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Foreword

Since the 1970s, official organisations 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. Although these systems are very different between countries, regions and sectors, they face common challenges such as the need to increase productivity and sustainability in agriculture and food production.

In March 2012 the European Union's Standing Committee on Agricultural Research (SCAR) published its report 'Agricultural Knowledge and Innovation Systems in Transition'[1]. Its main conclusion is that the interactions between the different actors within the AKIS, namely knowledge users (especially farmers), research, education and extension, have to be improved. The systems are changing, but there is no guarantee that they are fit to meet the challenges of the bioeconomy.

The publication of the report is timely as the *Innovation Union* is one of the seven flagship initiatives of the European Union's Europe 2020 strategy for a smart, sustainable and inclusive economy. The European Commission acknowledges the importance of research, knowledge transfer and innovation in addressing the challenges faced by European farmers. Its proposals for the Common Agricultural Policy after 2013 include a strengthening of innovation support, in part through the creation of a 'European Innovation Partnership for agricultural productivity and sustainability'.

This thematic issue of *Studies in Agricultural Economics consists* of nine papers that explore different aspects of AKIS in the context of the conclusions of the SCAR report.

The first two papers address the concepts of innovation and knowledge respectively. Social innovation is as an essential part of agricultural and rural innovation but what exactly is meant by the term often remains unclear. Bock clarifies the meaning and significance of the concept by distinguishing three main interpretations of social innovation: the social mechanism of innovation, the social responsibility of innovation and the need for innovating society. The traditional, 'linear' model of technology transfer (from scientists to the users) is outdated and knowledge flows within AKIS can be complex. Koutsouris explores the expert – lay knowledge gap as well as obstacles to participatory development from a critical realist point of view, providing useful guidelines concerning the emerging 'intermediation' functions within AKIS.

Materia describes how the Italian AKIS places itself in the new emerging framework. She identifies the need for more effective institutional coordination, a major effort in the demand analysis and impact evaluation, and a stronger investment in the skills of human resources involved in the AKIS. The operation of AKIS in ornamental plant production in Vlaanderen (Flanders), Belgium is explored by Vuylsteke and van Gijseghem who describe four examples of networking initiatives. While each of these has its own history and logic, all show that it is possible to move towards improved interaction within and between AKIS subsystems.

The next three papers explore approaches to increasing the level of farmer engagement in the AKIS. Von Münchhausen and Häring present preliminary results from a farmer-university network in the north-east of Germany. These show that such networks can be effective when non-traditional methods of learning and knowledge transfer that are adapted to different levels of professional education are adopted. The theoretical background to the topic of facilitated group learning is reviewed by Murphy. Using the ADER project from the East of England as a case study, he shows that facilitated group learning can be a very effective tool for supporting innovation amongst farmers. Similarly, Owen and Williams show how in Wales the establishment of small, close knit groups with a dedicated experienced facilitator and utilising Action Learning methodology can result in extremely effective and sustainable innovation and knowledge transfer.

Fenyvesi and Erdeiné Késmárki-Gally propose a technology development system for Hungary that incorporates three elements (measurement of inputs in space and time, market-focused technology development and a self-teaching information system for farmers) and that could be used in rural development, primarily in the area of agricultural production. Finally, Rebelo and Muhr demonstrate how, through a simple and informal network, five small wine producers located in the Douro Demarcated Region of Portugal, where high production costs and tradition and *terroir* are relevant factors, have been able to commercially exploit niches in international wine markets.

I trust that this issue of *Studies in Agricultural Economics* will make a useful contribution to the ongoing debate on the future of AKIS across Europe and beyond.

[1] Agricultural knowledge and innovation systems in transition – a reflection paper. Brussel: European Commission.

Andrew Fieldsend
Budapest, September 2012

Bettina B. BOCK*

Social innovation and sustainability; how to disentangle the buzzword and its application in the field of agriculture and rural development

Social innovation is often appointed as an essential part of agricultural and rural innovation. Everybody seems to agree that social innovation is important but what exactly is meant by the term remains often unclear. This paper aims at clarifying the meaning and significance of the concept by going back to its root in innovation science and policy. It appoints three main interpretations of social innovation, referring to the social mechanism of innovation, the social responsibility of innovation and the need for innovating society. Studying its application in the field of agriculture and rural development reveals that social innovation is rarely referred to when agriculture as a singular economic activity is concerned, but prominently present in discussions about rural development. Here social innovation may be referred to when identifying society's need for more sustainable production methods, the necessity for collaboration and social learning, and the scope of change needed for revitalising (rural) society. Often, however, social innovation is presented as a tangle of interdependent processes and beneficial outcomes. Its fuzziness contributes to its discursive power in discussions about agricultural politics and the significance of sustainability, but also hides the valued-loadedness of social innovation. As a result its critical potential becomes neutralised. For gaining more insight in how to more effectively support social innovation, it is important to disentangle the social innovation jumble, to unravel the diverse interrelations and to explore and monitor its functioning and contribution to processes of social change and renewal.

Keywords: social innovation, responsible innovation, critical innovation, rural development, sustainable agriculture, rural governance

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Introduction

Social innovation is often appointed as an essential part of agricultural and rural innovation. One might call it one of the buzzwords which has become popular and pops up in policy arenas and features as a container carrying a plethora of meanings. Everybody seems to agree that social innovation is important but what exactly is meant by the term often remains unclear (Neumeier, 2012; Pol and Ville, 2009). This paper aims at clarifying the concept by analysing its origin and variable interpretation and application. By focusing on its relevance in agriculture and rural development, it seeks to unravel the different but overlapping definitions in use and to reveal its most characteristic and distinctive features. Disentangling the social innovation jumble, unravelling the diverse interrelations and monitoring underlying processes is important for gaining insight in how to more effectively support social innovation.

The following section discusses the origin of the concept of social innovation and its use in the context of innovation today. A threefold categorisation is presented which provides insight and creates order in the multitude of applications and interpretations. The paper then focuses on the significance of social innovation in the field of agriculture and rural development. In the discussion the critical elements of social innovation are underscored and the need to monitor and evaluate the process of social innovation more closely, differentiating between its different aspects in order to better understand and support social innovation, is stressed.

Methodology

The paper summarises the results of a literature study on social innovation and its significance for the transition towards sustainability in agriculture and rural development, commissioned by the Collaborative Working Group of the European Union's Standing Committee of Agricultural Research (SCAR). The literature study focused on recent publications reporting on (social) innovation in the rural context in the global North, starting with a quick scan of its roots in more general recent literature on (social) innovation.

Defining social innovation

The concept of social innovation is born from the ongoing debate and critique on traditional innovation theory with its focus on material and technological inventions, scientific knowledge and the economic rationale of innovation. It points to the need to take notice of society as a context that influences the development, diffusion and use of innovations (Edquist, 2001; Lundvall, 1992 in Fløysand and Jacobsen, 2011), but also points to the fact that innovations bear risks as well as opportunities for society (Pol and Ville, 2009).

Three main interpretations of social innovation may be distinguished, underlining:

1. The social mechanisms of innovations,
2. The social responsibility of innovations, and
3. The innovation of society.

These different interpretations highlight a specific aspect of social innovation but also underscore a specific value. Social innovation is, hence, not a neutral concept as its interpretation reflects a more or less critical stance towards the functioning of society.

The social mechanisms of innovation

It is now common knowledge that innovation takes place within specific social and cultural contexts and networks of social relations. They stimulate and support the development of 'inventions' (Fløysand and Jacobsen, 2011), but new technologies and products also affect social relations, behaviour and attitudes (Pol and Ville, 2009; Phills *et al*., 2008). Innovations are, hence, socially, culturally and territorially embedded (Fløysand and Jacobsen, 2011). In order to become adopted new products and new technologies need to fit into a specific social context with a specific organisation of social relations and specific norms and values and accepted behaviour patterns. Businesses recognise the sociocultural nature of innovations and take variation in taste into account when introducing new products or processes. Here one may think for instance of the introduction of foreign food, that generally enters in an adapted form, in taste as well as presentation. This can be done by making dishes fit into the usual menu-structure of a 'proper meal' (i.e. a 'burger menu') or by adapting the original recipe and offering for instance 'grilled sushi' (Lang *et al*., 2009).

Recent theories of innovation use the concept of socio-technical innovation to explicate the inseparability of the social and technical in processes of innovation (Smith *et al*., 2010). The construction and introduction of new technologies always involves changes in the interaction of 'things' (artefacts), actors and 'ways of doing' (institutions) and effects and is affected by how society is organised and functions. This is the most evident in the case of 'system innovations' that go beyond the introduction of a new product or process but change the context, manner and meaning of how something is done, and lead to fundamental changes in many areas of society (Smith *et al*., 2010; Moors *et al*., 2004). Automobility is such a system innovation, which includes much more than the invention of the automobile.

> The regime of automobility, for example, includes not only paradigmatic technological design for cars, but also the specialised road planning authorities, the institutions of the 'driving licence' and 'motor insurance', the lobbying capacities of car manufacturers and oil companies, and the cultural significance of automobility. In combination, these elements form a socio-technical regime that stabilises the way societal functions are realised, and gives shape to particular patterns of producing and consuming mobility. (Smith *et al.*, 2010, p.440).

Based on these insights a new (systemic) analytical framework is developed – the multi-level perspective on socio-technical transition (MLP) – that explains why, how and where innovations may occur and lead to wider transitions, what preconditions innovation and how such a process may be fostered by innovation policy, for instance by offering room for social learning, cross-sector collaboration and experimentation (Smith *et al*., 2010; Moors *et al.,* 2004; see also next paragraph).

The social responsibility of innovation

In classic economic thinking innovation is considered important because of its ability to increase profit and encourage economic development (Voeten *et al*., 2009; Pol and Ville, 2009). Still today innovation is often associated with industries developing new products and new technologies driven by their wish to maximise profit. At the same time, technological innovation is increasingly met by scepticism and concern about for instance their potential risks for human safety and the environment. The on-going controversy around genetic modification may serve as an example here (Carolan, 2008). There is also a growing call for a different kind of innovation that helps solving important social problems. In addition, it is recognised that innovations may serve some groups more than others and that it is important to evaluate the social impact of innovations and to find out who are the winners and losers in innovation processes (Pol and Ville, 2009). All this may be summarised under a call for social or socially responsible innovation: innovations that are ethically approved, socially acceptable and relevant for society. Socially responsible innovation calls upon businesses to invest in society and to come up with socially relevant innovations, as part of their corporate responsibility for 'people and planet' and not only 'profit' (Phills *et al*., 2008).

Some theorists argue that the process of innovation has to change as well (Geels and Schot, 2007). Social innovation requires new – social – methods of innovation, characterised by processes of co-design or co-construction and collaboration with society. As a result the range of innovation-actors changes and research and development are no longer the exclusive domain of science and business; with the inclusion of users the roles of, and relationships between, science, market and (civil) society change. The Dutch Innovative Medical Devices Initiative (www.imdi.nl)[1] is an interesting example for such a project. Here researchers of various disciplines cooperate with physicians, technologists, as well as with producers and users of medical devices in eight centres of excellence. Their aim is to develop new medical technology that responds to the demands of an ageing society while remaining affordable. Their exchange and combination of knowledge becomes an important element of the innovation process as it goes beyond the creation of more knowledge. It regards processes of social and creative learning (Wals, 2007) that change perspectives and ways of looking at things, values and behaviour, and in doing so guide the development of socially acceptable and relevant products and processes.

The innovation of society

Social innovation is also referred to when indicating the need for society to change as a prerequisite for solving pertinent problems such as discrimination, poverty or pollution (Gibson-Graham and Roelvink, 2009). Here the focus is on changes in social relations, people's behaviour, and norms and values. Social innovation is then combined with concepts such as social empowerment and inclusion, social capital and cohesion. The Stanford Centre for Social

[1] For a description in English see: http://www.nwo.nl/nwohome.nsf/pages/NWOP_8BKJRG

Innovation departs from such an interpretation and defines social innovation as *Any novel and useful solution to a social need or problem, that is better than existing approaches (i.e., more effective, efficient, sustainable, or just) and for which the value created (benefits) accrues primarily to society as a whole rather that private individuals*.[2]

Similar calls for social innovations can be found in various government programmes. Also the Europe 2020 strategy document defines social innovation in the sense of social inclusion as one of its priorities. To design and implement programmes to promote social innovation for the most vulnerable, in particular by providing innovative education, training and employment opportunities for deprived communities, to fight discrimination (e.g. disabled) and to develop a new agenda for migrants' integration to enable them to take full advantage of their potential (EC, 2010, p.18).

Stressing the need to include and give voice to socially deprived groups underlines the political and critical element of innovation and its significance in a search for a better world, with more social justice and equality (Gibson-Graham and Roelvink, 2009). The extent of change envisioned may differ; some propose a substantial turnover of society whereas others aim for the improvement of existing practices. Social innovation is also strongly related to the innovation of established processes in politics and governance. Following Moulaert *et al*., (2005) social innovation needs innovative governance, which allows for the inclusion of non-traditional, marginalised actors, integrates various policy issues and centres on area-based development. It should invest in civil society and community development and support collective action, self-governance and political empowerment.

In summary

Social innovation is a complex and multidimensional concept that is used to indicate the social mechanisms, social objectives and/or societal scope of innovation. The social mechanisms of innovation refer to the fact that the development, diffusion and use of innovations always occur within the context of society and in interaction with social relations, practices and norms and values. As a result it is important to evaluate the social impact of innovations as there are generally winners and losers. Innovations should be 'social' in the sense of socially acceptable, relevant and ethically appropriate. This may be achieved by socialising innovation methods and reorganising innovation as a social and collective learning process with the purpose of the common definition of problems and common design and implementation of solutions. Finally, social innovation refers to the inducement of reorganising and improving society. In the latter case, the concept of social innovation is not only an analytical and academic concept, but also used in a normative way, stressing the need for social and political change, with clear differences, however, in the scope of change envisioned. It is, hence, important to be aware of the political element of (social) innovation and to analyse which kind of (social) changes are considered desirable and deserving governmental support and which not.

Social innovation in agriculture and rural development

The term social innovation is popular in the context of agriculture and rural development but its use and the importance attached to it differ according to the domain and scope of innovation referred to. Social innovation is most frequently used in the context of rural development as it is here where the need for social change is perceived as most evident. When rural development is concerned, the social is presented as a core element of innovation, also in the sense of engaging society in developing new solutions. When it comes to strictly agricultural development in the sense of production efficiency, social innovation is generally considered of less significance. Here a technology-oriented definition of innovation predominates (Moors *et al*., 2004). This has also to do with the different scope of innovations referred to above. Agricultural development, as such, is primarily built on business innovation and deals with new products and processes or new strategies, structure or routines (Pol and Ville, 2009). These technological or organisational innovations are developed and/or adopted by individual businesses in order maximise private profits. Rural development regards the innovation of socio-economic systems and seeks to meet unmet public needs and to create public value where markets and common socio-economic policies have failed (Phills *et al*., 2008).

For what regards the sustainability challenge the scope and direction of change is highly contested, and likewise is the need and desirability of social and business innovations. This is clearly reflected in for instance discussions about the Common Agricultural Policy (CAP) (High and Nemes, 2007), where 'agricultural modernisation' and 'multifunctional rural development' meet as conflicting paradigms or 'innovation models', and different solutions to the sustainability challenge. Those who support multifunctional rural development foresee the need for fundamental social changes – in organisation, behaviour as well as values – and attach great importance to social innovation as an essential part of the solution and part of a collective learning process (Knickel *et al*., 2009). Those who support agricultural modernisation have generally high expectations of scientists and their capacity to develop and design new technologies. They refer to social innovation in the sense of responding to social needs such as food safety and food security. Others use social innovation as synonymous for 'critical innovation' (Pol and Ville, 2009) and as a pledge for the creation of alternative systems of production and consumption.

The ambivalent use of social innovation complicates the definition and description of its significance and meaning in the field of agriculture and rural development (Neumeier, 2012). It also hinders scientific research and limits our insight into social innovation processes, which is essential for more effectively supporting social innovation (Reed *et al*., 2010; Klerkx and Leuuwis, 2009). In order to reduce and disentan-

[2] Stanford Graduate School of Business: Center for Social Innovation http://www.sdgrantmakers.org/members/downloads/PhillsSan%20Diego-Social%20Innovation.pdf

gle the 'social innovation-jumble' we make again use of the three-folded categorisation of the concept introduced above.

Social mechanisms – co-production of rural innovation

In the past, social mechanisms were considered as important when reaching the phase of diffusing agricultural innovations, when extensionists transferred new knowledge, products and/or technologies to farmers and convinced them to accept and use them (Leeuwis and van der Ban, 2004). Traditional Agricultural Knowledge Systems (AKS) are based on this approach (Dockès *et al*., 2012).

The new systemic approaches stress the importance of social mechanisms as basic elements also during the development phase. Innovations are seen as born from collective and creative learning processes and the mutual exchange of knowledge. All innovations are, hence, social as well as technical, and require social learning. Learning is no longer structured as a linear transfer of knowledge from teacher to student, but becomes a shared, social and circular process, in which the combination of different sources and types of knowledge creates something new (Oreszczyn *et al*., 2010; Stuiver *et al*., 2004). This type of learning is in itself innovative as it allows for a new (cross-border) constellation of actors to collaborate, who come from different backgrounds and have different interests (Tovey, 2008; Fløysand and Jacobsen, 2011).

Here social innovation is put on a par with collective and creative learning. At the same time it is also more than an innovation method, as it also produces (social) innovation in the sense of new skills, products and practices, as well as new attitudes and values, and new social relations between for example citizens and farmers (Rist *et al*., 2007; Bruckmeyer and Tovey, 2008).

The EU LEADER programme is a good example of an innovation policy that is based on this approach. Some even present LEADER as synonymous with social and cultural innovation (Dargan and Shucksmith, 2008). Starting as an experiment in some European regions, it has been mainstreamed as a cross-cutting axis for the local delivery of rural development plans in the present CAP (2007-2013). LEADER represents a territorial, participatory and endogenous approach to rural development. Following its philosophy it is important to enable the inhabitants of rural regions to realise their own development plans, making use of local resources and local knowledge. LEADER facilitates local capacity building and the growth of confidence and self-esteem among citizens as well as a positive collective identity (Dargan and Shucksmith, 2008). It also supports the creation of local and extra-local networks (Convery *et al*., 2010; High and Nemes, 2007; Dargan and Shucksmith 2008; Lowe *et al*. 2010). In doing so LEADER intends to create favourable conditions for the social mechanisms of innovation to function.

There are other examples where novel practices are born from the interaction and exchange of knowledge and experience between social groups that did not use to interact, such as farmers and citizens. Well-known examples regard environmental cooperatives in which farmers collaborate with citizens (Wiskerke *et al*., 2003), or consumer buying groups where urban consumers enter in stable relationships with farmers (Lamine, 2005).

Social objectives – responsiveness to market failure and unmet social needs

The call for responsiveness to unmet social needs and expectations is a strong driver for innovation of the agro-food system (Lowe *et al*., 2010). Recent food scares are a good example, but also loudly uttered concerns about genetic modification, animal welfare and environmental degradation and declining biodiversity exemplify this public call. Continuously returning are also critiques that point at the damaging effect of the globalisation of agricultural production and trade on developing countries. Finally, the social and economic decline of rural areas has been pointed out as one of the externalities of agricultural modernisation and the traditional production oriented agricultural support systems.

> Likewise, as consumers have prospered, they have become much more discerning and judgemental about the quality and wholesomeness of their food and the treatment of animals and nature in its production. As a consequence, the ethics of intensive farming have been called into question, and the discourses of commodity productivism challenged by those of 'slow food', organic, welfare-friendly and food chain localization. (Lowe *et al*., 2010, p.288).

The above reflects a call for social innovation in the sense of socially responsible agri-rural innovation, which is, however, received in various ways, reflecting different approaches to innovation and a variable appreciation of the existing system of production and consumption. At the one hand we see attempts to meet social concerns by way of new technological designs that reduce the negative effects. This is often achieved through more efficiency and reduction in either energy demand or polluting emissions (i.e. bio-economy, precision agriculture and intensive sustainability) (e.g. Tilman *et al*., 2011). Representatives of society may also be consulted about their concerns and engaged in the development of new products or technologies. Such consultation processes have for instance accompanied the design of new stables for pigs and poultry (Grin *et al*., 2004; Bos *et al*., 2012). The purpose is to find ways to reconcile social concerns with the requirements of modern production and to find solutions within the dominant system of production and consumption.

The promotion of a new (rural) paradigm of place-based agri-food eco-economy and multifunctional, integrated development is a more radical response to social concerns that calls for critical (social) innovation and attempts to change the agri-food system as a whole (Marsden, 2012; Horlings and Marsden, 2011). It seeks to replace what is indicated as the 'bio-economical', productivist modernisation paradigm by a system in which agriculture is place-based and relocated into 'the regional and local systems of ecological, economic and community development' (Marsden, 2012 p.140). Farmers no longer aim to maximise production against minimal costs but instead develop new products and services, such as local, high quality food, nature conservation as well as rural

tourism and green care (Roep and Wiskerke, 2004) and in doing so meet newly emerging social needs[3].

Social transformations – Changing (rural) society

When rural development and agriculture are concerned, social change is always implied. Changes in urban and rural lifestyles drive and demand innovations. It is, for instance, often argued that concerns about animal welfare typically arise in rich, urbanising societies, where citizens became estranged from farming (Boogaard *et al*., 2010). But also in the social mechanism of innovation and co-production of innovation, social change is implied through the crossing of rural-urban boundaries and re-establishment of their relationships, as well as the development of new attitudes and values (Neumeier, 2012).

But social change may also be the explicit purpose of innovation processes. Social innovation is then appointed as desired outcome – a renewed, revitalised society - as well as instrument and strategy to rescue rural societies through collective engagement. This is most prominently the case when rural development, in the sense of local development, is concerned and when the objective is to re-integrate rural societies that are perceived as marginal. Attention is then focused on the social fabric of rural areas that is considered as too weak as to assure its survival, and in need of revitalisation or 'innovation'. It includes concern with depopulation and the weakening of the social structure as a result of an ageing and masculinising population (Manos *et al*., 2011). In addition, there is worry about the need to mobilise and educate the population so that they become capable and willing to engage and re-create their society, and worry about the obstruction and 'hi-jacking' of change through powerful local interest lobbies (Convery *et al*., 2010; Vidal, 2009; Dargan and Shucksmith, 2008).

