of the project or programme has ended.

Increased competition for scarce resources

The increasing competition for contracts and financial sources within the AKIS in turn leads to less collaboration and less sharing of information sources. This competition does not only play out between all the actors involved: both public and private. The traditional roles of some knowledge providers is becoming broader as organisation also move into new territory. This leads to increasing competition between knowledge providers and a decrease of collaboration. This hinders the diffusion of beneficial innovative practices. In the Netherlands and England, problems are reported with an excessive number of support organisations (innovation intermediaries). They start to pose a problem, as they create confusion, add to the bureaucratic burden and do not streamline the process anymore. This is especially the case when the innovation intermediaries start to pursue their own goals.

Institutional logics and incentives do not match

Within the traditional actors of the AKIS the main problems regarding information transfer lies with the knowledge providers: scientists only want to publish peer reviewed articles, knowledge demanders (farmers) are not very good in articulating their knowledge needs or the government who wants to micro-manage the interactions. However, with the increase of new actors in the countryside, there are also more people who have to be involved in the knowledge production and rural innovation and it becomes important that the interactions within the network are properly managed. This seems to especially pose problems for university researchers whose academic incentives are geared towards peer reviewed publications. These academic incentives in turn may hinder interactive research together with stakeholders of research, because interactive research may make it harder to produce monodisciplinary academic output and thus provide a disincentive for some researchers to engage in interactive processes (Hoffman *et al.* 2009).

5. Implications for social learning and collaborative innovation networks

Networking, knowledge co-creation and collaboration between different partners is becoming very popular across the different countries and also with the concept of the European Innovation Partnership, or EIP also within European policy, although its practical implementation is fraught with

difficulties and some cultural differences. The comparative analysis shows many examples how some of the national particularities of the AKIS might likely hinder or foster social learning and collaborative innovation networks within a particular country.

Regarding the structural characteristics, a general threat for bottom-up innovation and collaborative learning are the reductions of the budget of these types of collaborative innovation networks. The reduction of research and innovation budget leads to an increasing competition for scarce resources. This competition leads to a concentration process on the one hand of actors trying to survive by pooling resources but on the other hand it is not very conducive for collaborations and information sharing between competing organisations.

Rules and regulations are often not very well suited to support collaborative networks. Funding for these types of bottom up networks is hindered by the inability of funding agencies to deal with the unique properties of social learning, where sometimes the social outcomes and improved stakeholder relations are very important. However these types of results are notoriously difficult to monitor and evaluate (Burgess & Chilvers 2006, Head 2008).

As mentioned earlier, the cultural characteristics of a country also determine the potential success of collaborative networks pursuing processes of social learning. Countries like Switzerland and the Netherlands have a culture that values collaboration and strives for consensus. In contrast countries like Hungary and Latvia many farmers do not like anything 'collective' as a result of the years of forced collectivism in agriculture under communist rule. Innovation networks that depend on collaboration therefore can be expected to far more easily within the Dutch and Swiss culture, however the downside of the Swiss and Dutch preference of consensus is that risk taking is not well established culturally and changes can only occur at a slow pace as all parties involved have to concur to the changes made.

Regarding competences, in some countries there is a need to develop at the farmer level the skills necessary for self-organisation and collaboration. However they are not the only ones who need some additional set of skills. Advisors and consultants also often see themselves as technical advisors focussing on knowledge transfer and not so much on knowledge co-creation. Similarly researchers often also require a different set of skills to communicate effectively with farmers, but sometimes even with colleagues from other scientific disciplines. Innovation brokers can play an important role establishing the link between different types of organisations, but except for the Netherlands, the category of the innovation brokers does not yet seem to have caught on in other countries.

Many of these issues can be summarised under the heading of the existence of trust and 'social capital' between the different actors of the AKS. Social capital is an important prerequisite for collective action and a lack of social capital and trust can hinder innovative collaborations to take off. The trust in the role of government is especially important and the trust of the mayor players in the AKIS is in many countries decreasing.

6. Conclusions

The comparison of the country reports reveals some remarkable paradoxes. The first paradox is somewhat related to the network characteristics of the AKIS. An AKIS where the actors form a more or less closed network enjoy the advantage that their AKIS is more manageable. Lines of communication are short and there is a shared discourse and vision on the future of the sector present. The downside of this situation however, is formed by the difficulty a closed AKIS has in incorporating new actors and opposing views. New information does not easily enter such an AKS, and new bottom-up initiatives and innovative practices are not necessarily recognised as such.

However, the opposite situation an AKS that is characterised as an extremely open network, has its own disadvantages. With increasing knowledge supply by brokers, advisors and agricultural consultants, the AKS becomes much more complex and the overview of the different services on offer, not only from commercial actors, but sometimes also from (applied) research institutes, becomes difficult to oversee. End-users sometimes get lost in the abundance of possibilities and knowledge providers. Even though bottom-up initiatives have easier access to the more formal research institutions, the steering of the AKS does not necessarily improve. Government has a more difficult job to steer the AKS in a desirable direction as there is no consensus over the direction of the agricultural sector.