Social innovation, hence, refers to society as the arena where change takes place, as well as the need for society to change. It is, however, important to closely look at the scope of change envisioned. The call for a sustainable agri-food eco-economy, and 'real ecological modernisation' (Marsden, 2012) may serve as an example for a call for radically changing society and its systems of production and consumption. In the promotion of this 'innovation' the social is at the core of the innovation itself. The reorganisation and redefinition of the agri-food economy requires the substantial innovation of relations of production and consumption relations, of norms and values as well as behaviour, and the principles of agri-food governance (Marsden, 2012).

In summary

All three interpretations of social innovation are prominent in the context of agriculture and rural development and often used in combination. Generally the focus is on promoting social innovation as an important motor of change, referring to the social mechanisms of change as part of the process, new and yet unmet social needs as desired outcomes, society as the scope or arena where change takes place as well as indicating the scope of (societal) change envisioned. Also in the rural context the concept of social innovation is complex and multi-dimensional and often referred to as one big tangle of related and undifferentiated processes and outcomes that all together are portrayed as beneficial and desirable for the public good. It is the latter which makes social innovation a popular buzzword that, due to its positive notions, is often used to mobilise support. A call for 'social innovation' may, however, come from advocates who promote radically different directions of agricultural and rural change. For some social innovation indicates their wish to consult society when developing new products and processes, others use it to call for society to change. The lack of clarity and fuzziness of the term hides the value-loadedness of the social innovation and neutralises its critical potential.

Discussion

This paper aimed at unravelling the jumble of social innovation concepts in use and more particularly its interpretation and significance in the context of agriculture and rural development. It demonstrated that social innovation is rarely referred to when agriculture as a singular economic activity is concerned, but is very prominently present in discussions about rural development and the transition towards sustainability. In these discussions all three interpretations of social innovation are in use and often mixed up when referring to social innovation as one big tangle of interdependent processes and beneficial outcomes. Its fuzziness contributes to its discursive power in discussions about agricultural politics and the significance of sustainability. Social innovation is, hence, often used as an argument and strategy for promoting quite different directions of change.

The transition towards more sustainability and related discussion about 'agricultural modernisation' and 'multifunctional rural development' as opposing solutions is a good example of this. It also demonstrates that the position and function of 'social innovation' within the two programmes differ. It embodies the main message of the 'paradigm of multifunctionality' and 'eco-economy' – the renewal of our system of production and consumption, the development of new production and consumption practices, guided by new attitudes and values. Here the interpretation of social transformation and the innovation of society presides. The paradigm of 'agricultural modernisation' and 'bio-economy' strives for repairing the current system, so that it may better serve the needs of its citizens. Here social innovation fulfils a more instrumental function: innovators should engage citizens in their practices so that the new products and processes better meet their expectations and needs. The emphasis then lies on the social mechanisms and objectives of innovations, and not the innovation of society.

Social innovation may, hence, mean quite different things, and may be used to convince others of the need to realise quite different outcomes. Several authors argue for the need to agree upon one definition for the sake of research

[3] Combined with the ideas of endogenous, territorial development the multifunctional paradigm presupposes collective civic actions as a motor of change and as such also refers to social innovation in terms of the previous section. Farmers and other rural actors who exchange knowledge and ideas, combine their products and practices and in collaboration revitalise the rural economy by creatively responding to the call for agricultural and social change (Vander der Ploeg and Marsden, 2008).

and scientific progress as well as for the sake of supporting policymakers more effectively (Pol and Ville, 2009; Neumeier, 2012). The question is if this is really possible as long as social innovation is a buzzword, which adds legitimacy to messages of different kinds. What we can do is agree upon its main elements and interpretations and case-by-case check which interpretation is prioritised, and which meaning underscored (or pushed to the back) when applied in specific contexts and why. Based on the previous analysis, we consider its rootedness in critical innovation as a truly essential feature. Social innovation presupposes a critical attitude towards existing systems and their inherent failures, as well as a search for social justice and the public good. What to change and how, is a question of debate.

Independently of how radical are the changes proposed, social innovation is considered essential as instrument and process to realise a transition towards more sustainability. This underlines the importance of better understanding how it works and how the process related with social innovation may be effectively supported. For gaining more insight in how to more effectively support social innovation, it is important to disentangle the social innovation jumble, to unravel the diverse interrelations and to explore and monitor their separate and shared functioning and contribution to processes of social change and renewal.

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Alex KOUTSOURIS*

Facilitating Agricultural Innovation Systems: a critical realist approach

The turn of agrarian sciences and agricultural extension from reductionist and transfer of technology, respectively, towards systemic approaches has transformed agricultural/rural development thinking in the last decades. Nevertheless, the emergence of Agricultural Innovation Systems (AIS) has to confront a number of gaps among which the expert – lay knowledge gap is of major importance. This paper aims at exploring such a gap as well as obstacles to participatory development from a critical realist point of view. Critical realism (CR) with its realist, differentiated and stratified ontology aims at interpreting the world in order to ultimately bring about transformation. CR allows for new insights on the nature of knowledge as well as on development research and practice. It thus provides useful guidelines concerning the emerging 'intermediation' functions within AIS.

Keywords: Agricultural Innovation Systems, critical realism, knowledge, participation, intermediation/facilitation

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Introduction

Agrarian sciences have until recently been dominated by instrumental rationalist knowledge (Habermas, 1984), or the paradigm of experimental, reductionist science (Packham and Sriskandarajah, 2005). This, in turn, resulted in a 'culture of technical control' (Bawden, 2005) implying reliance upon scientific experimentation to create a 'fix' for agricultural problems (Nerbonne and Lentz, 2003). Along the same lines, the dominant in agricultural development 'diffusion of innovations' model, also known as the transfer of technology or knowledge (ToT/ToK) model, has been based on the understanding that innovations originate from scientists, are transferred by extension agents and are adopted/applied by farmers (Rogers, 2004).

However, despite reductionism's dazzling achievements, alternative proposals have, since the 1970s, flourished, based on the realisation of the inadequacy of linear and mechanistic thinking in understanding the source and thus the solutions of problems (Hjorth and Bagheri, 2006). Prominent among these alternatives have been systemic approaches (Ison, 2010). Such approaches look at a potential system as a whole (holistically) and focus on the relationships (important causal inter-linkages or couplings) among a system's parts and on system dynamics, rather than the parts themselves. Particularly the systems of innovations (SoI) approaches, including national systems of innovation (Edquist and Johnson 1997; Lundvall, 1992), technological systems (Carlsson and Stankiewicz, 1995; Hughes, 1987) and socio-technical systems (Bijker, 1995; Geels, 2004) imply that innovation emerges from networks of actors as a social (and institutional) as well as a technical, nonlinear and interactive learning process.

In parallel, despite its long history of innovations and increased effectiveness in food production, the 'diffusion of innovations' model has been heavily criticised as it fails to respond to complex challenges and rapidly changing contexts, including the shift to sustainable development. Among others, the 'traditional linear' model does not acknowledge farmers' experience and knowledge as well as the fact that general regional advice often does not match individual farm conditions and the socio-economic context of farmers; additionally, advice in ToT is seen to come out of a 'black box', since the reasoning behind it is not transparent (Chambers and Jiggins, 1986; Röling, 1988; Röling and Wagemakers, 1998).

A leap forward in this respect has been, in both theoretical and practical terms (Byerlee *et al*., 1982; Simmonds, 1986), the emergence of Farming Systems Research/Extension (FSR/E) approaches. Inspired by ecology and general systems theory (Schiere *et al*., 1999), FSR/E approaches have, on the one hand, demonstrated that local farming systems are complex adaptive systems that have co-evolved with human societies to fit local ecological conditions and satisfy human needs. On the other hand, through FSR/E vast experience has been accumulated in terms of understanding farmers, eliciting information and developing relevant tools and methods. FSR/E contributed substantially to the recognition of different actors in development and helped to create awareness about the need for new ways to conduct research and extension, taking into account context and relations (Collinson, 2000; Darnhofer *et al*., 2012).

A further important evolution has been, within the FSR/E tradition, the turn from Rapid/RRA to Participatory Rural Appraisal/PRA (Chambers, 1992, 1994; Pretty, 1995; Webber, 1995). This shift underlined the need for interaction and dialogue between different actors and networks (Chambers, 1993; Scoones and Thompson, 1994), based on the realisation that flows of communication and exchange between different actors are extremely important for existing knowledge to be either reinforced or somehow transformed or deconstructed, thus leading to the emergence of new forms and a 'fusion of horizons' (Leeuwis *et al*., 1990).

Therefore the question 'how do we go about generating innovation and development in agriculture' does not concern strictly technical issues. For Leeuwis (2000) it is important to consider farmers' views regarding the compatibility of new technical solutions with prevailing management demands and wider social-organisational conditions. This, in turn, implies that farmers must be able to set their own strategic goals, participate actively, and build upon their own experiences and knowledge within a co-learning process which does justice to individual differences and qualities of people. This also implies that the learning environment has to be secured as a mentally and socially safe space, and allow for effective interactive communication; it requires trust and time (Koutsouris, 2008a).

Subsequently, the emphasis has gradually shifted towards learning, i.e. the processes of human interaction from which learning emerges (LEARN Group, 2000; Röling and Wagemakers, 1988). The epistemological point of departure is that learning is an active knowledge construction process rather than the (passive) absorption and reception of knowledge. In this respect, learning is seen as a social process in which participants in interaction and negotiation determine what is socially known (Koutsouris and Papadopoulos, 2003). Thus the emphasis given on the principles of experiential learning (Kolb, 1984) and its advances such as participatory learning and action research (King *et al*., 2001) stressing, among others, the importance of reflection and dialogue.

In general, the attempts to solve the current, increasingly complex problems with a view to sustainability make clear that this is a particularly complicated task since while, at the same time, there is no single privileged point of view for their analysis. Besides, when dealing with such problems (and sustainability) there may be little useable science, high levels of inherent uncertainty, and severe potential consequences from decisions that have to be made. Moreover, the realisation that real-world problems do not come in discipline-shaped boxes calls for the cooperation of diverse academic experts and practitioners. Such a *problematique*, in turn, reinforces new forms of learning and problem solving integrating perspectives and insights. As a result, new, 'integrated' (cross-disciplinary) forms of learning (and research) strive to take into account the complexity of an issue and challenge the fragmentation of knowledge; they accept local contexts and uncertainties; they address both science's and society's diverse perceptions of an issue through communicative action; and, they work in order to produce practically relevant knowledge. New concepts, theoretical contributions and metaphors are thus flourishing nowadays to help understand and predict the links between the social, ecological and economic systems, meet the real world challenges and address sustainability as well as to organise various forms of 'cross-disciplinarity' into a coherent framework (Koutsouris, 2008b).

The requirement to move across the boundaries of different scientific branches as well as between extensive spectra of stakeholders has resulted in the emergence (both in theoretical terms and in practice) of a wide variety of approaches to collaborative-participatory development (Koutsouris, 2008b). Therefore, new configurations in sustainable natural resources management and integrated/sustainable agricultural/rural development also emerged including learning partnerships, group extension, farmer-field schools, communities of practice, study circles, farmer networks, etc. (Cristóvão *et al*., 2012).

The emergence of Agricultural Innovation Systems

As stressed by Hubert *et al*. (2000), 'The dominant linear paradigm of agricultural innovation based on delivery to, and diffusion among, farmers of technologies developed by science, has lost utility as an explanation of what happens', and therefore 'There is a search for new models of innovation and new roles for science' (p.17).

In this respect there has been a shift in conceptual frameworks in the study of agriculture-related policy, research, technology and rural development from the strengthening of National Agricultural Research Systems (NARS) to Agricultural Innovation Systems (AIS) (Rivera *et al*., 2005; Spielman and Birner, 2008; World Bank, 2006). The NARS framework, espousing a linear model of research, development and extension, aimed at investments in agricultural research institutes and higher education institutions in order to strengthen research supply. Subsequently, the Agricultural Knowledge and Information Systems (AKIS) framework brought attention to the demand side factors (Röling and Engel, 1991). It aimed at integrating farmers, education, research and extension and has been depicted as a triangular arrangement (knowledge triangle) with the farmer being placed at the centre of this arrangement. More recently, AIS emerged as a framework that embraces 'the totality and interaction of actors involved in innovation' and extends 'beyond the creation of knowledge to encompass the factors affecting demand for and use of knowledge in novel and useful ways' (Klerkx and Leeuwis, 2008a p.809, citing Hall *et al*., 2006; see also Klerkx and Leeuwis 2008b; Klerkx *et al*. 2010; Leeuwis, 2004). The AIS concept thus embraces the totality and interaction of actors (i.e. organisations, enterprises, and individuals) involved in innovation. It furthermore claims that the process of innovation is messy and complex with new ideas being developed and implemented by actors who engage in networks and make adjustments in order to achieve desired outcomes. Nowadays, as aforementioned, innovation studies increasingly focus on learning itself, with emphasis on facilitation and the processes of human interaction from which learning emerges (LEARN Group, 2000; Röling and Wagemakers, 1988).

The 'battlefield of AIS' will now be explored focusing on the expert – lay knowledge dichotomy. Such an exploration will take place based on the premises of critical realism (CR). Therefore in the next sections the general theory of CR is drafted followed by CR's account of knowledge. Based on these theoretical foundations the issues of expert – lay knowledge' conflict and participatory development are critically discussed. The article concludes with a brief discussion on the emerging 'intermediation' (facilitation/brokerage) function in AIS.

Critical realism

Critical realism (CR) holds to the view that, on the one hand, there is a mind-independent external reality and, on the other hand, it is possible that some things that exist in the world (external reality) can become progressively known – and that is why science and research, aiming to explore and understand the world, have been developed. In parallel though, CR acknowledges that there is a distinction between the way things are and our knowledge claims about those objects of knowledge as well as the fallibility of knowledge claims – the latter being always relative to the historical, social and political context in which they were produced (Bhaskar, 1978; Sayer, 1992, 2000).

Furthermore, for CR reality is differentiated/complexly structured comprising: (1) the empirical; (2) the actual; and

(3) the real domain. The 'empirical' consists of our experiences of what happens in the world; the 'actual' is constituted by our experiences as well as by events, independently of whether we experience them or not (i.e. whether they may go unnoticed); and the 'real' comprises of our experiences, events as well as causal powers and deep structures or what might, metaphorically, be called mechanisms with generative power, i.e. the power to produce events (Bhaskar, 1978; Collier, 1994; Outhwaite, 1998; Sayer, 1992). Crucially, generative mechanisms are circumstantial rather than deterministic; that is, depending on contingently related conditions, mechanisms may or may not be exercised and therefore are considered as 'tendencies'. Moreover, the exercise of generative mechanisms, the events they produce and our experiences are not normally in phase unless science makes them so. Therefore, the aim of (CR) research is to uncover these mechanisms, acknowledging that they may or may not be exercised; indeed, it is these mechanisms that make scientific investigation both meaningful and necessary.

Such a line of argument about generative mechanisms and counter acting mechanisms points, among other, to the importance of context. Given that events are produced in, more or less, highly complex contexts, the outcome of a mechanism is always dependent on the particular situations and contexts in which it is active; processes are always contextually determined. It follows that research has to be conducted in accordance with the context within which the respective, under study phenomenon is manifested. This is crucial especially as far as social sciences are concerned since social reality, on the one hand, has a limitless number of interacting 'variables' and, on the other hand, tends to resemble 'structured messes' (Carter and New, 2004).

Moreover, CR argues that reality is stratified, i.e. it consists of hierarchically ordered layers/strata (Bhaskar, 1978; Collier, 1994). Each of these has its own generative mechanisms; indeed, it is the existence of specific mechanisms that constitutes each of the layers. Crucial concepts within this perception of stratification are those of rootedness and emergence. That is, although a 'lower' level creates the conditions for a 'higher' level, the latter is not determined by the former; each 'higher' layer is qualitatively different from the 'lower' one with the former's mechanisms emerging, i.e. not being reduced to or determined by the latter's mechanisms. Therefore, for CR causal tendencies are multidirectional (both 'upward' and 'downward') and layers are neither independent nor closed.

The riddle of (and relationship between) knowledge forms

For CR, knowledge, including science, is produced in a context of work and communicative interaction with other people (Sayer, 1992). In this respect, on the one hand, knowledge is the outcome of work, either as the intended product of scientific work or the tacit concomitant of everyday work. On the other hand, the inter-subjective and conventional dimension, although necessary, does not imply that just anything goes; some conventions provide a useful guide to action while others do not. Furthermore, as aforementioned, CR agrees with weak social constructivists in that knowledge is situated while 'noting that the social character of knowledge does not mean that it cannot successfully identify real objects' (Sayer, 2000, p.90). Moreover, knowledge is not true as soon as it is useful to someone; contra instrumentalism CR claims that useful knowledge is useful because it is true – not that knowledge is true just because it is useful. Finally, for CR, the usefulness of knowledge is a question of how well it captures the generative mechanisms of the phenomena.

As far as the relationship between everyday/lay and theoretical knowledge is concerned, according to Collier (2003), the latter presupposes the former; the origin of theoretical knowledge is practical breakdowns which, in turn, trigger the need for explanatory knowledge, i.e. for a new kind of work with cognitive aims (science). Additionally, science, although being in all fundamental respects like any other knowledge, signifies examined concepts; interested in minimising fallibility through correction and testing, science consciously and systematically reflects upon concepts in order to be consistent and at a higher level of integration. Consequently, explanation in science is not like everyday explanation; the latter often involves the explanation of one event with reference to other events which based on implicit generalisations and unstated assumptions (or, the uncritical acceptance of the mental units with which people think as part of their cultural inheritance) results in the aggregation of disparate phenomena in 'chaotic conceptions' (Sayer, 1992). On the contrary, the development of abstractions is crucial for science (Danermark *et al*., 2002). Theoretical knowledge is acquired as (general, explicit and coherent) systems of meaning and knowledge integration (integration of meanings) is independent of specific contexts. For CR, in particular, explanations go beyond the description of observable events and their associations and thus strive to obtain knowledge of the mechanisms which contributed to the generation of the phenomenon under study. Therefore, scientific knowledge is something else and something beyond more unreflective everyday knowledge based on traditions, conventions and practical considerations 'here and now'.

Emerging issues

Following a CR perspective, a couple of issues/problems pertaining to agricultural/rural development theory and practice and particularly AIS emerge. The first concerns the attempted 'integration of knowledge'; the second addresses the obstacles to participatory development.

The expert - lay knowledge battlefield

The different tasks and thus approaches taken between experts and practitioners inevitably result in a gap between lay and scientific knowledge. According to CR, scientists try to identify and analyse mechanisms at the level each of them is trained. This specialisation, in turn, often implies (more or less) a 'rupture' between research and practice; often research does not correspond (straightforwardly) to the everyday reality of the practitioner, i.e. to the 'whole' (complex phenom-

enon) with which the practitioner is confronted. As a result, the effort of scientists to become concrete and 'practical' (i.e. to move from the abstract/real to the empirical domain) may well result in conflicts. This is often the case, since practitioners are likely to expect research to provide them with as accurate predictions for practice as possible. Sometimes this may work; but it usually does not work at all (especially for social science). This is so since, as already mentioned, the experiential outcome of a mechanism 'depends' on the interplay between mechanisms at various levels and the specific context (and scientists do not have continuous contact with each particular field); research thus in many cases can only provide (scientific) knowledge about mechanisms and tendencies, i.e. knowledge with little value in terms of tangible prescriptions of how to do things once and for all. Therefore, research does not necessarily result in practical recommendations; in most of the cases further, concrete analysis, to bring in all sorts of factors that do not figure in a particular science, is needed, out of which concrete knowledge to guide practice will emerge (Collier, 2003).

The consequence of the differentiation of knowledge forms between scientists and practitioners is that the relationship between the two parties cannot but be a reciprocal learning process. That is, researchers may pass on knowledge on mechanisms and tendencies identified by scientific theories. In turn, practitioners can learn how mechanisms work at different levels and thus increase their knowledge and understanding of the outcome of the complex interplay of such mechanisms/factors. On the other hand, practitioners, confronting the whole complex phenomenon (and applying scientific knowledge on concrete problems) can provide research with insights on how mechanisms and their interplay is empirically manifested (and challenge scientific knowledge) thus allowing researchers to further develop their knowledge (Danermark *et al*., 2002).

It follows that the issue of how concepts and values of lay knowledge are integrated in research is extremely important. For CR the contents of lay knowledge constitute the immediate mechanisms behind activities (i.e. they exist, inform and motivate concrete actions) and thus are the 'raw material' that scientific knowledge must systematically take into account (Bhaskar, 1989). A lay concept of a phenomenon is thus of crucial importance to the researcher as it may be an essential aspect of the phenomenon under study. The understanding of the material setting and the cultural meaning of social practices (tentatively) allows for the understanding of people's options and reasons for acting the way they do. Therefore, research must attempt to report those ideas, as they are held, and debate in what respects they are correct or false and, thus, make a difference to what happens.

Yet it has to be underlined again that both researchers' and (lay) actors' knowledge is fallible. For, in science too, and despite our efforts, we tend to see only some aspects of reality and are blind to others; given that in every epoch certain (societal) assumptions seem unshakeable as well as that any research project reflects a particular worldview (Joseph, 2004). Nevertheless, as already mentioned, science signifies examined concepts; within such a process, ruptures with self-evident/unexamined assumptions to which a theory subscribes lead to the emergence of new theories.

The participation battlefield

A second issue, related to this discussion, has to do with the participation hype in the sense that nowadays it is difficult to find development projects that do not in one way or another claim to adopt a 'participatory' approach. A basic principle, among others, of participatory methods is that the starting point should be the internal knowledge, priorities and perceptions of local people (Chambers, 1993); therefore, the importance of indigenous (or local/lay) knowledge and competence. It follows that, although their application is still challenging, interactive approaches characterised by 'knowledge integration' are of extreme importance.

However, in the context of the issues addressed in this paper the following points emerge. The first concerns a well-known obstacle prohibiting participation: experts' attitudes that 'they know best' and thus have the monopoly of solutions which they aim to transfer to the local communities who by definition 'know less'. Scientism, i.e. the view that only science can give knowledge (based on the positivist triumphalist models of knowledge; Parker, 2001) results in the denial and loss of local and practical knowledge. Indeed, in many projects, 'participatory' processes begin only after the project has been already designed; 'participation' is meant to promote the legitimatisation and acceptance of already taken decisions - to convince 'beneficiaries' about what is 'good for them' (Botes and van Rensburg, 2000). This may have further repercussions, such as: the perceived (on the part of the experts) commonality with respect to the problem, the homogeneity of the community addressed (Quaghebeur *et al*., 2004), selective participation (Botes and van Rensburg, 2000) and 'hard-issue' bias (Mosse, 2001). As a result, in most such cases experts propose answers that address the wrong question, which, in turn, leads to failures. When people are offered specific ways in which they should 'participate' (they have to participate but this opportunity is offered by the 'project' under prescribed conditions), the 'paradox of participation' arises (Quaghebeur *et al*., 2004).