The second paradox that can be distilled out of the comparison of the country reports has to do with a trend of accountability of politics and public policy. This trend increases the pressure on politicians and civil servants to show 'results'. Combined with a shift towards more attention to short term thinking this results in many countries in incoherent innovation policies that focus on short term results. In order to be eligible for funding an innovation project is required to provide detailed information on the expected results, focusing often on hard measurable criteria and ignoring the softer outcomes of a collaborative innovation process. At the same time however, there is often a lack of monitoring and evaluation criteria for innovation projects and programmes once a programme has finished. Learning effects are not systematically documented and these feedback mechanisms are not formalised in many countries.

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Appendix A: Overview of main differences between Agricultural Innovation and Knowledge Systems

	ENGLAND	FRANCE	GERMANY	HUNGARY	ITALY	LATVIA	THE NETHERLANDS	SWITZERLAND
Infrastructure								
Public extension and advice	Public extension completely privatised	Strong public extension system still present.	Technical- and economic extension through public extension service is insufficient. No public extension in eastern Bundesländer	Village extension services gives advice on legislation and subsidies. Public servants with a controlling task	Public extension is present, but also depends on region.	Extension gets a lot of policy attention; rest of AKS functions get less attention	Public extension completely privatised	Public extension mainly deals with the conformation with rules and regulations (direct payments).
Private consultancy and advice	A diverse advisory community emerged	Many advice organisations, somewhat in competition. However not a lot of private advice companies	Great organizational diversity, growing number of private advisors	Commercial advisory services are small, because subsidised options are cheaper.	Private sector advice is mainly connected to large agro-food corporations	Largest consultancy firm is privatised, but still retains close relations to the Ministry of Agriculture	A wide array of brokers and intermediaries has become available on all levels of the AIS	Shift from public to private
Culture, norms and values								
Stakeholder involvement in policy making	Popular (with government but not farmers) are voluntary as alternatives for regulation.		Lots of „posts of honour“ and civil society involvement	Aversion for 'collectiveness' due to communism. This hampers collaboration	Stakeholders consultation of limited impact on policy making, still dominated by the main actors), essentially top-down information flow.	Involvement of social partners in policy making required by law.	Networking and collaborative partnerships are popular. Consensus driven society.	Switzerland's political system is based on consensus, which forces different actors to interact to solve problems.
Capabilities								
Education and information skills	Knowledge consumers don't know where to go for new information, less able to afford it, less sure about which information is important and of good quality.	Not much activity on innovation and change management.	Best agricultural practices widely adopted	Large segment of small scale subsistence farmers with low education		Farmers: low level of formal agricultural education, lack of knowledge demand capacity. Low professional qualifications one of the key-problems	Dutch farmers are among the best trained farmers in Europe, with regard to formal education. However, information acquisitions skills have not been developed by all farmers	Swiss farmers tend to be curious and predisposed to new ideas and innovation, particularly with regard to technical innovation and diversification.

Interactions and networks								appendix A: continued
Vertical fragmentation / between levels	Weak and fragmented relationships after privatisation	Segmentation between Research / Education / Extension. However still many common networks, projects and activities.	Lack of communication and cooperation between actors from ministries down to individuals with only a few national platforms where actors can meet.	Vertical integration is weak; the ministry has an official role but hardly coordinates for advisory services	Insufficient links and coordination between the main components of the system (research, education, training, extension)	Lack of coordination in AKS; high fragmentation especially between business and education. Less with regard to researchers and extension.	Links between different actors have become weaker with privatisation with little synergy between education and research.	The system, although complex with cantonal system of government, remains clear and many of the actors know each other and have strong formal contacts (in 'platform's) and informal contacts.
Open / closed networks		Advisors and farmers have the same origins, the same education, the same training.	Leading fairs in Europe (Agritechnica, Eurotier, Biofach) providing a link to other sectors in Europe		A system mainly centred upon farmers, not able to open to the new actors and their needs		Due to high investment cost, farming is only an option for farming families: most changes are made when a son or daughter takes over a farm.	Links with the wider AKS (regional development) are sparse. Moreover the Swiss knowledge system is quite closed to interaction outside existing networks.