The second issue refers to participatory techniques which, nowadays, have become an obligatory part of 'bottom-up' development efforts. Among other considerations, such as an over-preoccupation with methods and the unrealistic confidence in the efficacy of methods *per se*, an issue directly related to CR is that participatory techniques easily fall into the trap of empiricism. Based on the premise to take participants or stakeholders seriously and to fundamentally base project activities on their knowledge, needs and interests, they heavily rely on empirical information provided by project participants. As Henkel and Stirrat (2001) note, the 'participation orthodoxy' celebrates the local, indigenous and marginal at the expense of the antipathetic and deprecated technical or scientific. However, for CR such an implicit ontology (based on experience) confuses the 'empirical' with the 'real' domain (Subramaniyam, 2007). As argued by Sayer (2000) 'Observability may make us more confident about what we think exists, but existence itself is not dependent on it' (p.12). Furthermore, not only is the generation and use of local knowledge shaped by power relationships but the articulation of 'needs', as expressed by locals, is influenced by projects themselves in the sense that

the objectives of the project and local's perceptions of what the project is able to yield shape 'needs' (Quaghebeur *et al*., 2004). Finally, in many cases, the context is largely ignored (Warner, 1997). Then, lip service is paid to development: generative mechanisms are ignored, choice is limited (re: poor knowledge of opportunities) and the 'establishment' is not challenged; focusing exclusively on local knowledge, discrete and self-referential, may well prove unfortunate.

Aftermath: The intermediation function

As already pointed out, SoI approaches build on networks as social processes encouraging the sharing of knowledge and, notably, as preconditions for innovation. Such approaches, therefore, focus on processes (instead of the emphasis on structures) with knowledge conceived as being constructed through social interaction – i.e. not unproblematically transferred but instead continuously created and recreated. Thus particular attention is given to (social) coordination and networking.

In the same vein, and given that, in relation to the functioning of AIS, a number of gaps (cognitive, information, managerial or system) have been identified, resulting in network and institutional failures (Klerkx and Leeuwis, 2009), growing attention is nowadays given to various types of (process) 'intermediaries/facilitators'. Such 'intermediaries' are increasingly found in contemporary literature as third parties, (knowledge/technology) brokers, bridging organisations, intermediaries, boundary organisations and so on (Howells, 2006). Despite the fact that extensive reviews on the topic show that the field is still theoretically fragmented, not well-grounded and largely practice-oriented (Dogherty *et al*., 2010; Howells, 2006), it is quite clear that such 'intermediaries', taking an independent systemic role, are involved in 'indirect' innovation processes (i.e. in enabling stakeholders / process facilitator) rather than in direct ones (i.e. in actual innovation projects / innovation source or carrier) (Haga, 2009).

Social learning (SL), i.e. the collective action and reflection that occurs among stakeholders as they work towards a mutually acceptable solution to a problem pertaining to the management of human and environmental interrelationships (Keen *et al*., 2005), lies at the heart of such multi-stakeholder processes. Intermediation, therefore, in general implies a (social) mechanism for facilitating SL, i.e. participatory processes of social change, through shared learning, collaboration and the development of consensus about the action to be taken (including innovations to be explored).

Consequently, in terms of AIS, a new extension approach aiming at participatory and group learning and networking with extension agents acting as facilitators is required. 'Conventional' extension, identified with the linear model of innovation, is concerned with 'exploitation', i.e. with the capturing, transfer and deployment of knowledge in other similar situations. On the contrary, nowadays new extension approaches are emerging, operating on systemic perspectives and aiming at enhancing the interaction between a variety of actors; they thus focus on 'exploration', i.e. with the sharing and synthesising thus with the creation of new knowledge (Levinthal and March, 1993; Murray and Blackman, 2006). A major role of the new extension is that of the co-learning facilitator (usually found in literature as 'facilitators' or 'brokers') aiming at the development of shared meaning and language between dialogue partners in order to stimulate change and develop solutions and innovation. The engagement of stakeholders in dialogue, despite its difficulties and its time consuming nature (since (social) learning and change are gradual), is necessary so that critical self-inquiry and collaboration will be achieved. According to Sriskandarajah *et al*. (2006), '[L]earning among heterogeneous groups of stakeholders and among different epistemologies has become one of the most central issues today' (p.27).

As already noted, intermediation (facilitation and brokerage) has yet to be thoroughly described, operationally defined or well evaluated. Explicit attention has to be given to theoretical developments; without a nuanced understanding of the concepts, terminology and controversies, study findings will be difficult to interpret and guidance to practice change may become untenable. In this respect some points of concern have already emerged. For example, the experience of Landcare groups in Australia has shown that (Campbell, 1997) (1) in many instances '[L]andcare facilitation often looks anything but strategic, and its purpose is often lost' (p.147); (2) although the key premise is that facilitators (and brokers) hold an impartial-independent position, 'there is no such thing as a neutral, detached, value-free facilitator' (p.147; see also Devaux *et al*. 2010; Klerkx and Leeuwis, 2009); and (3) a facilitator should have both facilitation skills and appropriate technical background (see also Ingram, 2008; Leeuwis 2000, 2004). The sustainability of 'intermediation' is a further point of concern since as Cristóvão *et al*. (2008) have shown the withdrawal of 'external', i.e. project supported facilitators results in the end of such work in the localities concerned. Finally, the dilemma of 'top-down' vs. 'bottom-up' roles of an intermediary should be pointed out.

Especially as far as AIS are concerned special attention should be given, as argued in this paper, to issues concerning, firstly, the bridging of / dialogue between expert – lay knowledge (as well as the demand and supply side), as espoused by CR as well as by approaches such as 'post-normal' science (Funtowicz and Ravetz, 1993) and 'Mode 2' research (Gibbons *et al*., 1994), and, secondly, as argued, the use of participatory methods and the working out of the 'paradox of participation'. On the other hand, Klerkx and Leeuwis (2008c) underline that, despite inherent difficulties, there is a need to become able to measure the added value of intermediaries. This way their contribution will become explicit and thus recognised in the knowledge infrastructure. Such an agenda will help in further highlighting gaps in our knowledge as well as strategies to address such gaps and, thus, in building a solid knowledge base which will be valuable for policymakers, academics and researchers, and practitioners. In this respect the role of policy and Higher Educational Institutes in fostering 'intermediation thinking' and practice remains an open question.

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Valentina Cristiana MATERIA*

The Agricultural Knowledge and Innovation System in Italy: dynamics, incentives, monitoring and evaluation experiences

The new challenges facing the European agricultural and rural sectors call for a review of the links between knowledge production and its use to foster innovation, and for a deeper analysis of the potential of the current Agricultural Knowledge and Innovation Systems (AKIS) to react to the evolving context. This paper highlights how the Italian AKIS places itself in the new emerging framework, with a particular emphasis on the incentives guiding the system and the experiences of monitoring and evaluating the national AKIS policy. It shows that important changes are needed to approach the new efforts Europe is adopting to match innovation demand and supply.

Keywords: AKIS, incentives, monitoring and evaluation, knowledge policy

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Introduction

The complexity of the national knowledge systems is the focus of current European and global discussion: the revival of attention to the issue of knowledge in agriculture is due to the emergence of the more demanding challenges the sector is facing, especially climate change and food security (EC, 2010; OECD, 2012). The current European context surrounding knowledge policy is in turmoil. Proposals for the new Common Agricultural Policy (CAP) for 2014-2020, the Europe 2020 Strategy for a smart, sustainable and inclusive Europe, the project of building a European Knowledge Based Bio-Economy (KBBE), and the creation of thematic European Innovation Partnerships (EIP) with the aim of channelling policies and resources into the creation of innovations about specific themes are just some of the milestones of a new context where research and innovation are the core principles that the development of knowledge systems should build upon (EC, 2011a; 2011b). Yet, at present, Europe does not seem to be able to transform knowledge into products to be offered on the market, so these strengths on which the evolution of knowledge systems hinges are unlikely to result in real economic growth (Flemish Government, 2010).

Experiences with the Agricultural Knowledge and Innovation Systems (AKIS) reveal large diversity corresponding to different country contexts (EU SCAR, 2012). Changes implemented in the last decade indicate a general movement from the traditional linear top-down approach (from research to innovation to adoption) to an innovation systems approach (Hall *et al*., 2006), which is more reactive and interactive, and where agents contribute together to find innovative solutions. But, at the same time, incentives need to be in place for the systems' actors to generate, develop and exchange new technologies, knowledge and experiences (OECD, 2012). Measurement of AKIS must be multidimensional. Although there has already been significant work devoted to characterising the drivers of the system, very few studies have measured the output and results of these systems (OECD, 2012). Monitoring of the knowledge and innovation systems is generally fragmented, and for the moment a major inconsistency exists between the high level of attention to innovation in the policy domain and the lack of data and research for evidence-based policy.

Since meeting the challenges ahead requires an evolution of the role of innovation and technology and an efficient transfer of this knowledge to the actors involved, a process of rethinking the national AKIS is therefore ongoing worldwide (Bergeret, 2012; Poppe, 2012). The aim of this paper is to raise awareness of the experience of the Italian AKIS, which has a particularly articulated structure that represents a typical specificity in the general European framework and about which not much has been published in the international literature. This allows the possibility to discuss which strategy should be followed to address the current system weaknesses and to design and implement a more efficient and effective knowledge policy. The central research questions associated with this exploration are therefore to what extent the Italian AKIS is ready to meet the changes the new European knowledge policy context requires, which policy and governance approach and at what level (regional and/or national) could be effective in addressing fragmentation between research, extension and education processes of knowledge sharing and what could be done to exploit its potential in the general AKIS domain. The recommendations deriving from this evidence-based know-how support the process of monitoring the European AKIS and their evolution.

Methodology

The paper describes the Italian AKIS, in the form of a case study, with a particular emphasis on its dynamics, incentives, and the monitoring and evaluation experiences. It therefore proceeds with an overview of the organisational issues concerning the system, presents the evolution of the underlying knowledge policy and then reflects on the experiences so far realised in order to check the 'health' of the system. From this framework derives a discussion about the strategic choices to be made.

The Italian AKIS: organisational issues

The Italian AKIS is characterised by different organisational models, contents and approaches in its three constituent segments as defined by OECD and FAO: Education (henceforth EDU), Research and Development (R&D), Extension and the Support System (EXT). There is no unique policy for the entire system; rather it is possible to identify a specific policy for each component, with different roles and objectives (Esposti *et al*., 2010; Materia, 2012). The presence of different institutional levels of responsibility in terms of knowledge promotion and management, the national and the regional ones, witnesses this critical aspect: secondary and higher EDU are the responsibility of the State, professional EDU falls within the regional competence. R&D is the responsibility of the State, the twenty Italian regions and the two autonomous provinces (AP)[1]. EXT falls within the regional competence.

The resulting fragmentation reaches significant levels, making it difficult to give an overview of the entire system. The lack of a unique policy is also due to the absence of a central coordination agency regulating the national AKIS, a problem felt even today in most European countries (EU SCAR, 2012). The high level of fragmentation within the Italian institutional system, together with the fragmentation of incentives that drive the different parts of the system itself, limit the efficiency of the system, which leads to a duplication of efforts and stimulates the challenge to achieve vertical and horizontal coordination in a coherent way.

At an operative level, moreover, different actors and different policies coexist, each of them with a specific ratio that seems to elude any rational systematisation.

The education system

The current structure of the Italian EDU system derives from significant changes initiated in 2008. With regard to secondary education, the reform has dramatically reduced the hours of teaching in vocational schools and changed the structure of the school courses. Introducing the autonomous 'training and vocational paths' on which the regions have exclusive legislative competence has offered the schools the opportunity to promote the territorial organisation of the education supply according to the needs expressed by the labour demand and the territory, forming in this way professional profiles that meet the local needs.

Higher education, instead, is represented essentially by the university and responds to programmatic indications defined by the State through the Italian Ministry of Education, Universities and Research (MIUR). The Italian university system is organised around faculties: for the agricultural field, there are currently 24 agriculture and 14 veterinary medicine faculties, with a staff of almost 3000 among professors and researchers (in 2011). These faculties are distributed across Italy, with at least one for each region. However, other faculties may also implement agricultural education and training activities (i.e. life sciences, economics, medicine, engineering etc.), and this witnesses the multidisciplinary feature of the same activities. The reform has reduced the number both of faculties and departments, increasing coordination of activities, and has proceeded towards simplification and greater administrative efficiency and transparency of the internal university management.

Research and development

Owing to its complexity, the description of the public National Agricultural Research System (NARS) goes beyond the typical vision of an 'organic system' (Figure 1). It is in fact fragmented between different actors (individual actuators and funding institutions) and several programmatic initiatives that lack central coordination (Esposti *et al*., 2010). Both the State and the Italian regions are in charge of this component. The principal national funder and manager bodies involved are MIUR and MIPAAF (the Ministry of Agriculture, Food and Forestry Policies). The national research bodies, instead, are grouped into three different structures: (a) university, funded and supervised by MIUR; (b) National Research Council (CNR), funded and supervised by MIUR and carrying out research in all fields of knowledge including agriculture (through its Agro-food Department, 640 personnel units involved in 2010); (c) public research institutes funded by MIPAAF: the principal structures, with agricultural research as institutional mission, are the National Institute of Agricultural Economics (INEA); the National Research Institute for Food and Nutrition (INRAN); the Council for the Research and Experimentation in Agriculture (CRA). On average, in the last three years these institutes have together employed about 1600 units of which 506 are researchers.

MIUR and MIPAAF fund almost all of the fixed costs of the national structures (staff, instruments, offices) and sup-

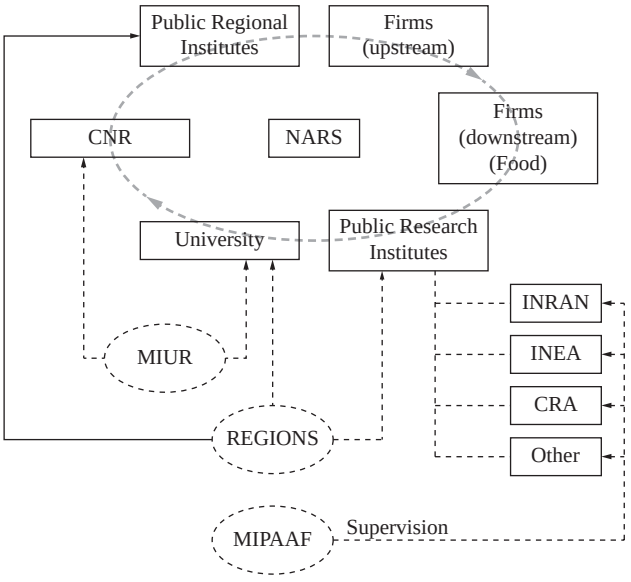

Figure 1: Structure of the Italian National Agricultural Research System.

Source: Own composition

[1] Bolzano and Trento. A province is an administrative division at intermediate level between a municipality and a region. The autonomous provinces perform roles similar to those of the regions.

port R&D directly or through national financial instruments (e.g. the National Research Programme). The Italian NARS is supported also by the regions, whose role in the field has increased as a result of important context stimuli (administrative decentralisation, generalised reduction in financial resources, the European Community rules on state aid) and since the Italian Constitution was in part changed in 2001 to explicitly recognise their relevance in the identification and promotion of research programmes, detection of territorial needs for research and innovation and in the autonomous funding for research projects tailored to the specific requirements of their local agriculture and agro-industry system. The twenty Italian regions and two AP fund agricultural research either directly or indirectly. Some regions have their own research structures, others implement their own research programmes through national structures (e.g. universities) situated in their territory. R&D represents however an example of the great distance and limited collaboration between the two levels of responsibility: the influence of the regional level on the system governance is low, although its role in promoting local research activities is crucial.

The role of the private sector, finally, seems to be not very influential: the upstream and downstream firms undertake some R&D activities, but sometimes they face structural difficulties which discourage them in realising research. Nevertheless, innovative firms are part of the NARS as knowledge carriers, feed-back generators, and leaders to which other firms look to innovate. Although there is little evidence on private expenditures, encouraging data on the innovation capacity of farms run by young farmers come from analysis the Italian 'Observatory on the innovation of agricultural firms' made during 2011[2] (Agri2000, 2011). The study shows that to be 'innovative' an agricultural farm should recur to a 'managerial administration' and be guided by a strategic path that makes training, networking and business organisation its strengths[3].

Extension and the support system

Extension and the support system in Italy refer to a unique, complex and evolving entity which usually covers basic/specialised technical and financial extension support[4] to farms and farmers, as well as all possible forms of information and innovation dissemination that enable farms to express their economic and social potential. The support system is a sub-system of extension: the first is supported exclusively by the public as it provides advanced

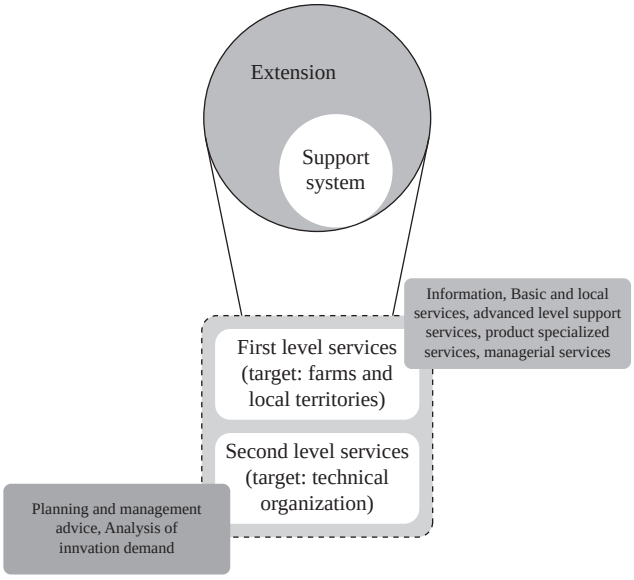

Figure 2: The extension and support system component of the AKIS in Italy and classification of services.
Source: Own composition based on Ascione and Vagnozzi (2011).

level technical instruments whose high cost could not otherwise be afforded; extension is coordinated by the public but managed and implemented by different organisations, including private ones in some cases. As the field of interest of the public extension is very broad and diverse, services have needed a complex system of classification which is briefly depicted in Figure 2. This component, therefore, consists of two parts, very different from each other: the private component, including professional agronomists assisting farmers and private industries producing inputs for agriculture[5], is targeted to medium-high income firms; the public one, supported by public institutions and implemented by both the public and the private, is motivated by economic policy objectives and promotes the development of agriculture and rural territories (Vagnozzi and Volpi, 2008). Each region autonomously manages programmes and funds policy interventions to promote public extension services in the context of a specific law that identifies areas of expertise, roles, actors and procedural arrangements for the funding allocation. It follows that the Italian AKIS lacks a 'national' extension system as each regional reality has organised the issue in peculiar ways both in terms of productive sectors and territorial typologies, and in terms of actors to be involved[6]. The regions support services for farms using European, national and their own funds. For more than ten years they have promoted public calls (for public and private bodies) that are specialised in different services to the farms.

The debate on the effectiveness of services provided by the various organisations involved has always been animated: both the public and the private sectors try to meet

[2] Despite the overall decline in the number of farms, the share of farmers under 30 years old has increased (2.5% in 2010 against 2.1% in 2000); the same trend is found for farmers under 45 years old (18.6% in 2010 against 18.2% in 2000) (Istat). The Observatory covers a total of 90,000 young professional farmers, 11% of farms entering the Italian Chambers of Commerce and Industry, and 36% of the national agricultural production value. The sample analysed in the Report consists of 1,000 young entrepreneurs interviewed on innovation issues in October-November 2011.

[3] The main areas where the managerial profile of entrepreneurs appears to have innovated are production (89%), organisation and management (64%) and product marketing (52%). It is estimated that a farm management oriented to training, market openness, the use of the Internet and ICT, a strategic vision towards the future, the creation of collaborative networks and integration with other farms have resulted in a more than 30% increase in production for 75% of the sample (Agri2000, 2011).

[4] Technical supports are activities collecting and processing data useful to the agricultural processes by means of advanced level technical instruments (e.g. meteorological networks and chemical laboratories). Basic extension is an all-purpose assistance given to farmers, but nowadays its use has been reduced since farms are often specialised and they rather need expert advice.

[5] For the diffusion of the varietal, chemical, mechanical etc. innovations produced, agronomists, biologists, engineers and veterinarians offer advice, technical assistance and training both to the farms and the network of technical means's wholesalers and retailers using technical journals, specialised exhibitions, fairs, websites and door-to-door contacts.

[6] Anyway, besides the regions, the farmers' professional associations (i.e. trade unions or agricultural products associations) also supply services to farms. They are private bodies but often cooperate with public institutions or receive public funding.

the farmers' needs concerning innovative and more rational productive processes, improvement of agricultural products, reduction of costs and environmental sustainability. However, these two parts of the national services system are separated and, seldom if ever, work together.

Dynamics and evolution of the Italian AKIS policy

The evolution of the Italian AKIS policy in the last decade has followed a specific path for each component that has adapted its own strategy and priorities to the changes that have occurred in the agricultural sector. As a consequence, topics have expanded towards non-traditional areas of expertise such as environment, climate, tourism, social issues etc. Interdisciplinary works have then increased, training activities for researchers, technical and administrative staff and advisors have been promoted, applied rather than basic research has seen a great expansion, but the advisory organisations have experienced some difficulties in adapting to the farm needs that change very quickly.

Education follows a single national policy that reflects the one generally valid for all sciences. In recent years it has aimed to provide theoretical and specialised training in agriculture, but it has failed to ensure a sufficient link with the productive world, which has rather been given to the research component. In addition, the Italian university suffers from an inability to attract talent from abroad, low salaries of researchers and teachers compared to other advanced countries, scarcity of employment opportunities commensurate with the capabilities of the best graduates, the fact that research in private industry is quantitatively and qualitatively lower than in other industrialised countries and often focused on the mere acquisition of government subsidies for research (Paba, 2010). The reorganisation of the education system planned through the abovementioned national reform has brought a new role for decision making bodies, the participation of society in these bodies, and a reduction of the number of chairs and specialisations.

For the R&D component coexist a national policy and a regional one: the first promotes both basic and applied research through national pluri-annual programmes or specific sectoral plans; the second promotes applied research and tests innovations at local level through planning and implementing regional programmes. The evolution of the NARS has focused on two objectives: evaluating research in terms of scientific output, organisation and management, and promoting a functional and more efficient link between research activities and policy guidelines. As a result of this new approach, three National Research Programmes have been issued since 2001, some official committees have been constituted (experts committee for research policy, science and technology councils etc.), a first national R&D evaluation exercise was carried out in 2004 (while another is still ongoing), new ways of funding research activities have been promoted, increasingly linked both to the possible forms of cooperation (partnerships aimed at submitting projects; permanent consultation groups defining the research question), and thematic priorities identified by the policy. Regional policy mobilises significant resources to meet local needs and follows a 'problem solving' approach with even an interregional coordination of activities, but the disconnection with the national level is high (Vagnozzi *et al*., 2006). Although programming, evaluation and participation have been the milestones of the evolution of national and regional research policy, regional research lacks a scheduled and repeated monitoring and an *ex-post* evaluation procedure of research projects and outcomes. The problem of objectively quantified research results is not just regional, it is indeed a significant problem at national governance level.

Every region, in addition, has a specific extension policy regulated by regional laws that apply also to agricultural applied research. The main objectives of the regional extension policy regard technological transfer, farm competitiveness, cross-compliance, rural animation, diversification, food safety, environmental impact and with regard to the last three factors in more recent years it has become more connected with the objectives of the CAP (OECD, 2011). But the extension system still lacks a structured involvement in the definition of development policy, a greater effort on some issues relevant for the future (especially climate change) that also require the promotion of greater projects interdisciplinarity, a strong policy of innovation capable of increasing the uptake of research results and transforming them into competitive advantages for the agricultural sector and rural areas. Furthermore, EXT continues to suffer from fragmentation of actions that fail to aggregate around common goals.

Although the Italian AKIS is driven by different policies, in the last decade an approach typical of an 'agricultural knowledge network' has emerged enhancing collaboration among the components. The system evolution has then proceeded in the last decade towards specific objectives: connecting R&D and Higher EDU to the development policy through planning, evaluation and coordination; connecting R&D to EXT with experiences of common projects; promoting the competition between public, public and private, and private bodies through public announcements and other participated procedures; promoting coordination between the regions; implementing the European policy especially with regard to the new agricultural functions and the environmental impact. These activities have incremented products and actors of the system, have improved relationships between the components but have reduced the level of general coordination of the same activities (Materia *et al*., 2012a).

Some critical issues remain, inherent to the lack of an institutional procedure that directly links the agricultural and food policy to the agricultural knowledge system. Extension and the support system, in particular, suffer in Italy from a sort of isolation, as they often are not able to organise their structures in order to interact more effectively and efficiently with the policy makers. As a result, the structural robustness of the system is jeopardised, especially with reference to the management and organisation of institutions that offer services to farms.

Incentives, monitoring and evaluating the Italian AKIS

Incentives for the AKIS represent the criteria on which its components are evaluated and rewarded (including financially), and on which they are allocated money. The principal common AKIS incentive instrument is therefore the dedicated funding. R&D and EXT, for example, at both national and regional levels, are mainly stimulated and evaluated based on the project which is mainly funded through public calls, direct assignments and negotiated procedures.

Evaluation is 'judging, appraising or determining the worth, value or quality of proposed, ongoing or completed programmes or projects, generally in terms of relevance, effectiveness, efficiency and impact' (Horton *et al*., 1993, p.6). Monitoring goals are to ensure that implementation is proceeding according to plan, to provide a record for input use, activities and results, to anticipate deviation from initial goals and expected outcomes. It is useful to think of monitoring and evaluation as parts of a continuum of observation, information gathering, supervision and assessment. They are functional to accountability and decision making, and their role changes during the phases of the management cycle of a programme or a project (i.e. planning, implementation, review). Applying these concepts to the Italian AKIS requires distinguishing among different situations: if for EDU there is a consolidated evaluation system, for EXT and R&D only some experiences exist of more systematic monitoring and evaluation (M&E) not consolidated or efficiently linked to each other nor widespread. Therefore, there is no unique system of AKIS policies M&E and this causes extreme complexity when it comes to giving an overview of the efficiency of the system and its capacity to respond to the challenges ahead.

Incentives driving the AKIS

Secondary education evaluation is managed by the National Institute for the Education Evaluation (INVALSI), the reference for the international PISA system. It applies an evaluation model reflecting a systemic approach called CIPP after its four component types of evaluation (Horton *et al.*, 1993): context (population, scholar age, education supply, participation etc.), input (financial resources, human resources as teachers' number, absenteeism etc.) and structural resources (laboratories, students, territorial context), process (school organisation, teachers' professionalism, activities for the students, school-families-territory relationship), product (learning texts' results, students' outcomes). Funds come almost exclusively from public sources.

For Higher EDU, instead, the main incentive is the ordinary fund covering university's management fixed costs. It is distributed for less than 10% on a rewarding basis and the quota is decided on criteria such as research quality evaluation and didactics evaluation rather than its quality (e.g. professors/students, current students/graduates employed), and for more than 90% on a historical basis. At the institutional level an assessment of didactics quality is imposed, but it does not affect the appropriation of funds.

When it comes to research, for national applied R&D one can refer to a *system* evaluation. Some incentives regard the output and refer to: type and number of products (usually weighed on the researchers' number), quality, relevance, originality and innovativeness. Particular attention is devoted also to its internationalisation and/or the competitive potential, as to research exploitation (e.g. patents). Other incentives regard the researchers and structures involved, and then consider their mobility, training and access to national or European projects, and the capacity to attract resources. These criteria have been defined in the first experimental exercise of evaluation of the Italian research system, realised in 2004 with reference to research activities carried out in 2001-2003[7]. The second evaluation exercise is currently under way with regard to research carried out in the period 2004-2010, but these practices do not currently show that character of reiteration that would indeed be coherent in a system that looks at M&E as a guiding principle for its development and its evolution.

Evaluation of regional R&D, instead, is mainly based on the project and is *ex-ante*. The regions use competitive procedures to access funds, and selection criteria regard the project itself: quality and management; coherence with regional programming; results transferring/applying (involvement of EXT services and productive sectors). The fact that an ongoing and *ex-post* evaluation is completely absent represents a very critical aspect: the risk of moral hazard behaviour of some researchers is high (Materia and Esposti, 2010).

Finally, since EXT consist of several different activities, mainly immaterial and qualitative as they attain the improvement of human capital, they can be described only by qualitative indicators. It is then quite difficult to realise a complete and accurate monitoring. Since 1990, three monitoring exercises have been realised in Italy (Ascione and Vagnozzi, 2011), each of them different for organisational methods and contents, but with common aspects monitored, in particular the policy objectives they respond to, contents, methodology and users involved. In the last two years the National Rural Network has launched a new experience of monitoring the Italian FAS and it has been organised at two levels: the first relating to the recognition of human resources involved and the audience reached, the second aimed at verifying the implementation of the Rural Development Programmes' (RDP) measures related to the Farm Advisory System (FAS) (111, 114 and 115). Data collected have been: financial resources requested, criteria for selection of applications (e.g. presence of priorities, thematic advice, inclusion in integrated projects), number of both FAS advisors and beneficiaries, and related expenditure made (Cristiano and Ascione, 2010).

Some interesting M&E experiences from regional R&D

A concrete example of practices to monitor and evaluate the AKIS is offered by the regions with reference to their efforts in promoting, realising and assessing agricultural

[7] In total, 17.329 products were evaluated, 773 of which regarding the agricultural sciences scientific area (90% articles in English, the remaining 10% books, chapters and patents).

research. Some evidence comes from systematic attempts carried out at an interregional level to assess research in view of verifying the appropriate allocation of the available financial resources. Other evidence comes from studies individual regions promote to assess the efficiency and effectiveness (in terms of impact on the territory) of regional spending on agricultural R&D, or the diffusion of R&D results to farmers. Both of these assessments influence policy decisions at both regional and national level.

In the first case one can refer to an important initiative created and managed by INEA on behalf of the Regional Representative Network of Agricultural Research (RRN-AR), an interregional coordinating organisation playing a multiple role at interregional and national level since 2001[8] (Materia *et al*., 2012a). This is the 'Information system on regional agricultural research', namely a network system consisting of an on-line database constantly updated aiming at collecting and disseminating statistics and information on regional research activities in the agro-food and agro-environmental sectors[9]. At present it consists of 1600 items of research for 15 regions for a total amount of EUR 200 million, 160 deriving from public co-financing.

The initiative started thanks to the regions' interest in coordinating their efforts in achieving a wide dissemination of knowledge and practices in the agricultural domain. The overall aim of the project is to provide regional policy makers with a multimedia information instrument supporting their policy decisions, but over time other operational objectives have been added, such as to promote an active participation of research institutes and to find a more efficient meeting point between agricultural research supply and demand (Materia *et al*., 2012b). This instrument makes it possible to verify the evolution of regional agricultural research in terms of funds, objectives and contents, as it contains information regarding: actors (funders and researchers), costs, contents (basic or applied R&D; NABS and CRIS classification, productive sectors etc.), type of innovation and technical characteristics (product, process, mixed; agronomic, biochemical etc.), impacts (economic, productive, environmental, social); dissemination (software, papers etc.) and results transfer (methods, instruments). Regional support for agricultural research has focused in particular on experimentation or applied activities, aiming at practical applications to meet specific needs of farm and territories and, therefore, closely related to regional policies for agricultural development. Consistent with these data, most of the detected research provides demonstration and dissemination activities, in addition to or alternative to the testing of results[10].

For what concerns the second type of evidence, it is worth reporting the experiences of two regions. The Emilia Romagna Region financed a study focused on the analysis of the agricultural R&D co-financing carried by the region between 2001 and 2006 according to the pluri-annual programme established by its regional law supporting R&D (Esposti *et al*., 2010). The Piemonte Region, instead, financed a study concerning the analysis of the innovation diffusion paths in the regional wine sector (Vagnozzi *et al*., 2007).

Besides the regional application of methodologies and results, what emerged from these experiences was that, from one side, it becomes crucial for the future to implement a 'unique control room' which is the only national leader of interregional task forces, and that a stronger collaboration among the regions is desirable given the aim of defining common practices, such as common methodologies for assessing the impacts of research, testing of innovative forms of R&D funding and new methods of cooperation between research facilities. From the other side, for innovations to be disseminated and useful to farmers, some essential requirements need to coexist: a dynamic production background, rigorous scientific activity, a local agricultural knowledge network connected with the farming system, a regional governance of research/extension activities supporting processes and monitoring results.

Discussion

The new attention Europe is giving to knowledge and innovation requires governments of EU Member States to review their role and adopt new governance approaches and regulations in order to develop more effective AKIS and to better support and strengthen knowledge flows between research, extension and practice in agriculture. The specificity of the Italian case, i.e. the territorial characterisation of the sectors applying to the 'bio-economy', facilitates the development of a reticular approach in the agricultural knowledge field, but at the same time the high heterogeneity of actors and evolution together with a fragmented and dispersive structure of the AKIS itself risks leading to an oversimplification of the reality, which is instead peculiar of regional and local experiences. The evolution of the Italian AKIS has then proceeded consistently with the aim of responding to local needs but at the same time an integration and coordination among the actors and the institutional levels involved are still lacking. A rather top-down approach is still dominant (Esposti, 2012), and this is in particular evident for R&D, which is still too fragmented and scarcely linked to the other components[11].

The Italian agro-food and forestry sector therefore needs to innovate and promote human capital growth through a more fluid and rapid knowledge flow. Agricultural labour productivity grew at a relatively low rate in 2000-2010, gradually losing ground to the rest of the economy; 50% of human capital employed in agriculture (56% self-employed) is above the age of 45, compared to 40% of the total economy; about 67% of employees has only a primary education (INEA, 2011). Among multiple causes for this, the lack of a process of knowledge and innovation diffusion is the most crucial.

[8] RRN-AR creates synergies between the regions and AP to address common issues, identifies methodologies concerning detection, promotion, testing and transferring of innovation, and defines priorities at the core of regional and national R&D programming. It acts in this sense as MIUR and MIPAAF interface.

[9] http://www.bancadatiregioni.inea.it:5454/index.html

[10] It is possible to find a general heterogeneity with respect to the topic of the research: it regards for the most part plant production, a very small part animal production and food technology. In general, these items of research aim at developing new products or processes and/or improving existing products. In recent years a greater effort has been devoted to quality production, environmental sustainability and sustainable development.

[11] Important institutional changes, especially in R&D, have moreover highlighted the role of regions which could be seen as autonomous AKIS themselves, often not integrated with each other.

The major challenge for the Italian AKIS to meet the future changes the European agriculture requires regards therefore three specific issues. Firstly, it becomes necessary to implement an institutional coordination that engages both public/private institutions and research structures in the definition of a shared strategic agenda that addresses priorities and approaches and verifies the necessary financial resources with a short-medium term perspective. Secondly, a major effort in the demand analysis and impact evaluation and, thirdly, a stronger investment in the skills of human resources involved are needed: it is important that public initiatives become more connected to a more structured system of monitoring and evaluation, even one per each component, and that researchers and technicians use a more efficient system of 'ongoing training' especially when it comes to choosing correct working methods that meet farmers' needs. In this sense the attempt made to formalise a monitoring system of the regional research activities has been of crucial relevance. The experiences reported suggest that to be efficient the monitoring systems should be coordinated, simple and directly involve the actuators of initiatives (as much as possible in real time), which must find in them benefit and interest.

The new European Rural Development and Research policies provide support and initiatives of knowledge transfer: this is an opportunity for Italy to assume as cogent this priority and to make crucial governance choices. If for the last two decades the knowledge dissemination issue has been handled involving all levels of government, it is now necessary to define a strategy resulting from coordinated action among national and regional levels, while the identification of actors involved and the implementation of interventions should be regional to take account of the specific and local needs and peculiarities. The knowledge and innovation promotion should build upon information, training and advisory measures and on the creation of partnerships for innovation diffusion, but the (intangible) interventions finalised to achieving human capital growth require also foresight methodology in their implementation. Hence, the need for the governance level to identify an institutional framework where methodological and procedural paths regarding actions to be taken are well defined. Aiming to diffuse knowledge and innovation and to bridge R&D to practice, the Operational Groups (OGs) in the EIP context represent an opportunity for concrete action. There are various possibilities to select, manage and implement the OGs[12]. At a regional level within the RDP, this would mean a direct connection between the OGs' objectives and those of the RDP, and a greater involvement of local actors, but the lack of a national strategic approach to innovation would fail to address problems that are trans-regional and/or common to different territories, cause replication of some of the innovation transfer objectives while missing other targets, and involve preferentially regional research structures. At the national level, instead, a strategic approach to innovation would identify research issues and actors involved and increase attention to the methodological quality of the innovation transfer projects. But the possibility of creating a national programme under the RD policy is uncertain, some crucial measures for the OGs projects are typical of regional RDPs, the attention to local issues and the involvement territorial actors would be weak. A third solution would require a joint State-Regions model with a regional implementation, but this would mean a procedural complexity in the selection of OGs owing to differences in productive and territorial structures.

[12] These possibilities represent the outcome of reflections made at the institutional level to support the Ministry in the definition of the OGs and are still under discussion.

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Linking the agricultural knowledge and innovation system's subsystems: the case of the Flemish ornamental plant production

Knowledge and innovation are keywords in a context of resource scarcity and sustainable intensification of agriculture. But in order to fully use the knowledge potential and to transform research results into innovative practices, there is a need for an adequate configuration of the agricultural knowledge and innovation system (AKIS). This configuration should be considered in relation to its own specific context and history. This paper focuses on the particular situation of ornamental plant production in Vlaanderen (Flanders), Belgium. In practice, we see that innovations in this sector are not limited to individual companies, but that new collective structures are put in place. The sector's geographical clustering within the province of Oost-Vlaanderen is hereby an important facilitating factor. The new AKIS constructions have their own logic and objectives, but illustrate the need for further development of interlinkages between AKIS subsystems. The four examples of networking initiatives focus upon the production practices of ornamental plant production companies (VMS), alignment of research (Technopool Sierteelt), knowledge transfer and interaction between research and primary production (Sietinet) and, finally, co-creation of new varieties between research and the growers (BEST-select and Azanova). The results show that such initiatives can indeed contribute positively to the functioning of the AKIS. A partial approach, which looks at specific interactions instead of the AKIS as a whole, is thereby a more practical starting point than an integrated or overarching strategy.

Keywords: Agricultural knowledge and innovation systems (AKIS), ornamental plant production, Vlaanderen, innovation, networking initiatives

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Introduction

The agricultural and food sectors face a huge challenge to boost production without exceeding the world's ecological boundaries. Research and innovation are hereby of crucial importance as sustainable intensification will largely depend upon the increase of productivity (instead of farming more land). Increased investments in agricultural research are thus an important, but not the only, factor (FAO, 2009). Significant gains can also be realised through an improved translation of research results into practical innovations. The interaction between knowledge users, research, education, extension and other stakeholders is thereby of crucial importance. A recent reflection paper (EU SCAR, 2012) points out that although research, extension and education are part of the same agricultural knowledge and innovation system (AKIS), they are faced with different problems and react to other incentives. This causes fragmentation instead of synergy and collaboration.

Policy attention for research translation and multi-actor approaches is growing, as illustrated by the European Union's (EU) Europe 2020 strategy and the European Innovation Partnerships. This is enforced by a shift in research funding from research and development to innovation in products and processes. Simultaneously, the system is evolving from the traditional linear and top-down approach to an innovation systems approach. The latter are not only more reactive and interactive, but are also characterised by agents that collaborate to find innovative solutions (OECD, 2012). The general assumption is that, in a context of limited natural resources and additional pressure from climate change, AKIS will have to adapt and to improve their functioning to meet the future needs in food and agriculture.

Within this discussion, the institutional design of AKIS is a crucial element. Experiences reveal a large diversity amongst European countries and regions, mainly as a consequence of the different country contexts, history and available actors. In several countries, examples of networking practices between AKIS subsystems occur and can serve as good examples (EU SCAR, 2012; OECD, 2012).

In this paper, we study AKIS developments and new networking initiatives that are occurring in Vlaanderen (Flanders), Belgium. Through the discussion of examples in ornamental plant production, we aim to better understand the context in which such initiatives grow and to learn lessons on key factors and bottlenecks. Our analysis starts with a context description. The objective is to give an overview of the circumstances in which the sector operates in order to better understand the AKIS configuration. The elements that are addressed comprise, amongst others, the production characteristics, the sector's innovation profile and the actors involved in the AKIS. The next section elaborates upon new AKIS constructions in the sector and discusses four initiatives. Two initiatives work within a certain AKIS subsystem: *VMS* aims for the implementation of more sustainable practices in primary production and the *Technopool Sierteelt* focuses upon improved alignment of research. The other two initiatives concern the interaction between research and the production sector. In the example of *Sietinet*, the objective is to generate a better knowledge transfer and interaction, while *Best-select* and *Azanova* aim to co-create plant varieties between research and companies. The discussion section brings together the findings and formulates the paper's conclusions.

Methodology

The paper builds upon a case study analysis of the AKIS in Vlaanderen (Vuylsteke and De Schepper, 2011). This study was carried out in the framework of the Standing Committee on Agricultural Research's working group on AKIS. This mixed working group of civil servants and researchers aims to reflect upon national and regional approaches with regard to research and innovation policy. Practical examples are used as a starting point for more profound discussions and analyses of the situation of AKIS in European countries and regions (EU SCAR, 2012).

Our focus is upon the northern part of Belgium (Vlaanderen) and the particular case of ornamental plant production. The decision to study a region (Vlaanderen) instead of a country (Belgium) is motivated by the fact that policies on research (partly), innovation, education and agriculture are regional instead of national matters. In order to better focus and understand the results, the paper explores the specific situation of the ornamental plant production sector. This is one of the most dynamic and innovative subsectors in Flemish agriculture (Deuninck *et al*., 2007; 2008).

In the paper, we present an integrated analysis of primary and secondary data on the sector, innovation at farm level and experiences with the networking initiatives under study. The analysis also benefited from earlier analyses of innovation policies and instruments (Deuninck *et al*., 2007, 2008; Vuylsteke and Van Gijseghem, 2010). Alongside the available statistical and farm economic data, the implementation of innovation was measured through surveys (in 2007 and 2012) with the participants in the Flemish Farm Accountancy Data Network (FADN). High response rates were achieved through individual follow-up by the responsible accountants.

In 2007, 747 surveys were sent out to FADN participants and, of the 715 surveys received, 49 were from specialised ornamental plant producers. In the questionnaire the respondents were asked through a series of general questions to describe the product, process, organisational, marketing and other innovations they implemented in the last five years, whether they were the first to implement this innovation, and to estimate the rate of adoption in comparison with other growers.

In 2012, 711 surveys were sent out to FADN participants and, of the 663 surveys received, 31 were from specialised ornamental plant producers. A similar, but more elaborate questionnaire to that used in 2007 was employed in which respondents were asked to describe, in specific, separate questions, the product, process, organisational, marketing and other innovations they implemented in the last five years.

The descriptions of the networking initiatives are based upon secondary data analysed and experiences from the initiatives.

The current status of ornamental plant production in Vlaanderen

The objective of this section is to describe the current status of ornamental plant production in Vlaanderen, in order to capture the context in which new AKIS initiatives originate. Four aspects are addressed: the sector's characteristics, innovations at farm level, the actors involved and the relevant AKIS policy instruments.

Characteristics of ornamental plant production

In 2011, 995 or ca. 4% of all Flemish farms were involved in ornamental plant production (Figure 1a) and they cultivated 5,808 ha or 1% of the total agricultural area (Figure 1b). The data show the effects of intensification. The older growers have left the sector and the younger ones are buying the available land. The process is reinforced by high energy costs (which cause drop out) and scarce land availability (farmers catch opportunities when they arise). The geographical clustering is an enabling factor. More than 88% of the ornamental plant production is used for outdoor cultivation. Ornamentals such as roses, shrubs, bushes etc. have the largest area (62% of the total area). The sector's production value was estimated at EUR 509 million in 2011

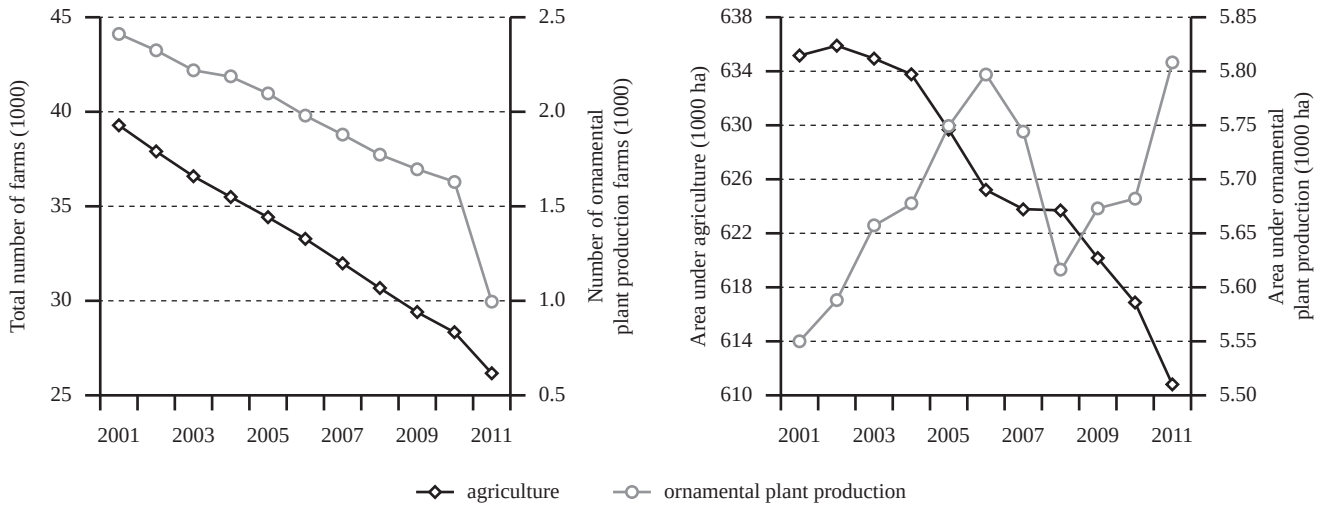

Figure 1: (a) Number of farms and (b) area for the entire agriculture and ornamental plant production in Vlaanderen, 2001-2011.
Source: Directorate-general Statistics and Economic information, Vlaanderen, Belgium.