Appendix B: Overview of common trends

	ENGLAND	FRANCE	GERMANY	HUNGARY	ITALY	LATVIA	THE NETHERLANDS	SWITZERLAND
Infrastructure:								
Lack of funds / decreasing funds	Lack of investment in agricultural research and knowledge transfer (public and private).	Public funding is decreasing.		Funds are drying up. A struggle for survival and competition of scarce resources.	Continuous decrease of resources. Replacement of national funds for European funds.	Lack of funds leads to: poor infrastructure; instability; brain drain; lack of long term priorities.	Relatively low public and private investments in R&D.	Research has suffered big budget cuts.
Research institutes and universities	Strong concentration of research institutes over the last 30 years, from 30 -> 3	Universities are given incentives to collaborate or even merge; the number of agricultural colleges has halved.	Agricultural faculties have difficulty. They struggle for survival.	Universities and research institutes struggle for budget.	Reduction of public funds.	Research institutes focus on practical R&D in seeds and plants.	Mergers between universities, universities and vocational schools (HBOs) are increasing.	Research institutes are well resourced.
Private research by agro-food industry	Increasing close cooperation between universities and agro-food industry.	Agro-food industry is very present in applied research and in advice to farmers.	Shift from universities to private companies (gene technology, agricultural chemistry)	Private research is often done outside Hungary. University contracts with industry decreasing.	Agro food industry and private sector are growing in importance. Starting up joint research with universities		Cooperation with universities more and more common	Farm supply companies are active innovators inside the value chain.
Education	Education for agriculture has shrunk because of lack of funds and declining interests.		Mass education and budget cuts weaken education capacity.	Green education is in a bad shape: not enough students and ageing faculty members	Attention for linkages between education and research is growing.	Decline in student numbers; declining prestige and ageing of teaching staff diminishes quality.	Links between education and agricultural businesses are sparse.	Vocational schools have a good infrastructure, and staff with a high level of training.
Legislation, laws and regulations:								
overregulation & bureaucracy		Lack of stable fundin. More and more short projects targeted by the tender system.	Excessive regulation of agricultural production implemented by public administrations (farmers).	Complex and ever changing application forms and procedures.			Funding schemes, often short term and too complex for agricultural entrepreneurs.	Overregulation leads to a high burden of legal and administrative tasks for all stakeholders
Monitoring and assessment		Lack of common assessment system. Little reflexivity on the AKS by its members	Wrong incentives set for research and financing of research.	Saving experience is difficult: high turnover in Ministries.	Lack of mechanisms for monitoring the results and providing feedback		No structural evaluation of finished programmes.	The feedback system from stakeholders in to researchers is ineffective.

Appendix B: continued

Norms, values and culture								
Contested vision of the future	New actors with new visions enter the country side. There is a growing interest in 'doing things differently'.	The concepts of innovation, and of sustainable development are not clearly defined, nor shared among the players of the system.	Public focus on organic food and environmentally friendly production (however with selective perception and overvaluation of organic or "quasi natural farming"		There is an increasing awareness by a part of civil society about critical features of current food system and demand for change.	no single vision	Fragmented vision and competing interests and discourses on rurality	The concept of sustainability in the Swiss population also translates in demand for sustainable production.
Social capital and trust	Farmers feel overburdened with regulation and red tape and under-rewarded. This leads to declining trust in government	Farmer feel underestimated by the general public ... but the general public still shows interest in agriculture.	Conflicts between farmers and local population become more frequent, esp. regarding animal rights and bioenergy	Towards the field trust is missing; leading to overly regulated subsidies; avoidance of risks and normative control	Increasing importance of trust relations between farmers and consumers within short food chains	Lack of trust between farmers and scientists. Blame each other for gaps in AKS		Farmers confidence was high but has suffered by the top-down implementation of integrated pest management (IPM)
Interactions and networks								
Barriers for interaction in different types of logic and incentives	Different parts of the public sector operate too separately, because of their distinct forms of core funding.	Too academic orientation of public research and of scientists evaluation.	Exchange between university research and practice is difficult. Little incentive for practitioners to get involved. Scientific conferences are unattractive for practitioners.		Persistence of difficulties (cultural barriers) in public-private cooperation: public and private research systems are in the most of the cases detached from one another	Incompatibility between scientific knowledge and farmers needs.	Conflicting organisational logics and evaluation schemes limit the possibilities for successful cooperation between different types of actors	There are significant communication barriers between researchers and farmers.
Market structure								
Increasing competition between knowledge providers	There is a perceived shortage of advisors in several specialist areas, on the other hand some people argue for more generalists	Competition among advisory organisations.	Growing numbers of private advisors combined with organisational fragmentation of research: too many and too small research institutes with a lack of coordination	Only very few advisors can live of the FAS. Advice, extension and consultancy suffer from a lack of coordination	Excessive number of support organisations, not well coordinated and managed.	Increasing competition between knowledge providers in a small market (10,000 commercial farmers)	Competition between institutes and sometimes within (large) institutes results in a failure to share potentially commercial information	Strong competition in education and advice to farmers. Consultants are motivated by financial survival, which makes them risk averse.