(Algemene Directie Statistiek en Economische Informatie, 2011; Platteau *et al*., 2010).

A remarkable feature is the sector's strong geographical clustering, with the majority of the production concentrated in the province of Oost-Vlaanderen (surroundings of the city of Gent). But at the community level, geographical differentiation occurs between potted plants (Lochristi, Destelbergen, Merelbeke and Melle), ornamental trees (Wetteren, Oosterzele, Laarne, Wichelen Lede), the cut flower industry (direction of Brussels) and forest tree cultivation (Maldegem, Waarschoot, Evergem) (Platteau *et al*., 2010).

Micro-economic data are only available for specialised ornamental plant production companies under glass. Table 1 gives an overview of the economic results of the companies monitored in the FADN. While the average area increased slightly between 2006 and 2010, there was an increase in the full-time labour equivalents. The figures furthermore illustrate that the sector has been struggling for years with low incomes. While there is a small but positive family income per hectare, the net farm result (after deduction the family labour compensation) has been negative for years. The solvency ratio (equity over total assets) fell in 2010 to 62% (Platteau *et al*., 2010; Raes *et al*., 2012).

Table 1: Economic results of specialised ornamental plant production companies under glass in Vlaanderen, Belgium, 2006-2010

	2006	2007	2008	2009	2010
Average area (ha)	1.05	1.07	1.06	1.20	1.19
Number of FTE	2.61	2.79	3.14	3.14	3.09
Return (EUR/100m²)	2,610	2,722	2,999	2,769	3,051
Cost (EUR/100m²)	2,306	2,514	2,938	2,702	2,875
Family income (EUR/100m²)	305	208	61	67	175
Family labour compensation (EUR/100m²)	653	695	661	657	580
Net farm result (EUR/acre)	-348	-487	-601	-590	-405

Source: Raes et al. (2012)

Innovation in ornamental plant production companies

The strong international competition and the increasing production costs are the main factors that explain the sector's difficult economic position. Companies are continuously looking for scale advantages and all kinds of innovations to counter these trends. The survey results show that the percentage of companies that had an innovation in the last five years increased significantly between 2007 and 2012: from 47% to 84% (Figure 2). These percentages are by far the highest compared to other agricultural sectors in Vlaanderen. Also the diffusion rate is higher, with more than half of the population categorised as innovator (20%) or early adopter (33%) (Vuylsteke, unpublished).

With regard to the type of innovation, there is a growing importance of organisational, marketing and other innovations at the expense of product and process innovation (Figure 3). The increased detail in the questions in the 2012 questionnaire can partly explain these findings, but they underpin the on-going evolution in the sector. The interpretations of the types of innovations are very diverse and often company-specific. New breeds, cultivars and varieties are most often cited as examples of product innovations, but other examples

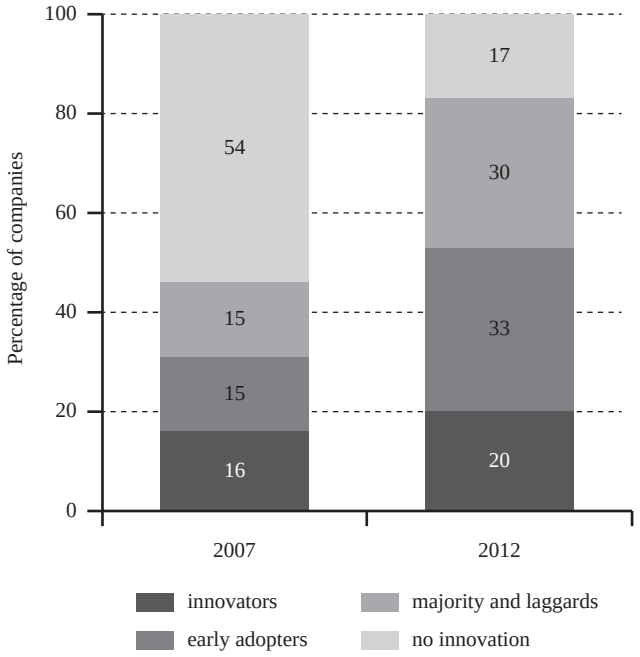

Figure 2: The degree of innovation diffusion in specialised ornamental plant production companies in Vlaanderen, Belgium in 2007 (n=48) and 2012 (n=30).

Note: In each year the status of one company could not be determined

Source: Own survey data

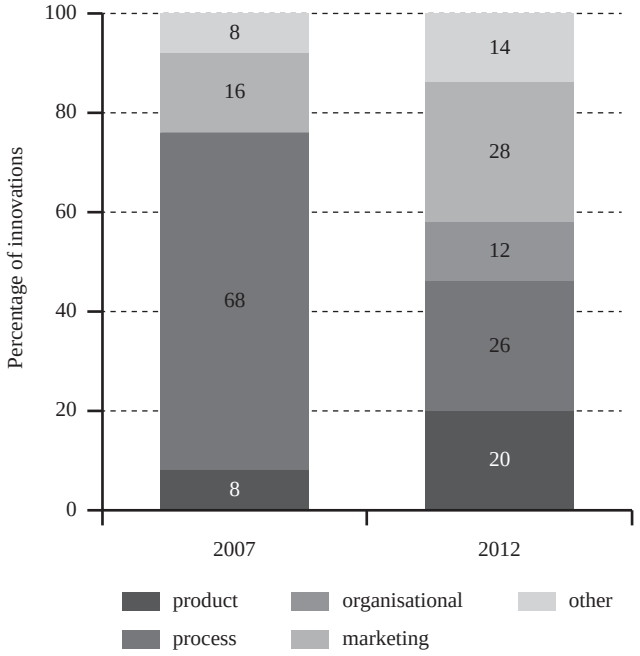

Figure 3: Distribution of the types of innovation in specialised ornamental plant production companies in Vlaanderen, Belgium in 2007 (23 companies, 25 innovations) and 2012 (26 companies, 50 innovations).

Source: Own survey data

are the container size, the composition of the product range or improved product quality. Automation and labour savings are the main keywords for process innovations. In addition, companies have invested in water storage, biological control and lighting. The organisational innovations include the evolution towards fewer or more staff, working with other

breeders and changes in the legal structure of the company. The examples of marketing innovations are more diverse and include agreements and cooperation with customers, reorientation towards new customers, creating own brands, more contact with customers, home sales, new packaging and sales through mediation. Other innovations include investments in cogeneration plants (heat and power) and the inclusion of non-farm related tasks (Vuylsteke, unpublished).

The identified drivers for innovation are also reflected in the motivations to innovate cited by the respondents. The most important reasons to innovate are the realisation of a higher income and cost reduction (75% of the companies). The most important bottlenecks are market insecurity (59%), lack of time (40%) and insufficient financial means (37%). Farm leaders most often cite inadequate collaboration (37%), lack of support (28%) and insufficient knowledge (27%) as unimportant issues (Vuylsteke, unpublished).

Actors in the AKIS

The farmers are the central actors within the AKIS of the Flemish ornamental plant production sector, but other actors are also involved. Based on the concept of Dockès *et al*. (2011), we make the distinction between research, extension, support systems and education. The growth and development of the AKIS has been a gradual process, building on the elements available. The AKIS studied here has been rather stable since 2006, after consecutive phases of constitutional reforms in Belgium and the process of improved administrative policy within the Flemish government. The following description is a snapshot of the situation at the start of 2012.

Research. Several actors are involved in agricultural research: universities, the Institute for Agricultural and Fisheries Research (ILVO), university colleges and experimental stations. While research related to ornamental plant production is in general embedded within the overall agricultural research done by these institutions, there are also experimental stations that focus upon ornamental plant production (Research Centre for Ornamental plants, PCS) and the preservation of horticultural products (Flanders Centre of Postharvest Technology, VCBT). Similar to the clustering of the primary companies, most research groups involved in the sector are situated in the province of Oost-Vlaanderen.

Extension. Bergen and Van Gijseghem (2010) made an inventory of extension services in Vlaanderen. The results show that the extension landscape in Vlaanderen covers many and diverse activities, which are often sector-related or even sector-specific. The activities are in general relatively cheap or free, but there is a growing trend towards paid but tailored advice. The Flemish government organises collective information or extension activities and (co-)funds training courses by approved centres. The provincial authorities have complementary activities, which for example cover experimental farms and education initiatives. Other services that aim for individual information and guidance are in general offered by private services (especially the Innovation Centre for agriculture and horticulture) or private services with additional government funding (such as the farm advisory system). Also research actors are - to a greater or lesser intent - involved in extension.

Support systems. The support system covers a very broad field of activities. The most relevant actors in Vlaanderen concern the farmers' organisations, which are for many farmers and growers a first source of information. These organisations provide a wide range of services and one of them (the Belgian nurserymen and growers' association, AVBS) is dedicated to ornamental plant production. Other actors within the support system are knowledge networks and study clubs, input providers and cooperatives.

Education. There is no specific education related to ornamental plant production, but the sector is encompassed in the general and agricultural education system. Next to the general secondary education, there are also around 20 technical and vocational schools that offer an agriculture-related education. Topics covered include agro- and green management, forestry, animal care, agricultural mechanisation, agriculture, horticulture, nature and green technical sciences, plant, animal and environment, gardening and animal production. The higher education system is open to anybody with a qualifying diploma and students can enrol at any institute of higher education of their choosing (except for medicine and dentistry, and arts). This education is organised by university and university colleges. Relevant degrees are for example Bachelor and Master of Science in Bio-science, Bachelor and Master of Science in Bio-science engineering and Professional Bachelor in Agro- and Biotechnology.

AKIS instruments and funding schemes

In Vlaanderen, several instruments and funding schemes exist that aim for research and innovation activities. They are targeted at the agricultural sector in general and are thus not specific to ornamental plant production. Distinction can be made between institutional funding and funding schemes. Table 2 gives an overview of the instruments and the respective budgets in the period 2007-2011.

Table 2: Resources available for institutional funding and funding schemes on knowledge and learning processes in Flemish agriculture, 2007-2011 (EUR million).

Funding schemes	Total budget (EUR million)				
	2007	2008	2009	2010	2011
Institutional funding					
- ILVO	16.030	18.039	17.889	18.362	18.753
- Experimental stations	3.790	4.180	3.954	5.303	4.137
Funding schemes					
- Agricultural research grants programme	9.602	9.602	9.602	9.122	10.122
- Demonstration projects on sustainable agriculture	1.180	1.303	0.982	0.922	1.000
- Stimulation of organic agriculture	NA	NA	0.102	0.098	0.435

Source: Vuylsteke and Van Gijseghem (2010)

Institutional funding. The institutional funding concerns the yearly endowments to research institutes to cover (part of) their operational costs. The Ministry of Agriculture and Fisheries provides such funding to ILVO and the 14 recognised experimental stations. Other research institutes, such as universities and university colleges, receive operational grants via the education policy. This funding is general and not specific to agriculture.

Funding schemes. Different types of funding schemes are available in Vlaanderen and at the federal (Belgian) level. These schemes have a fixed logic (for example: funding of fundamental research), but do not have a thematic programming. Three instruments are specific to the agricultural sector:

- The agricultural research grants programme (operated by the Agency for Innovation by Science and Technology, IWT) aims to acquire, integrate and translate knowledge into innovative applications for agriculture and horticulture. The results of the projects must have a clear added value for the entire sector, with an active involvement of the target group (IWT, 2011).
- Demonstration projects on sustainable agriculture are part of the Flemish Programme for Rural Development. They want to stimulate farmers to adopt more sustainable practices through the fast transmission of innovative practices that have left the research phase and are ready for implementation at the farm level. The instrument is operated through thematic calls.
- Funding of research on organic agriculture is also thematic and is funded by the Ministry of Agriculture and Fisheries through tenders and public procurement contracts. The calls are related to the actions within the strategic plan for the organic sector on agriculture and knowledge exchange.

Other funding mechanisms for research and development have an open approach and concern both research projects and personal grants (PhD or post-doc). These instruments – managed by the Research Foundation Vlaanderen and IWT – are open to all research fields and topics. Simultaneously, a trend towards more integrated programming can be found in the agricultural sector, with the White Paper on Agricultural Research (Van Gijseghem *et al*., 2009; Vuylsteke and Van Gijseghem, 2009) and ILVO 2020 (Van Bockstaele and Moens, 2010) as examples.

New AKIS constructions in the Flemish ornamental plant production

This section elaborates upon new AKIS constructions that have emerged in recent years. The aim is to understand which drivers help to realise and improved interaction within and between AKIS subsystems. We thereby focus on four types of initiatives:

- Implementation of more sustainable practices in primary production: *VMS*;
- Improved alignment of research in the sector: *Technopool Sierteelt*;
- Better knowledge transfer and interaction between research and practice: *Sietinet*;
- Co-creation between research and companies: *BEST-select* and *Azanova*.

In the following paragraphs, all initiatives are described in order to understand their logic and the challenge they sought to address.

VMS. The Flemish environmental plan for ornamental plant production (*Vlaams Milieuplan Sierteelt*, VMS, 2012) was established in 1996 in collaboration with the growers' associations. It is a centre for sustainable entrepreneurship which aims to guide ornamental plant production companies towards a future-oriented, socially responsible business that pays attention to the environmental impact and society without losing sight of the continuity of the company and the economic reality. According to the stepwise approach, the evolution is built on registration, reduced use of pesticides, optimisation of the farm management and evolution towards higher certification schemes (in cooperation with the Dutch MPS). The practical design is done together with the companies and on the basis of common experiences. Nowadays, around 90 companies participate in the scheme. If successful, the companies are certified, which not only has environmental benefits but can also lead to improved farm results and market opportunities.

Technopool sierteelt. The *Technopool Sierteelt* (Technopole on ornamental plant production) refers to a declaration of intent between four research institutes: Ghent University, University College Ghent, ILVO and PCS. After a first declaration in 2002, the four partners agreed in 2008 to collaborate more intensively to promote the ornamental plant production sector. The collaboration should lead towards improved knowledge generation, knowledge transfer and the valorisation of knowledge and expertise. The *Technopool Sierteelt* intends to (i) establish and exploit the synergies and complementarities between the research actors involved, (ii) develop a common approach for the establishment of research infrastructures, (iii) realise the optimal use of the available research infrastructures, and (iv) consult and collaborate with regard to the available and future research infrastructures. To make these objectives more concrete, the partnership aims for:

- Initiation and development of a technological platform for ornamental plant production;
- Alignment and elaboration of research skills;
- Joint application for (research) projects and their implementation;
- Support of knowledge transfer towards the primary sector;
- Further expansion of the cooperation with the ornamental plant production sector.

The parties in this collaboration are supported by the Development Agency Oost-Vlaanderen (Gobin *et al*., 2001; ILVO, 2009). The main funding should however come from improved access to project funding. This initiative is perhaps not as visible for the sector as the other networking initiatives, but an improved coordination of research activities and optimal use of infrastructures can only benefit the sector. This is also feasible because of the spatial proximity.

Sietinet. The Ornamental Plant Production Technology and Innovation Network (Sietinet, 2012, *Sierteelt Technologie en Innovatie Netwerk*) is an example of interaction and collaboration between practice (companies) and research. The initiative has grown from the Flemish ornamental companies' strong focus on innovation to take an important role in the world market (including increased international competition). In this situation, technological advances were then important to remain competitive and could be realised through the leading position of Flemish knowledge institutes and their access to scientific knowledge worldwide. Innovative companies in the horticultural industry and nine knowledge institutes joined forces and gave rise to SIETINET in 2004. The initiative was supported by IWT with a grant that covers 80% of the costs, while the remaining 20% is paid by the participating companies. The project funding ended in 2012 and new ways to maintain the initiative are being examined.

In total, sixty ornamental production companies joined the network. They cover different parts of the sector (*in vitro*, young plants and breeding), but are in general rather small and innovative. The access to recently developed techniques in plant biotechnology is realised through the technology consultant employed by SIETINET. Recently developed techniques in the fields of *in vitro* technology and processing, plant physiology and growth regulators, DNA marker technology and genes are made accessible, but the technology consultant can also assist in the innovation process at the farm level. Overall, the actions are very diverse, for example technological advice by telephone, email or farm visit, profound technological advice, workshops, symposia, a newsletter, mailing literature bimonthly and a website (with protected members' area). This variety of interaction has created a dense network with many informal interactions, and illustrates the initiative's success and achievements (Lambrecht, 2011; Sietinet, 2012).

BEST-select* and *Azanova. Finally, there are two initiatives – *BEST-select* and *Azanova* – which serve as examples of the co-creation between plant growers and the primary sector. As the sector is characterised by a constant search for new varieties and novelties, an alliance with research helps to access the latest knowledge of breeding techniques, extensive collections and – above all – very specific skills.

The mission of BEST-select cvba (Best-select, 2012) is to introduce novelties of high quality in the assortment of ornamental plants and to do this under one label. The initiative concentrates on the development of resistant and sustainable cultivars, appealing to the consumer because of their attractiveness. The initiative was founded in 2000 as a loose cooperation between 22 Flemish nurseries and the former Department of Plant Genetics and Plant Breeding (now ILVO). After a successful trial phase, the cooperative organisation was founded in December 2004.

The Azanova initiative (Azanova, 2012) is similar, but involves the collaboration between 21 azalea growers and ILVO to realise innovations in the azalea assortment. These innovations are driven by quality and value for the consumer. AIKO® azaleas were developed at ILVO and are marketed by Azanova cvba. In 2008, Azanova received an award from the Innovation Campaign because of the unique collaboration between various individual companies and a public research institution.

Discussion

Starting from a context of resource scarcity and need for improved knowledge and innovations, the paper has illustrated that ornamental plant production is a unique sector in Flemish agriculture, not only because of the geographical clustering of production and knowledge institutes in the Gent region, but also due to its constant search for innovations and novelties as an answer to the companies' challenges and objectives. The sector can thereby rely on the general AKIS. All identified AKIS subsystems occur in ornamental plant production, but the sector is furthermore characterised by a high degree of networking within and between AKIS subsystems. These networking initiatives are often initiated by the growers themselves, to collectively realise promotion, supply and purchase in the absence of cooperatives in the sector, but also other actors are involved.

Innovation policies and instruments in the agricultural sector are in general specific to the sector. Almost all instruments originate from their own policy field – Agricultural and Rural Development Policy – or concern measures within the general science and innovation policy that have agriculture as the sole beneficiary (Vuylsteke and Van Gijseghem, 2010). An earlier analysis based upon Malerba's sectoral systems of innovation and production (Malerba, 2002) indicated that the innovation instruments in Vlaanderen can in practice not be considered as an innovation toolkit. Instruments are considered in relation to their particular objective and/or by the way they are funded, instead of as a coherent whole that stimulates innovation. The instruments primarily focus on agents on the one hand and knowledge and learning processes on the other. Unfortunately, there are currently no tools that directly stimulate the interaction between subsystems.

A closer look at the developments in ornamental plant production reveals that the innovations in the sector originate from both research and the growers and upstream sectors. The diffusion rate is high, thanks to geographical clustering and the quality of extension services, but also due to the actor's economic situation.

Within the AKIS of Flemish ornamental plant production, each of the elements (education, research, extension and support) is well covered by the actors and their activities. When it comes to the interaction within and between the AKIS subsystems, important differences can be found. In the networking initiatives addressed in this paper, we focused upon the interaction within primary production, within research and the interaction between practice and research. This choice is not a coincidence, but points towards the important fields of action. While each of these initiatives has its own history and logic, they all address shortcomings or niches within the AKIS. And above all, the initiatives show that it is possible to move towards improved interaction within and between AKIS subsystems. It is striking that all initiatives have chosen to focus upon specific interactions within the AKIS and not for a general, overarching strategy. By doing so, the work and objectives were more clear and feasible, but also directed towards specific target groups.

Other interactions, such as the relationships between the research and the support system and between extension and the support system, mainly play at an *ad hoc* and informal

base. The degree of interaction depends to a large extent on the actors involved and the upcoming questions. Education, however, is something else. While there is a clear alignment between the growers and education (producers are formed in the education system, with an evolution towards a higher degree of education of the farmers), the relationship between education and the other elements of the system is rather weak and could be improved significantly. It is thus clear that action is also desirable on these interactions and that – in the end – all new initiatives also interact to realise a real AKIS.

The analysis furthermore illustrated that the AKIS functions separately from knowledge and innovation systems in other economic sectors, such as the food or chemical sector. In many cases, the actors and instruments in the AKIS differ from those in a more general context. The policy context (with the EU Common Agricultural Policy and the Rural Development Policy) is a main driver for this observation, but VRWI (2010) advocates an improved integration of agriculture into the general economic context. Owing to the nature of techniques such as breeding and *in vitro* cultivation, this link is stronger in comparison with other agricultural sectors, but is often not made explicit. Further research is needed to investigate the relationship and interaction between the AKIS and similar systems in other sectors.

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Susanne VON MÜNCHHAUSEN* and Anna M. HÄRING*

Lifelong learning for farmers: enhancing competitiveness, knowledge transfer and innovation in the eastern German state of Brandenburg

Farmers must continuously adapt production and management systems in order to maintain and enhance the competitiveness and sustainability of their businesses. The development and implementation of innovations require both information and the farmers' willingness to change daily work routines. Learning and knowledge transfer among farmers, technology developers, experts and university teams ensure the development and application of innovative ideas which are crucial for a sustainable growth in food (and non-food) production. The paper presents results from three transdisciplinary research projects that are part of a wider initiative aimed at establishing a farmer-university network in the north-east of Germany where economic and farming conditions are unfavourable. A team from Eberswalde University facilitates the network. The partners in the network are agricultural farms, agricultural organisations of Berlin-Brandenburg and federal research institutes. The results obtained to date indicate that lifelong learning approaches are promising tools to foster agricultural innovations and thus contribute to the resilience of the agricultural sector. Lifelong learning helps to engage with farmers who are not normally reached. The success of joint learning projects depends among other factors on the relevance and quality of offers, professional management of the network and facilitation of activities. Farmer-university networks function effectively if all involved see themselves and work together as equal partners.

Keywords: lifelong learning, innovation networks, agricultural innovation, knowledge transfer, farm development, education, qualification

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Introduction

In the European Union as well as globally, conditions and requirements for agricultural production are changing. On the one hand, the agricultural sector has to increase production and productivity in order to respond to the significant growth in global food demand; on the other hand, farming systems have to improve sustainability and resource efficiency and address environmental issues (such as biodiversity loss). Farmers face the challenges of not only to produce more, but also to produce in a better way (Dwyer *et al.* 2012; EC, 2012)

The conditions for agricultural production are rapidly changing due to urbanisation, growing inequities, human migration, globalisation, changing dietary preferences, climate change, environmental degradation, a trend toward biofuels and an increasing population. Unprecedented challenges are ahead in providing food within a global trading system where there are other competing uses for agricultural and other natural resources (Anderson *et al.,* 2008; Dwyer *et al.* 2012).

Under these conditions, farmers need to adapt production and management systems in order to maintain or even enhance the competitiveness of their businesses. Though farmers have always had to adapt, they are now confronted with more complex and better known challenges than in the past. Decision makers in agriculture need to have an in-depth understanding of their production systems and the related ecosystem. They rely on appropriate farm management information and tools. Innovations are expressed in structural changes (farm size, cooperation, land ownership, labour/income organisation, equity capital and borrowed capital ratio, infrastructure, market structure) and in farming practices (intensity, productivity and specialisation/ diversification of existing systems, new products and technologies, management innovations). Agricultural information, knowledge and the ability to learn are preconditions to handle change successfully. A very good knowledge of innovative technics and processes is crucial when a farmer plans to:

- increase productivity of traditional production system e.g. by introducing new technology (intensification);
- produce new crops, animals or services (diversification);
- reduce the scope of farm products (specialisation);
- alter the farm's orientation e.g. towards organic farming;
- change the farm's size (e.g. full-time versus part-time farming, family labour versus employees etc.)

Agricultural knowledge and information systems aim to support the knowledge exchange between farmers, technology developers, plant breeders, universities and researchers. They consist of institutions and organisations that generate and disseminate knowledge and information to support agriculture production, marketing and post-harvest handling of agricultural products and management of natural resources (World Bank, 2012). If researchers, advisors and other experts communicate appropriately, effective knowledge exchange is achieved. At the core of such effective knowledge exchange are three basic and interconnected components: Firstly, participants who are interested in innovative ideas; secondly, the relevant and sufficiently complete knowledge which must be pitched at a level appropriate to the currently held knowledge of participants and, thirdly, the environment of the knowledge exchange (location, facilities, ease of access, time, time set aside by each person and other factors that can facilitate or constrain).

Strong partnerships between public authorities, universities, food processing industries, farmers' organisations, farm-

ers and farm employees constitute an agricultural knowledge and innovation network, often located within a particular region. In general, public or private organisations, focussing on advisory services or professional education, are the main drivers of a knowledge and innovation network. Network initiatives are best facilitated by brokers who understand and approach the development of the network from both an economic and a social point of view (Knickel *et al.*, 2009). They are often triggered by issues perceived as a problem or difficulty (Huggins, 2000). However, any strategy to foster networks must take into account the constraints of network participation: restricted entrepreneurs' time available for networking activities and 'the autonomy of independence' typical of business owners (Malecki and Tootle, 1996).

Lifelong learning helps to obtain qualifications, and extend knowledge and understanding. It is about gaining new skills and competences or enriching personal growth (EC, 2009). Lifelong learning is based on training and education for working adults who already have fundamental education and/or experiences, aiming to enhance professional competence (Otala, 1993). The Leuven Communiqué emphasises the concept of lifelong learning: 'Faced with the challenge of an ageing population Europe can only succeed in this endeavour if it maximises the talents and capacities of all its citizens and fully engages in lifelong learning as well as in widening participation in higher education' (EC, 2009, p.1).

The implementation of lifelong learning initiatives tends to be based on strong partnerships between relevant actors from education, business and/or societal groups. Lifelong learning methods recognise and build upon prior learning. The focus is on learning outcomes regardless of whether the knowledge, skills and competences were acquired through formal, non-formal or informal learning paths. Lifelong learning requires adequate organisational structures and funding (EC, 2009).

The programme and research presented in this paper comprises an action research initiative (consisting of several projects) and a set of monitoring and evaluation activities. The latter employ qualitative and quantitative social science research tools. The paper starts by presenting the impacts of changing natural, structural, economic and other conditions on farms in the Federal State of Brandenburg which is situated in the north-eastern part of Germany. Based on the theoretical concepts and the challenges farmers are facing in the region, the paper analyses the network activities of the Eberswalde University for Sustainable Development (HNEE) which aim to build an agricultural knowledge and innovation network for organic farming. HNEE is an independent non-profit institution focussing on sustainability issues with a strong regional focus. For that reason, it is well placed to organise and facilitate a farmer-university network and the related activities.

The first research results from three research projects with different orientations which contribute to such a network are presented in this paper. They include data from a first evaluation round and a preliminary identification of limiting and enabling factors in farmer-university networks and lifelong learning. The lessons learned so far from the HNEE engagement in farmer-university networks are discussed.

Challenges for the agricultural sector in Brandenburg

In Brandenburg, apart from difficult physical conditions for farming with poor quality soils and low annual precipitation, farmers face constraints related to:

- A lack of skilled young people. Young and qualified people migrate due to professional training and employment opportunities in the western or southern federal states of Germany (Staatskanzlei Brandenburg, 2011; Landesamt für Bauen und Verkehr, 2011). Especially in fruit and vegetable growing, farmers rely intensively on permanent and seasonal workers, traditionally from Poland. Since well organised networks in Poland and other eastern European countries organise the labour exchange, job offers from Brandenburg have to compete with offers from Ireland, United Kingdom or France (Hagedorn, 2011).
- Pressure on producer prices resulting from a globalisation of markets and concentration in retail chains, and coupled with changes in the demand for food and non-food products. Since cereals, oil crops and beef are traded internationally, global markets set price levels and trends (Witzke *et al.*, 2008). Expected rising returns of arable crop and animal production (FAO-OECD, 2011) might partly vanish due to increasing energy costs that also occur in rising fuel, fertiliser and feed costs. In addition, farmers will have to deal with increasing price volatility, as markets for agricultural products are expected to become even more volatile.
- Rising land prices and prices for rented agricultural land. The proportion of rented land is very high at nearly 70% (MIL, 2010) and after 20 years of reunification, many farmers have to renew their leases, forcing them to reflect on the cost-effectiveness of their present production systems. Farmers with low-intensity production – which is very common in Brandenburg – need to either raise intensity levels of animal or crop production or reduce the size of the farm and release labour.
- Environmental degradation and the need for more sustainable farming practices, as well as rapidly increasing demands related to climate change mitigation and adaptation. Increasing incidence of extreme weather events such as droughts and floods are affecting Brandenburg (MUGV, 2011). Global warming impacts on water cycles, not only by changing regional precipitation and temporal variability but also by affecting water flows and soil moisture dynamics. Agricultural structures and production systems need to be adapted with resulting challenges and costs (Hagedorn, 2011; Holsten *et al.*, 2009).
- Even with a high proportion of specialised crop farms, nearly every farmer has some grassland. Often, the economic exploitation of pastures and meadows is restricted due to nature or landscape conservation standards. Low-intensity grazing or forage production for beef cattle, sheep and horses is characteristic of Brandenburg's remote rural areas.

In addition, the sector has to face serious changes in education and qualification systems, and in administration, as well as in research. A lot of these changes have to do with pressure on public budgets and the need for cost savings. Part of it is still related to the transition from a socialist system to a market economy based on private ownership and reduced government interference in production and markets. Rural areas of Brandenburg are sparsely populated except those areas neighbouring Berlin. The state's economic potential is relatively low due to a lack of production and service industries.

Despite the increasing challenges for the agricultural sector, professional training and education opportunities and research have received less public funding because of these financial pressures. Owing to the lack of funding, farmers and farmers' associations are experiencing a reduction in regional specific expert knowledge. For the same reason, there is less applied research and development, although farmers are also asking for results of field studies and for scientists with farming experience. The state's budget for agricultural administration and research with regional orientation has declined because the economic potential of Brandenburg is relatively low owing to a lack of production or service industries. Consequently, independent research or testing institutions have closed down and agricultural experts have left the region or changed duties. In return, testing and research of large agro-industrial enterprises has become more important as they have become the only available information source for innovative technologies (Achler, 2009).

Regarding management and farm economics, farmers nowadays rely on private advisory services that only large or successfully run farms are able to afford. As the region's farming systems are relatively low yielding, Brandenburgian farmers' budgets are low in comparison to farm businesses in the neighbouring states. For that reason, private advisory services or branch offices of large agri-business enterprises are located for example in the federal states of Mecklenburg or Sachsen-Anhalt and serve customers in the state of Brandenburg. It is particularly difficult for farmers in Brandenburg to develop and implement innovative approaches. New forms of knowledge transfer are therefore actually needed.

The Knowledge and Innovation Network for Organic Businesses in Brandenburg

University teams at HNEE noticed the problems of the Brandenburgian agriculture caused by the withdrawal of expert knowledge at an early stage. In response, they started to develop an agricultural knowledge and innovation network. The initiative aims at developing a transdisciplinary network for organic businesses that will close the communication gap between farming business, private advisory services, agricultural research and university studies as well as administrative and policy bodies. HNEE will serve as a knowledge brokerage institution aiming to enhance the sustainability, competitiveness and resilience of agricultural farms in the state of Brandenburg. The knowledge and innovation network will support farmers in the process of tackling the forthcoming challenges of agricultural production, processing and marketing.

The network initiative operates at different levels and consists of several projects implementing the overarching methodological approach. Firstly, a bottom-up multi-stakeholder process, facilitated by a professional innovation network manager, helps to formulate the needs for innovation of individual farmers and of rural regions as a whole. Annually, the stakeholder group identifies topics of core relevance. Secondly, the university team develops the most appropriate format of cooperation: student projects and graduation theses at different levels of expertise, business internships, on-farm research projects, farmers' seminars related to technological, economic or management innovations, field days, and cooperation within larger research projects that rely on external funding but are relevant to a larger group of entrepreneurs.

Under the umbrella of the HNEE network initiative, three teams work on innovative research projects:

- The transdisciplinary 'Study Partner Network for Organic Businesses' (*Netzwerk Studienpartner Ökobetrieb*), established in 2004, mainly serves as a teaching and research resource. In the beginning, it was a unique teaching approach among German universities. Based on an intensive and trustful knowledge exchange between university teams and entrepreneurs of the organic food and farming sector in the region, the network was further developed over the years towards an innovation network;
- The project 'Innovation Network Climate Adaptation Brandenburg Berlin' (INKA-BB) is one of two projects that focus on knowledge exchange related to innovative farming practices among farmers and between agricultural experts and farmers. The INKA-BB project contributes to the development of farm adaptation strategies to climate change and is part of a national research project of climate change adaptation research (ZALF, 2012). A small expert group consisting of six arable farmers, the organic producers' organisations Bioland and Naturland, regional experts (farm advisors) and researchers develops adaptation strategies to climate change impacts on crop farming. Together, the group implements the projected field trials at selected agricultural sites in Brandenburg and evaluates them;
- The 'Lifelong Learning in Organic Farms in Brandenburg' project also focuses on knowledge exchange related to innovative farming practices. It is funded by the European Social Fund (ESF) and the Ministry of Science of Brandenburg, and since April 2011 has supported production specific networks in Berlin-Brandenburg by bringing together farmers, agricultural researchers and regional and national experts. Although the title suggests a purely organic orientation, conventional farm participation and studies of non-organic food production are included, aiming to facilitate comparative analyses.

The three key research questions addressed with the HNEE network initiative are: Firstly, how can the shift from linear innovation processes (the conventional approach used

in the first stages of the industrialisation of agriculture) to a more network driven approach be implemented? Secondly, how do effective farmer-university networks function? Thirdly, what are the main limiting and enabling factors for the network development?

The two related hypotheses are: firstly, that a shift from linear innovation processes to a more network based approach is not only possible, but it is actually needed in order to meet the demands on agriculture in a modern post-industrial society. A second hypothesis is that the successful establishment and functioning of farmer-university networks is possible if some clearly identifiable organisational issues are managed appropriately. Universities and transdisciplinary research projects (including students' Bachelor and Master projects) can play a significant role in such networks.

The research approach used to address the above questions builds on a set of monitoring and evaluation activities that accompany the farmer-university networks. Qualitative and quantitative social science tools, including case studies, participant observation, expert interviews, focus groups and more formal questionnaire surveys are used. Some of the research is implemented through students' Bachelor and Master theses.

Results

The data presented in this section are derived mainly from feed-back given by participants of annual meetings, field days and workshops. The 144 student theses prepared in the Study Partner Network were examined in terms of focus and approach. Twenty-nine experts and farmers participated in face-to-face interviews. Other information sources included the interest and number of participants in different offers and comments received after completion of a study project. The results obtained so far are of a preliminary nature because the programme, monitoring and evaluation activities are continuously evolving. The discussion comprises the following areas: (a) content matters; (b) experiences with the lifelong learning project; and (c) integration of students' research projects.

Content matters

Learning offers need to be perceived by farmers as immediately relevant to their needs. Climate change and adaptation, for example, are still of little concern to farmers. Much more important is in particular the immense economic pressure on farms.

Joint work and analyses therefore focus on farm management and economic questions. One tool used for the economic analysis of the impacts of policy programmes on (typical) farms is the *agri benchmark* approach of the vTI (Deblitz and Zimmer, 2005). The approach is based on an international network of beef, sheep and arable farmers and a data-based comparison of production systems, income and costs structures annually. What matters most for the farmers is not the data base as such but the question of how they can relate their own situation to the comparative data. A data base often seems abstract for them – especially for farmers without formal agricultural education. Productivity and adaptation strategies emerge from the discussion of economic results in the Brandenburgian farmer groups only if they have the opportunity to relate to their own situation and if this process is appropriately facilitated. The result of evaluations indicates that:

- 80% of participants found such meetings helpful;
- 65% of participants liked half-day workshops, 35% voted for longer workshops;
- 70% had a particular interest in the international comparisons.

Since the beginning of the project, 29 interviews with agricultural experts and farmers have taken place. These interviews dealt with farm structures and specific problems in Brandenburg, competitiveness of present systems, the need for information and for innovative farming practices. Since the interviews were based on an open question approach and invited the interviewee to point out highly relevant issues, not all topics were covered by all interviewees.

- 76% of farmers/experts said that farmers need more and better information to develop their farming business; thereof 90% emphasised the information related to production systems and farm economics and, in addition, 50% emphasised the relevance of information on future policy programmes;
- Nearly 60% of farmers/experts said that organisational issues such as travel time, travel costs or the availability of a replacement on the farm/in the household are of core importance for participation in an information event;
- 63% of farmers/experts said that trust in the information source and in the organisers/facilitators of the information event (workshop, field day, seminar etc.) is of core relevance for participation and for learning success. A third of the interviewees emphasised that information events need to encompass practical components;
- Most interviewed farmers (96%) were interested in cooperation with HNEE. Some of them had already good experiences from participating in former projects of the Study Partner Network.

The interviewed experts and farmers provided positive feed-back: The objectives of the ESF project are adequately defined and the cooperation with the university is welcome. The most important finding, however, is that all learning offers need to be perceived as relevant by farmers. This seems obvious but experience shows that sometimes too little attention is paid to professional approaches and the quality of data and materials.

Lifelong learning related to farming practices

The ESF project 'Lifelong Learning in Organic Farms in Brandenburg' concentrates on the competitiveness and resilience of typical farming systems in Brandenburg and on farmers who are not normally reached by extension services and industry. The focus is on enhancing different production-specific networks: a cereal farming group, a beef cattle group, a sheep farming group and a dairy farming group.

Learning from each other, efficient knowledge transfer from researcher or advisor to farmer and vice-versa are main elements of the approach. The project team organises workshops and discussions aiming to foster knowledge exchange on present farming problems. Innovation needs - expressed by participants - are addressed and farm development strategies discussed.

As part of the evaluation activities of the INKA-BB project a wider circle of farmers and the participants of the field days are invited to 'think outside the box' and to open their mind towards the upcoming challenges driven by climate change impacts. The evaluation of the project reflects the diffusion of innovative ideas and new technologies among participants. Currently, the increasing number of interested farmers may be taken as a proxy indicator of its impact/ success so far. Even if not intended in the beginning, the involved organic associations wanted to take over the responsibility for the field days independently, aiming to provide their members with highly relevant field study results. Consequently, not only the core group consisting of around 15 farmers and experts profits from the project's results but, in addition, around 30 farmers regularly follow the upcoming experiences of the alternative farming practices.

Trust is of crucial importance for success. It is a precondition for knowledge transfer from researcher to farmer and between farmers and therefore fosters the application of innovative ideas and technologies: When participants have good experiences with cooperative projects, they come back with new ideas. The reliability of the network organisation and the quality of the information are key factors for increasing trust and enhancing the network's development.

A challenge for lifelong learning in agriculture is habits. Many farmers stick to well-established routines. Daily routines in agriculture often show a remarkable persistence due to cultural or family traditions; and of course they are 'safe'. Innovation in farming relies on the farmers' and researchers' attitudes towards joint learning. Lifelong learning in agriculture is, as everywhere, closely linked to the ability of people – farmers, researchers, regulators, advisors, etc. – to try new approaches. Farmers, however, are those who have to manage the related (economic) risks.

Lifelong learning helps to engage with farmers who are not normally reached. Successful projects depend on a number of factors that are discussed further below.

Integration of students' research projects

Within the BSc study programme Organic Farming and Marketing, since 2004, 137 projects were realised as a compulsory part of the curriculum; thereof two thirds (89 projects) in the module 'Project for Organic Partner Farms' for year 1 students from 2005-2012 and one third (48 projects) in the module 'Farm economics – strategy planning' for year 3 students from 2008-2013. In this format, relevant innovations for individual farms have been elaborated in transdisciplinary cooperation between entrepreneurs, students and university researchers. The study partner projects are facilitated by specific methodological inputs supporting the involved stakeholders at different points in time by the professional innovation network manager.

For example, a young farmer was assisted in the process of introducing organic farming management practices as an innovation to his farm. The value added by the cooperation was the specific expertise on the organic farming system of the students and university staff, while the farmer created awareness of the limiting factors of the conversion process. Other groups worked on the development of alternative calf fattening systems, nitrate level analyses of the soils of an organic farm, alternative processing of vegetables and many more topics.

The HNEE team receives very positive comments from the involved entrepreneurs on about 80% of this type of cooperation project. These comments are collected during the feed-back rounds of the annually held Study Partner Network meetings. In addition to these verbal expressions, cooperating entrepreneurs usually come back with new ideas regularly and - by word of mouth - new farmers become aware of and join the network every year. Thus, although the network's contribution to the final adaption of the innovation by the individual farmer cannot be measured yet, this seems to be a very good proxy indicator.

In addition to these study projects, graduation theses at the Bachelor and Master levels also reflect the innovation processes driven by the Study Partner Network. In total, 144 theses from the years 2007 to present have been elaborated. The analysis of these shows that 25% focus on practical innovations for individual enterprises; they are based on the farms' conditions and aim to jointly find answers to the farmers' questions. Close linkages and trust between university teams and farmers are preconditions for these study theses focussing on farm-specific innovations. Around 50% of the theses work on regional innovation needs; they are based on data or qualitative information of a partner farm and aim to produce results for the agricultural sector in the region. The remaining 25% of theses are generic with recommendations related to organic farming sector issues; they are usually based on the cooperation with organisations such as organic farm associations (i.e. plural) that also contribute to the Study Partner Network.

Farmers profit from the cooperation even when they sometimes do not have the opportunity to implement the projects' results immediately. Experiences show that approximately 30% of cooperation partners express new innovation needs immediately after finishing a cooperation project. Approximately 50% of cooperation partners come back with new ideas within a year. Both indicators reflect the network's and the study projects' success.

Universities and transdisciplinary research projects (including students' Bachelor and Master projects) can play a significant role in such networks.

Discussion

Here we come back to the three research questions posed earlier and the related hypotheses. Where relevant, we will expand a little more on further work. We reflect on better measures for evaluation in innovation processes and networks. A final section on the importance of lifelong learning concludes the paper.

Towards more networked approaches

Information in the industrialisation of agriculture tended to flow top-down from industry or expert to the farmer. A large part of the conventional agricultural information and knowledge system still functions in that way. The much more complex challenges of today and the uncertainties related in particular to climate change demand different approaches. The HNEE network teams can be considered to be pioneers in the field of farmer-university network development because they already have experience from projects starting several years ago. Since access to professional expertise and advice has been declining continuously in Brandenburg in recent years, HNEE was able to (re)establish more future-oriented agricultural innovation networks.

The experience gained with the overarching network initiative and its constituent projects clearly indicate that the shift towards more networked approaches is actually needed. The demands on agriculture in a modern society as reflected in urban-rural relations and the demands related to the resilience of agricultural systems cannot be addressed in meaningful ways through conventional top down, disciplinary or linear approaches (Knickel *et al.*, 2009). The experience also shows that universities can play a major role in the implementation of network driven approaches.

Limiting and enabling factors of farmer-university networks

The successful establishment and functioning of farmer-university networks is possible if some clearly identifiable organisational issues are managed appropriately:

- *Interest in innovations*: Farmers' information needs for farm development and adaptation strategies. A lacking interest in changes and innovations reduces farmers' motivation to engage in network activities.
- *Farm structure and coverage*: Farm types that are not served (well) by extension services and private consultants tend to be more interested. More professional farmers working already successfully tend to be less interested in knowledge and innovation networks because they have sufficient information available. Small and part-time farmers need special appropriate offers in terms of timing and content (times of peak labour demand need to be avoided; a short distance to venues and limited travel times and costs increase participation).
- *Network management*: Participants value events with professional facilitation and room for discussion of results, both are crucial for long-term network participation. Farmers have limited time and are only willing to invest it when they really benefit. Network establishment tasks are hard to manage if projects are only short-term. The establishment of a well known series of events with a good reputation takes longer than research projects funding periods.
- *Learning approaches*: Methodologies used need to be appropriate; practical learning tools (e.g. farm visits, field experiments and field days) are often more useful. Participation in research projects raises interest and increases trust in results. When farmers and researchers organise research projects cooperatively in a transdisciplinary approach, the engagement of farmers as well as interest and trust in the results tends to be higher. An average lower level of education and media competence needs to be taken into account.
- *Trust*: Active involvement and interaction as partners increase trust in (new) information. Facilitation needs to enhance the partnership character of joint activities and attenuate the often critical attitude towards universities and experts. Word-of-mouth recommendations among farmers are important for network development.

Better measures for evaluation in innovation processes and networks

Accompanying monitoring and evaluation can contribute to the further development of farmer-university networks. The HNEE team evaluates the network projects' engagement and success annually. Based on the experiences gained so far, future evaluations of the HNEE innovation network will take into account:

- *Active engagement*: The actual level of involvement of farmers in network activities (e.g. active members in the core group and enlarged group of innovation development; regular participants of events; passive members such as irregular participants of information events).
- *Cooperation intensity*: This can be based on the quality of cooperation, the frequency of contacts, study projects etc.
- *Formal evaluation procedures*: Related to workshops and field days additional data can be collected from participants for in-depth analyses.
- *Interviews*: Regularly organised interviews with advisors or other experts can help to capture the actual diffusion and implementation of innovations in the regions.
- *Study projects*: The related analyses would evaluate the interrelations between information network participation and the farms' investment strategies and behaviour.
- *Network analysis*: Network linkages and the intensity of information flows in the region could be analysed using formal tools for network analysis.

Lifelong learning should play a much bigger role

Lifelong learning helps to obtain qualifications, extend knowledge and understanding which is what the farming sector needs at this time of manifold challenges. Moreover, lifelong learning strategies require strong partnerships which can be enhanced by transdisciplinary networks focussing on knowledge exchange and innovations; and it requires adequate organisational structures providing facilitation and reliability.

The HNEE initiative related to the establishment of a 'Knowledge and Innovation Network for Organic Businesses in Brandenburg' contributes to the implementation of

transdisciplinary approaches and, in the terminology of the European Commission, innovation partnerships. The focus on competitiveness, sustainability and resilience of agricultural production, and the interrelations between them, is very high on the political agenda (Dwyer *et al.* 2012). It needs to move much faster into practice and it needs to reach farmers who are normally overlooked. A vast majority of farmers in Europe is of increasing age and many have never received formal agricultural education.

Farmers need information on new developments, new opportunities and potential strategies for adaptation. They introduce innovative practices and technologies when they have the ability to learn continuously. However, experiences show that some farmers are difficult to reach with lifelong learning approaches and participants of workshops and seminars learn differently. Learning methods need to be adapted to different levels of professional education. Topics that are highly relevant for some farmers are of little interest to others. Traditional methods of education, training and management have to be scrutinised, aiming to ensure that farmers and other members of the agricultural sector participate in lifelong learning activities.

Mixed groups of farmers are challenging and promising at the same time. Innovative and successful farmers can provide a substantial input into the group and are welcome multipliers of innovative know-how.

Farmer-university networks function effectively if all involved see themselves and work together as equal partners. Researchers and university staff need to recognise that there are different types of knowledge (tacit, explicit; personal/experiential, procedural, propositional, etc.) and that these different types are complementary (Knickel *et al.*, 2009).

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John MURPHY*

The contribution of facilitated group learning to supporting innovation amongst farmers

There is increasing awareness of the need for new approaches to delivering agricultural extension based on an interactive model of networking systems which integrate knowledge production, adaptation, advice and education. This paper explores the literature surrounding the modelling of farmer decision making, concepts of learning and behaviour change, and ways to stimulate attitude and behaviour change. It shows that facilitated group learning can be a very effective tool for supporting innovation amongst farmers and cites the ADER project, which was implemented in the East of England region between 2001 and 2007, as an example of good practice.

Keywords: AKIS, facilitated group learning, farmers, ADER project

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Introduction

Several years ago, prompted by organisations such as OECD and FAO, the concept of 'agricultural knowledge and innovation systems' (AKIS) was introduced into the policy discourse. The concept was originated by a policy based on the idea that, in order to accelerate agricultural modernisation, innovation transfer should be strongly coordinated (Leeuwis and van den Ban, 2004). It was implemented in many countries through a close integration, generally at national level, of public research, education and extension bodies, in many cases under the control of the Ministry of Agriculture. AKIS embraces four main actors whose mission is related to agricultural innovation, namely research, extension services, education and training, and support systems (i.e. producers' associations, credit and input organisations etc.).

In many parts of Europe there has been a historical tendency when developing farm extension programmes to design a 'one size fits all' approach which assumes that all land managers are similar in their life and business goals, similar in their learning styles and are all profit motivated. Most of these programmes have also had a 'top down' approach where information is provided to land managers which is intended to persuade them to change their behaviour. Such an approach to knowledge transfer must now be considered as outdated, for at least two reasons.

Firstly, the political context of food and farming systems has changed. Agricultural practices are now set within the context of achieving sustainability and responding directly to consumer concerns. Agricultural research also has to address a range of related issues and demands, from the need for stable food security and safety systems, environmental criteria, socio-economic changes in rural communities, to issues such as landscape management, biodiversity and conservation.

Secondly, farming is much more diverse than in the past and is often combined with other activities. New knowledge is generated by farmers as well as researchers (basic and applied) and private companies and the importance of informal knowledge networks is increasingly recognised (Knickel *et al.* 2009). EC (2009) described AKIS in Europe as "currently unable to absorb and internalise the fundamental structural and systemic shifts that have occurred" (p. 95). It concluded that the old linear model of knowledge transfer (from scientists to the users) is outdated and should be replaced by an interactive model of networking systems, which integrates knowledge production, adaptation, advice and education.

Facilitated group learning is a potentially valuable component of a participatory problem solving approach in agricultural extension which can help to support innovation amongst farmers. This paper presents a theoretical background to the topic by firstly illustrating the differences that have been found between farmers when their decision-making processes have been modelled. It then reviews some of the literature surrounding concepts of learning and behaviour change and discusses some of the most effective ways to stimulate attitude and behaviour change in land managers and sustainable rural development. The paper finishes by citing as a case study the Agricultural Development in the Eastern Region (ADER) project, which was implemented in the East of England between 2001 and 2007.

Modelling farmer decision making

There has been a tendency amongst policy-makers and rural support advisors to view agriculture and farmers through a very simplified economic lens. There has also been an implicit assumption that all land managers are similar in their personal and business goals and are all focused on managing their farms as a profit driven business.

Edwards-Jones (2006) agrees that the traditional economic theory underlying these assumptions are based on the idea that people make decisions in order to create an expected change in their 'well-being'. The technical term used for 'well-being' in economics is 'utility'. 'Utility' is a useful concept for economists to model behaviour in a conceptual way but, according to Edwards-Jones (2006), this is too difficult to use in any real practical way. Many agricultural economic models assume that land managers always strive to maximise utility. Profit is often used by economists and policy-makers as a measurable substitute for utility and so the idea of the rational profit maximising land manager is created. This traditional view of land managers has been used in economic theory for years and has been central to agricultural policy models.

However observations show that a simplified view of land managers with the same management goals (i.e. maximum profit) cannot be true in all cases (Edwards-Jones, 2006). In an agricultural context one might expect all land managers in the same region on the same soil type to have exactly the same enterprises. While it is true that all farmers in the east of England, for example, with its good soil and low rainfall, tend to have crop based enterprises, not all farmers have the same enterprises or grow the same crops in the same way. As the importance of financial factors in the decision making process of land managers decline, so does the usefulness of focusing on profit maximisation as a measure of adoption of new technologies and policies.

In the current European Union (EU) policy context there is a good deal of interest in analysing how farmers will respond to a range of policies which are largely concerned with non-financial issues, particularly 'public goods' including the provision of environmental goods, ethical issues such as animal welfare, and social issues such as countryside access. In an attempt to understand farmer responses, the traditional disciplines of agricultural science and agricultural economics have increasingly drawn on contributions from other disciplines such as sociology and psychology.

The adoption of new technologies and policies has been fundamental to agricultural development over the last 50 years. Research work in this area has identified at least five sets of non-financial variables that influence the decisions of farmers on the adoption of new technologies and policies:

- Farmer characteristics (age, education, gender, attitude to risk and personality);
- Household characteristics (stage in family cycle, level of pluriactivity and work patterns of spouse);
- Farm structure (farm type, farm size and debt to asset ratio);
- The wider social milieu (level of extension available, information flows, local culture, social attitude, attitude of trusted friends, the policy environment and the structure and impact of a range of institutions);
- Characteristics of the innovation to be adopted (characteristics of product or policy to be adopted).

In a study to measure the attitude of farmers to animal welfare, Austin *et al.* (2005) found that not all farmers held the same managerial goals. Farmers considered to have a 'welfare orientation' answered questions in a similar way but differently to farmers with a 'business orientation'. Results suggested that there was a correlation between the strength of farmers' attitude towards an issue and their age and education. Also there was a significant correlation between scores for farmers' attitude to the importance given to an animal's natural environment and behaviour and the actual level of welfare on their farms.

Studies such as this show that attitude may be linked with behaviour. They also show a potential relationship between other aspects of farmers' personal characteristics (i.e. education) and their attitudes. Psychologists have known this for some time and it is embedded in the 'Theory of Reasoned Action' (Fishbein and Ajzen 1975) and the 'Theory of Planned Behaviour' (Ajzen, 1991).

However, Burton (2004) suggests that too much emphasis is placed on the role of attitudes in the role of decision making and that there are two other important elements to the theory: 'subjective norm' and 'perceived behavioural control'. 'Subjective norm' describes how farmers are constantly checking their behavioural intentions against the actual and perceived behaviour of others. 'Perceived behavioural control' suggests that when a person does not feel that certain behaviour will achieve the desired end, he/she is less likely to engage in that behaviour.

Edwards-Jones (2006) believes that there are legitimate reasons why researchers have focused on attitudes in relation to the Theory of Planned Behaviour (i.e. results are easy to analyse and easy to present to research funders) but in future emphasis needs to be given to other factors.

Understanding attitudinal and behavioural change

Change, persuasion and learning

It is generally accepted that land managers regularly change their behaviour, as evidenced by the rapid technological changes in agriculture over the past couple of centuries and particularly the 20th century. Some of these changes were initiated by individuals that created new trends. But usually individual land managers have found themselves responding to changes that were initiated elsewhere. Therefore the behaviour of individuals is 'locked in', not just in a static sense but also in a dynamic sense. Individuals are 'locked in' to behavioural trends rather than specific fixed behaviours (Jackson, 2005).

The question then is; how can people such as land managers be persuaded to change their behaviour? The Hovland-Yale Communication and Persuasion group framed successful persuasion in terms of three key elements (Hovland, 1957):

- The credibility of the speaker (the source);
- The persuasiveness of the arguments (the message);
- The responsiveness of the audience (the recipient).

The idea of an individual being exposed to a logical and persuasive argument which convinces him/her to change his/her attitude and therefore their behaviour is appealingly simple. But the empirical evidence shows that this linear model has significant limitations (Petty *et al.* 2002). Learning can occur without any change in attitudes, whilst a change in attitude (and behaviour) can occur without any assimilation of the persuasion message (Petty and Cacciope, 1981).

Social learning theory

Jackson (2005) noted that policy makers have traditionally placed a high emphasis and expectation on the ability of persuasion to achieve goals that are in the public interest, even though the limitations of persuasion have long been recognised. Exhortation and information remain two of the most widely used ways of trying to influence attitudes or behaviours but according to Campbell (1963) these are

among the least effective methods. Campbell (1963) suggests that the most effective ways to change behaviour are trial and error, observing what others do, and observing how others respond to one's own behaviour.

Bandura (1977) agreed that information and exhortation are not particularly effective ways of learning but he also questioned whether trial and error is the only way that learning proceeds as this would be laborious and potentially disastrous in real life situations. In his highly influential social learning theory he suggested that trial and error is complemented by observing others around us, including our parents, our peers, examples in the media, and modelling our behaviour on what they do.

Bandura (1977) suggests that there is a natural tendency to imitate behaviours in others that we judge to have been beneficial for those individuals. We also learn most effectively from models who are attractive to us, such as our parents (at certain ages), people who are successful, and people who are simply like us. We do not learn purely by imitation. Sometimes we learn by counter example by observing the behaviours of those we would like to dissociate ourselves from, or by observing negative consequences from other peoples' behaviours.

Control, helplessness and participatory problem solving

One of the paradoxes that haunt the debates on behavioural change is that more information is not always better (Jackson, 2005). People (including land managers) like to feel in control of their lives and resist feelings of helplessness. Attempts by external organisations to impose more information on their already crowded lives may simply reinforce their sense of helplessness about a particular situation.

Kaplan and Kaplan (1989) identified three insights into the information processing and problem solving propensities of people. People are motivated:

- To know and understand what is going on: they hate being disorientated or confused;
- To learn, discover and explore: they prefer acquiring information at their own pace and answering their own questions;
- To participate and play a role in what is going on around them: they hate feeling incompetent or helpless.

Using attitudes towards the environment as an example, a number of studies have highlighted the dangers of confusing feelings of helplessness with attitudes of indifference. Levin (1993) investigated the reaction to increasing levels of information about environmental problems and found that more information led to greater concern, but paradoxically also to greater feelings of helplessness. Another study, by NGO Public Agenda, cited by Kaplan (2000), attributed a recent decline in concern about environmental issues not to apathy but to an increasing sense of helplessness and futility on the part of individuals. Allen and Ferrand (1999) found that people who felt that their behaviour would not make any difference were less likely to participate in environmentally responsible behaviours.

Kaplan (2000) proposed that the general solution to this kind of problem is to develop a participatory problem solving approach to encouraging sustainable behaviours and practices. Rather than telling people what to do, the correct approach would be to provide people with an opportunity to figure out for themselves how various broadly defined goals can be met. Kaplan makes a distinction between three different understandings of behavioural change:

- Telling people what to do;
- Asking them what they want to do;
- Helping people to understand the issues and inviting them to explore possible solutions.

Although the first is often used and the second has been regarded as one way of increasing participation in government decisions, it is the third understanding that lies behind the participatory problem solving approach that Kaplan proposes. This approach also recognises the need for the state to support and guide the process of participatory problem solving. There is evidence (Wandersman, 1979) that people in groups prefer to work with experts than on their own. This approach relies explicitly on expertise from governments, corporate and non-profit organisations, and must be supported by appropriate infrastructure and institutions. Participatory problem solving is not a recipe for 'hands-off' government.

Improving farmer access to advice on land management

Garforth *et al.* (2003) carried out a review of agricultural advisory services in developed countries and concurred with much of what has been discussed above. They found that change amongst managers takes time and that a one-shot injection of information or generic advice will rarely lead to instant decisions and changes in behaviour. The more complex the change, the greater the perceived risk and the more people who need to be involved in the decision to change, the more time and support likely to be needed.

According to the findings of the review performed by Garforth *et al.* (2003), schemes underpinned by a well-founded model of human learning and behaviour changes are more likely to succeed than those which make unreasonable assumptions about the significance of information and knowledge constraints. Relevant questions to ask in a particular context are: what are the constraints to change? What factors are driving land manager decisions? How do land managers trade off business, social and personal factors? Garforth *et al.* (2003) accept that answers to such questions would not be uniform and would vary from farmer to farmer (with different personal and farm characteristics) but that there should be enough commonality within recognised categories of farmer to enable schemes to be designed accordingly.

The review also found that government initiatives in Europe are less open-ended and more prescriptive of the range of decisions and actions that can be taken compared

to initiatives in Australia, New Zealand and North America. An example of this is how the means of the successful Monitor Farm approach from New Zealand has been adapted for different ends in the UK. The New Zealand approach to Monitor Farm groups allowed decisions on changes in management to be made by members of the groups after discussion of current technical and business performance and considerations of options for improvement. In Wales, where ten monitor farms were set up, the group processes were set up but the focus was on delivery of environmental goods and far more non-farm stakeholders were in the groups. In England the model is being discussed as an instrument of demonstration of technologies and management practices to land managers who will deliver environmental goods. Garforth *et al.* (2005) state clearly that "the method will not necessarily work so effectively if it is used simply to demonstrate technologies which have been determined by someone outside the group" (p. 13). The same can be said for farm business management strategies. They went on to explain that the "credibility of those providing the service is a key ingredient to success. Conflict of interest is only likely to arise in the eyes of a client if the adviser mixes his or her roles when involved in delivering fee-based services as well as publicly funded schemes".

Garforth *et al.* (2005) found that in line with the recommendations of Edwards-Jones (2006) and the social learning theory of Bandura (1977), when developing a support service for land managers there should be a presumption against prescription of acceptable decisions and behaviours in favour of broad principles and local development of solutions. Sustainable rural businesses, communities and economies are more likely to emerge from creative processes of identifying problems and opportunities, and developing strategies for dealing with them, than from the implementation of a package of measures developed by others.

Case study: Agricultural Development in the Eastern Region (ADER)

The East of England region is a low-lying region neighbouring London, with a rich diversity of rural and coastal landscapes, communities and economies. Agriculture dominates as the main land user: over 80% of the land area is in agricultural production. However it accounts for less than 2% of the region's employment. Farming has had to become a competitive industry and in the late 1980s and early 1990s the industry began to restructure (and continues today) to form larger businesses. The average land area for individual holdings is 73 ha compared with 55 ha for England as a whole (Agricultural Census, 2004, cited by RDPE RSG, 2007). Despite this growth in average size the region has also seen a trend towards more diversity in farm size. Whilst the number of very large arable units (over 2,000 ha) has been growing, with some now over 5,000 ha now under single management, the number of farm holdings in the region has also increased with a marked increase in small, part-time farms. The sector is dividing into commercial farms which are growing in size and those being run as adjuncts to other employment or diversification (RDPE RSG, 2007). In 2009 there were estimated to be 8,300 farms of a size considered sufficient to occupy a farmer for at least half-time (Keep, 2009).

Agricultural Development in the Eastern Region (ADER) was an agricultural support initiative set up in 2001, at a time when farmers in the region were facing radical business choices about either leaving the industry, re-skilling, diversifying or adjusting farming practices in response to the then-new agri-environment incentives arising from the reform of the Common Agricultural Policy. Regarding the latter, for example, there was a clear demand for training courses in topics related to sustainability (agri-environment and organic farming) and the use of bio resources (to avoid pollution and maximise the economic value of wastes). It was jointly developed by the Regional Development Agency (EEDA, as the main funder) and a group of land based Higher Education Colleges (which provided the service), and was endorsed by industry organisations (such as the National Farmers' Union, NFU) which helped to secure political backing and funding and promoted the project to their members.

Just as the farm businesses in the region, ADER's target market, differed markedly in scale, complexity, focus and objectives (e.g. Keep, 2009), those employed within them had a very wide range of previous qualifications and levels of technical expertise and competence. Although by the late 1990s most farmers in the region recognised the need to diversify their businesses, a needs analysis concluded that the process was being inhibited by three 'market failures' (SQW, 2008):

- Farmers were under-investing in training or agri-environment activities due to lack of awareness/skills
- Farmers lacked information on business opportunities and sources of support
- There was a lack of information sharing/knowledge transfer amongst farmers

ADER focused on helping farmers, by means of skills development programmes and business support, to identify new opportunities and develop alternative business activities. Activities included workshops, small group seminars, visits to exemplar businesses and one-to-one on-farm support and guidance. Topics included computer training, business management, supply chain management, sustainability (agri-environment and organic farming) and use of bio-resources (to avoid pollution and maximise the economic value of wastes).

Farmer engagement was recognised from the outset as being fundamental to the success of the project. The ADER business plan (Collison, 2002) listed a number of factors which would determine how ADER would be seen within the market. To be successful in meeting farmers' needs it was considered important to:

- *Be flexible*. The needs of farmers were (and are) constantly changing and ADER needed to be flexible and responsive to keep in touch with changing farmer needs and to be seen to be meeting them;
- *Focus on farmer based promotion*, using farmers wherever possible to promote the programme.

Farmers respond very well to the recommendations of other farmers and ADER made extensive use of farmer organisations to promote its services and recruit other farmers to events;

- *Choose tutors and advisors carefully*. Farmers are very sceptical about the motives of professionals and tutors and advisors. Credibility with farmers is enhanced substantially if those advising them are seen to have practical experience and recent exposure to the realities of farming. ADER used entrepreneurial farmers wherever possible as 'champions' and 'mentors' to assist with provision of training and to lead change in the sector;
- *Provide a choice over timing and delivery location*. Farmers are much more receptive to support which takes into account the farming calendar and which is delivered locally. ADER timetabled its provision for quiet times in the farming year and offered provision at locations where take up could be optimised;
- *Find ways to engage 'at risk' groups*. Anecdotal evidence suggested that traditionally those farmers who are most in need of help to change direction are often the least willing to accept it. ADER sought to find innovative ways to access these 'at risk' groups by working with other agencies that might be able to identify them, such as the Rural Stress Information Network.

The ADER project quickly gained the trust of the farming community and successfully achieved its targets set by the funding agencies such as in providing one-to-one business support. However the experience of the ADER team was that this one-to-one support was not the most successful method in creating real change in farmer's attitudes and behaviours. Instead, the facilitated group learning (i.e. small group seminars) proved to be a more sustainable method in creating attitude and behaviour change in land managers and therefore more sustainable development in the rural community, even though it was perhaps less easy to report that information in a quantitative way to funding bodies.

During its existence ADER supported over 4,000 one-to-one clients and nearly twice that number of group attendees. In 2009, 48% of farms in the region were estimated (Keep, 2009) to have diversified enterprises (i.e. approximately 4000 farms), thus a large percentage of these will have used one or more services offered by ADER. A record of ADER case studies shows that 47% of the supported businesses were involved in adding value to farm production in the form of new products, farm shop outlets and marketing initiatives. Another 33% were not related to farm production but used existing buildings for diversification activities such as holiday accommodation, children's nurseries, a hat shop and upholstery work. The remaining 20% were involved in equine and wildlife and conservation projects. These results suggest that ADER, including its facilitated group learning activities, significantly contributed to supporting innovation amongst farmers in the region.

Discussion

Pretty *et al*. (2010) sought to improve dialogue and understanding between agricultural research and policy by identifying the 100 most important questions for global agriculture. Five of these questions relate to social capital, gender and extension. Prompted by the observation that what will be required will be new metrics of social change and institutional learning, question 63 (p. 229) asks: "What are the best social learning and multistakeholder models (e.g. farmers field schools) to bring together farmers, researchers, advisors, commercial enterprises, policy makers and other key actors to develop better technologies and institutions, for a more equitable, sustainable and innovative agriculture?" The experience of the ADER project provides a partial answer to this question.

The literature on decision-making and behavioural change demonstrates that the assumption that all farmers are the same is false, and that profit maximisation is not a good indicator for predicting the management goals of individual land managers. Different personalities, personal circumstances and social networks create different kinds of management goals for each individual land manager. A 'top-down' approach to problems and providing information on new technologies and ideas as solutions is also relatively ineffective. The behaviours of land managers, like all people, are regulated by the opinions of their peers. Also, as trial and error is an inefficient means for humans to learn, people look to the positive and negative results of their peers to help them decide what behaviour they should adopt.

Too much information in busy people's lives can have a counter-intuitive effect on their attitudes and behaviours. It can lead to feelings of helplessness and therefore an opinion that changing their behaviour will be futile. An effective solution to this is a participatory problem solving approach through facilitated group learning in partnership with government agencies with respected and credible experts. Long-term sustainable change takes time and investment but innovative behaviour is more likely to occur from creative processes of identifying problems and opportunities, and developing strategies for dealing with them, than from the implementation of a package of measures developed by others.

The ADER project, which combined agricultural extension with the other three components of AKIS (research, and education and training through the Colleges and support systems such as EEDA and the NFU), ran for almost seven years. Over this period, the project team learnt how to support innovation amongst farmers through both trial and error and best practice from other projects in other countries. Their developing opinion that facilitated group learning can be a very effective tool for supporting innovation amongst farmers is consistent with the results from the literature, and ADER is an example of 'good practice' that could be implemented elsewhere in the EU.

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Wyn OWEN* and Eirwen WILLIAMS*

The utilisation of groups for innovation and knowledge transfer

The use of group processes to encourage innovation and to transfer best practice is relatively novel in the agricultural sector. However, *Menter a Busnes*, a Welsh economic development company, has been utilising this approach for over a decade. Since successfully tendering in 2011 to deliver the main elements of the Farming Connect programme funded by the Welsh Government under the Rural Development Plan, they have been developing and expanding group principles with a view to engaging a greater number of farmers for a variety of purposes and with a broad range of different groups. This paper outlines how the company initially became involved in group processes through the design and launch of the Agrisgôp programme which utilises Action Learning to develop ideas and resolve issues. Examples of some of the projects undertaken by the groups are given along with experiences relating to group dynamics and facilitation. The broader context of the current Farming Connect programme is described and the variety and nature of group processes currently being utilised for knowledge transfer is discussed. Two studies undertaken in relation to groups are outlined. The first considers whether personality can be used to predict effective facilitators of organisational change and the second involves the design and development of a mixed measures tool to quantify the impact of group processes over time. Finally some conclusions are drawn with regard to lessons learnt in relation to group methodologies and possible ways forward for the future.

Keywords: groups, Action Learning, facilitation, innovation, measuring impact, knowledge transfer

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Introduction

In a paper reflecting upon the current situation regarding AKIS (Agricultural Knowledge and Innovation Systems) (EU SCAR, 2012), the Standing Committee on Agricultural Research (SCAR) makes several comments which are pertinent to this study. The paper reports that although innovation is primarily the responsibility of individual businesses, there exists a lack of research into innovation and knowledge transfer in agriculture. Furthermore the paper suggests that the Common Agricultural Policy (CAP) needs to provide freedom for businesses to innovate and fail. Burnes (2004) reports that the successful organisations in the twenty first century are those that continually instigate change despite the fact that seven out of ten change interventions actually fail.

For the purpose of our paper, innovation is considered to mean any new technique, concept or idea that enables those who manage agricultural businesses to make those businesses more sustainable and viable in the future. Many of those involved in the Welsh Government's Farming Connect programme would agree that successful innovation is derived from support and encouragement to experiment with new developments but more importantly to reflect upon and to learn from each stage of the process. Furthermore, they would argue that the utilisation of group processes is a fundamental tool and EU SCAR (2012) concurs, stating that more of the CAP budget should be directed towards the empowerment of groups of farmers, particularly for knowledge transfer.

The potential for using groups to increase productivity and viability is enormous; organisations in both the private and public sectors who introduced group or team methodologies report increased productivity and profits as well as more effective sales and marketing; and the evidence also indicates reduced job turnover and improved staff morale (Hayes, 2006). Katzenbach and Smith (1993) contend that the only way forward for successful and ambitious organisations is the establishment of teams, which they maintain results in greater efficiency, improved ability to deal with challenging situations and increased customer satisfaction.

However, it is important to note that there can also be negative aspects to group working which managers and facilitators of groups should be aware of and take measures to avoid before they have a long term effect on the group's potency. These negative aspects include 'social loafing', where group members actually put in less effort when working in a group (Latané *et al*., 1979), 'evaluation apprehension', when working in groups prevents individuals putting forward valid suggestions for fear of negative responses (Cottrell, 1972) and 'groupthink', where a group's overwhelming desire to agree and move forward positively can lead to a dangerously unrealistic perception of a situation (Janis, 1982).

Within the agricultural context, probably one of the first successful examples of bringing groups together with a view to improving profitability and efficiency through knowledge transfer was the monitor farm programme in New Zealand. Established in 1991, the monitor farm programme focuses on one farm for three to four years and brings together a community group to consider ways of improving profitability by improving grassland management, utilising improved genetics and analysing all aspects of farm management. The group designs and develops a business plan which is monitored over the project period and because the lessons learnt are relevant to all farmers within the group the benefits of improved practice are also transferred. Specific expertise such as consultants, vets and scientists are brought in to assist the process which is all arranged and organised by a facilitator (Beef + Lamb New Zealand, 2012). This successful and innovative model utilising group processes is one on which many of the subsequent European knowledge transfer programmes were based.

Murphy (2012) reviews the current literature on group techniques and makes several comments which are pertinent to this study, namely: facilitated group learning can be an extremely effective method for developing innovation with farmers, moreover the best way to support individuals through behavioural change is to assist them to clarify the issues and then enable them to develop their own solutions. Furthermore, he notes that when compared with individual

support, facilitating groups of farmers is a more sustainable means of changing behaviour and attitudes.

The objective of this paper is to outline how group techniques can contribute to innovation and knowledge transfer in rural businesses. The group approach developed for the Agrisgôp programme is in itself innovative and its success has resulted in continued growth over a ten year period and also a broadening of its application within the Welsh perspective. Furthermore, considerable potential exists to utilise this methodology across Europe and beyond and the majority of the lessons learnt are certainly considered transferable to other geographical contexts. The authors therefore wish to share their experiences of utilising group processes with farming clients in Wales and to develop ideas that will hopefully lead to more effective knowledge transfer through group methodology in the future.

Agrisgôp rationale, foundations and development

As a result of concerns regarding declining agricultural incomes and progressive reduction in subsidies, the Welsh Assembly Government launched the Agrisgôp programme in 2003. The programme is fully funded by the Welsh Government partly through European Union funding. Agrisgôp is a management development programme for the Welsh agricultural and forestry industries, designed to develop new business ideas and instigate positive change management. As an economic development company based in Wales, *Menter a Busnes* (MaB) was initially involved as a partner organisation in the design, development and launch of the Agrisgôp programme. As a result of successful delivery and through a series of tendering stages, MaB subsequently became wholly responsible for delivering Agrisgôp and eventually substantively involved with the Farming Connect programme as a whole as detailed later in this paper.

MaB is a practical organisation, drawing on diverse experiences of working with individuals, businesses, communities and public sector organisations to develop ways of thinking, inform decisions and deliver solutions. The company has been working with the agricultural sector in Wales since its involvement with the Cwysi project in 1994.

MaB employs a network of Agrisgôp Leaders throughout Wales, who recruit and develop groups of six to eight individuals and subsequently engage with them to develop group and individual ideas and to resolve issues, typically over a period of between nine and twelve months. In her review of the book 'Seeds for Change' (Pearce and Williams, 2010) published about the Agrisgôp programme, Pritchard (2011) reports that the Welsh Assembly Government's idea to seek to establish a management development programme 'for the intensely independent, pragmatic, 'self-contained', small businesses that make up Welsh farming' was a particularly novel and ambitious concept. To date, over 300 Sets (Agrisgôp groups) have been established resulting in a host of innovative and diverse group projects across Wales whose themes include adding value to primary produce, tourism, technical development, renewable energy, effective succession, biofuel processing and a brewery. However, those who work on the Agrisgôp programme believe that equally importantly they have changed the mindsets, attitudes to change and aspirations of thousands of individuals who have been involved with the project. This pioneering method for developing the rural sector demonstrates the support of best practice in a manner which engages a potentially resistant end user in knowledge transfer and innovation.

Agrisgôp, Action Learning and other group facilitation techniques

During the initial development and establishment of the Agrisgôp programme, Action Learning (McGill and Beaty, 2001) was selected as the process best suited to the development of ideas and resolving issues within the Agrisgôp groups. To utilise Action Learning as a facilitation process with very traditional Welsh farming family businesses was in itself ground breaking and innovative and considered by some to be at best risky and at worst foolhardy. However, despite being primarily used in very large corporate institutions, Action Learning has proven to be a highly successful and flexible tool which continues to be the primary group facilitation technique used by the group facilitators – known as Agrisgôp Leaders. It has been valuable in the development of ideas and resolution of issues; moreover its group methodology involves the combination of support and challenge which is a key factor in changing mindsets and attitudes to change, aligned with the idea that it is much easier to make difficult decisions when working with others. Also, Action Learning has enabled Agrisgôp Leaders to engage a target audience with a range of abilities and knowledge and has encouraged and strengthened commitment to the process and the group.

Nevertheless MaB has also constantly researched and developed new group facilitation techniques for use in tandem with Action Learning. Agrisgôp Leaders continually introduce, trial, develop and share new and innovative informal and typically short group facilitation techniques with their groups. Research has also been undertaken into other more formal and structured facilitation techniques, for example a comparison of Appreciative Inquiry (AI) and Creative Problem Solving (CPS) undertaken with both Agrisgôp groups and groups of Agrisgôp Leaders (Owen, 2008). Twenty-four participants in four equal sized teams engaged in a day's facilitation of either AI (Lewis *et al*., 2008) or CPS (Isaksen *et al*., 2000) and team potency was measured by individual questionnaires at the beginning, at the half way point and at the end of the session. The results suggested that although there was no effect on potency at the mid-task stage, group potency was higher at the post-task stage in both AI and CPS interventions. Furthermore, potency was significantly higher in the AI teams, when compared to the CPS teams.

Although alternative facilitation methods are constantly being trialled, adapted and developed, Action Learning continues to be the preferred primary technique utilised with Agrisgôp groups. The main reasons for this are that one of the main characteristics of the Action Learning process

is a strong ethos of confidentiality, which not only very quickly establishes trust within the group but also instils commitment to the group and the process. The fundamental Action Learning process of support and challenge also creates an environment where positive change is encouraged and this consequently enables and empowers individuals to make difficult decisions because they are working with others. Furthermore, Action Learning is an extremely flexible and adaptable process and this has proven invaluable to Agrisgôp Leaders, all of whom develop their own slightly different versions – albeit still facilitating within certain important guidelines. Finally to quote the founding father of Action Learning, Professor Reg Revans, MaB experience would certainly support his assertion that Action Learning is 'deceptively simple – surprisingly powerful'.

Dynamics and developments of Agrisgôp groups

Since March 2003 more than 300 Agrisgôp groups have been recruited and facilitated in Wales. Every group is unique and they all start on a journey not knowing their destination; this is one of the challenges and also one of the key benefits of the programme. Over time, much has been learnt about the differing dynamics of groups and the importance of considering this when recruiting and establishing groups. Women and men behave differently in groups, particularly initially, as discussed below. Therefore women-only groups, men-only groups and mixed groups all have quite different characteristics. Some Agrisgôp Leaders choose to work only with groups consisting of husband and wife couples, which they maintain is the only way to progress businesses in an industry which is traditionally and still primarily family-based. Experience also suggests for example that whereas having a group of forward-thinking innovative individuals can result in rapid progress, there is also an argument for having a mix of innovative resource investigators, some more cautious considered challengers and some completer-finishers. This not only tempers the potentially risky enthusiasm of the innovators but also conversely they contribute by inspiring the other more cautious group members. Furthermore, the team has a greater spread of abilities and tendencies, decisions made are more robust and the overall distance travelled by the team can be considerably increased. This is only a small insight into differing group dynamics experienced through Agrisgôp, for example much anecdotal evidence exists for the differing dynamics, requirements and processes involved when working with groups below the age of thirty which are often although by no means exclusively groups of young men.

As all Agrisgôp groups are uniquely different, success is difficult to define or quantify, as indeed are the preferred methodologies for achieving success. MaB experience indicates that the more successful groups are those that display a greater commitment to the group, the process and to their Leader. Action Learning is considered crucial in establishing trust and commitment and also in subsequently changing mindsets and attitudes. However, the Agrisgôp team also considers successful groups to be those who continue to meet and collaborate when they are no longer supported by their Agrisgôp Leader. Therefore it is fundamentally important that groups do not become over dependent on their Leaders and that they take responsibility for the group from its inception. Ironically, for the Agrisgôp Leaders it can be particularly difficult to 'let go' and move on from successful groups to the uncertainty of a brand new group. Again, experience within the team has considerably eased this process so that the groups themselves are now given much more responsibility from the outset, a strategy known as 'starting with the end in mind'.

Not only are all groups and group members different, similarly all Agrisgôp Leaders are different, and this diversity is encouraged. New Leaders are initially given a background to the Agrisgôp programme, its aims, its rationale and its methodology. They are trained in a range of coaching and facilitation techniques including Action Learning and benefit from the experience of other Leaders and the styles and methods that they utilise with their Agrisgôp groups. However, new Leaders are then encouraged to develop their own styles to utilise the elements most appropriate to their personality, experience and groups and to trial and develop new techniques and methods. Outcomes and development of management capabilities within the clients are considered to be much more important than strictly following a particular process or methodology. Agrisgôp Leaders often report that the only thing they know for certain about their next group is that it will be totally different to any that have been run previously.

Over the last decade, many Agrisgôp groups have developed major group projects which have substantially improved the viability and profitability of the businesses involved:

- Several groups have negotiated contracts with major supermarket chains to supply their produce under a unique brand and at a premium price. The produce in question includes lamb (unsurprisingly), beef and eggs. A group in South Wales established and now run a butcher's shop in the local village to co-operatively sell the meat they produce on their farms.
- Other Agrisgôp groups have utilised the process to research, develop and implement group and individual projects relating to renewable energy including biofuel, wind power, hydro and solar initiatives. The variety reflects changes over time in legislation, political will and financial incentives as well as suitability of particular farms to certain systems, usually determined by aspect and proximity to an electricity grid connection.
- Tourism is an important industry in Wales and often linked to farming businesses so it is natural that many Agrisgôp groups have explored the possibility of developing tourism ventures including 'bed and breakfast', camping, tea rooms and retailing to tourists. One particular group established a group tourism enterprise linked to a canal in mid Wales where visitors could spend several days travelling on or alongside the canal and experience a range of activities and accommodation along the way.

- Current groups are developing a broad range of projects, for example developing and promoting the Welsh Black cattle breed, ancient Welsh cattle breeds, Welsh Mountain sheep and the Welsh sheep dog. Other groups utilise the Agrisgôp process to strategically develop projects or organisations, examples being the Young Farmers' Association and the Wildlife Trust.

It is practically impossible to outline the nature of Agrisgôp groups without resulting in stereotyping or categorising. The above is an extremely small sample to demonstrate the diversity of Agrisgôp groups. It is a common misconception that Agrisgôp is a scheme to support farm diversification and, whilst it is extremely well suited to developing initiatives linked to tourism, renewable energy or adding value to primary produce, it is by no means restricted to these types of projects. Many businesses utilise Agrisgôp to develop core business activities linked to current traditional enterprises such as dairy, beef, sheep or arable. Groups consider animal health and welfare, crop development, genetics, performance recording, conservation and new technology linked to equipment, machinery and buildings. Discussions around managing staff, seasonal variations in staffing requirements, efficient co-working with family members and succession of family farming businesses are also commonplace.

Whilst those close to Agrisgôp and with extensive experience of working in the groups would agree that the flagship projects are very newsworthy and promote the success of the project to potential clients and funders alike, the true value of the project is that it changes mindsets and attitudes and develops the individual group members in ways and to an extent that they would never believe at the outset. Therefore, the underlying rationale and fall-back position of Agrisgôp is that it is a Management Development Programme. Its aim is to develop the human resources within the client businesses with a view to assisting those individuals to manage their businesses in ways which are more profitable, viable and strategic, and ultimately more sustainable in every sense of the word. MaB has discovered that working intensively with relatively small but committed groups over a short period of nine to twelve months is an extremely effective means of achieving this.

Farming Connect overview – history and development

Farming Connect was launched in 2001 as the main support programme for the agricultural industry in Wales. It was established to deliver the best possible advice on new technologies and production techniques to the Welsh farming industry, the aim being to enable farms to diversify, improve business viability and access new markets for their products and services. The 2000-2006 Rural Development Plan programme was reported to have been particularly successful and to have supported over 6000 farm businesses in maximising their potential (Ekos, 2008).

Farming Connect was restructured in 2007 to include the Farm Advisory Service, while continuing to offer a service that supported farming families to make the most of their agricultural and forestry businesses. In 2008 Farming Connect was re-launched, offering an enhanced service made up of a mixture of fully-funded and subsidised services. The subsidised services are mainly directed at individuals and include one-to-one subsidised support to help farmers and foresters develop their farm or forestry business. The Skills Development Programme provides access to training throughout Wales, practical and regulation-linked, as well as fully-funded skills assessments which identify knowledge and skills gaps within the industry.

The fully funded services from 2008 to 2011 included sector-specific development programmes (climate change, dairy, land management, organic and red meat), enabling farmers and foresters to learn from others and to share best practice by joining discussion groups, visiting demonstration farms and attending open days in their area. Prior to 2011 the delivery of knowledge transfer to each sector was undertaken by a separate organisation. However, following a tendering process in 2011, MaB was successful in its bid to deliver an integrated, joined-up delivery service that provided one point of contact for interested farmers and foresters and established climate change as an overarching theme for all delivery. Other cross-cutting themes within the delivery include animal health and welfare, health and safety, effective use of ICT, women and young entrants.

MaB is responsible for delivering the following three Farming Connect Delivery Contracts funded by the Welsh Government under the Rural Development Plan during the period 1 September 2011 to 31 December 2013:

- Farming Connect Knowledge Transfer Programme (Lot 1)
- Farming Connect Industry Development (Event Management) and Communications (Lot 2)
- Farming Connect Co-ordinators, Skills Development and Agrisgôp Management Development Programmes (Lot 3)

MaB is therefore currently responsible for delivering Farming Connect in its entirety with the exception of the advisory/consultancy element [Lot 4] which the Welsh Government deemed in the tender should by necessity be supplied by organisations other than the one delivering the main programme.

Menter a Busnes and Farming Connect since 2011

The extensive knowledge and experience within MaB from a range of projects including Agrisgôp was used to develop the group-based methodology for developing and promoting knowledge transfer and innovation to the agricultural industry in Wales. MaB believes that group discussion is vital to the development of a deep understanding of science and policy, and to improving the level of best practice adoption. This concurs with the view expressed in the 'Sustainable Farming and Environment – Action Towards 2010' report (2020 Group, 2007, p.9):

> To encourage future collaboration, innovation and change in the farming community we believe that the Farming Connect and Agriscop approaches in terms of group working, learning and knowledge transfer should be an important mechanism.

Based on previous experience, MaB developed a wide range of group activities within the Farming Connect programme. These can be categorised as follows:

- Discussion groups. These are primarily larger groups of approximately 20 farmers who come together over the winter months to listen to experts and specialist speakers. They include 'farmer champions' within our range of speakers, as sometimes the more progressive farmers have a greater impact on the audience. These are excellent means of raising awareness amongst the farming industry on particular topics.
- Demonstration Farm groups. Based on the same principle as the monitor farms in New Zealand, these are groups that are established around a demonstration farm, with a particular view of guiding the development of a specific farm project through knowledge development.
- Women's groups. Arguably, past knowledge transfer delivery in Wales has been geared towards men. This is a common trend worldwide. Trauger *et al*. (2010) studied agricultural extension programmes in Pennsylvania and concluded (p.98) that:

  > Curricula are developed to meet the male farmers' needs, and when they do not meet the needs of women, neither the content of the programming nor their ideas about women is seen in need of revision. Rather, the woman farmer herself is framed as an inadequate fit to the programme …

  Working with women, and especially women involved in farming has always featured prominently in MaB's work. Therefore, within the current knowledge transfer programme MaB has included the *Merched y Maes* groups which aim to provide a knowledge transfer programme tailored to meet the needs of women. The delivery of technical knowledge and information is targeted towards women, who are renowned for their ability to embrace change. This is supported by the Agrisgôp experience with Action Learning, where it became evident in the early groups that women were much more open to the process and approached the group with a strong will to support the group so that it could develop successfully. Conversely, men tended to be much more sceptical, even cynical with their initial response much more likely to be 'where's the catch?' or 'what's in it for me?'
- Young Farmer groups. Establishing groups of young farmers has also been effective. The farmer's son or daughter typically does not wish to attend the same discussion group as their father. Therefore by bringing them together as a group we are able to provide knowledge transfer that is tailored to their needs.
- Workshops. Each farmer in the workshop group is encouraged to carry out a test or analysis on his/her own farm which will provide the focus for the discussions during the workshop. This personalised aspect to the discussion together with the fact that the farmer will get a free sample ensures 'buy-in' from participating farmers. Typical workshop topics include: silage analysis, soil sampling, slurry and farmyard manure analysis, fluke resistance tests, scab/biting lice tests, bovine viral diarrhoea testing and mastitis bacteriology tests.
- Study tours. Considerable knowledge can be gained when a group of individuals spends a concentrated amount of time away from their home environment and outside their 'comfort zone'. The broadening of horizons and the social discussions that can happen over a two to three day tour can lead to life-changing decisions within a farming business.
- Business Clubs. These seek to engage with those farmers who perceive themselves as 'businessmen'. The objective of the Business Clubs is to improve business performance with the primary aim of introducing benchmarking which has, historically, had a low uptake by the industry. We have found that farmers who have taken part in the Agrisgôp programme are excellent members of Business Clubs as they have already gained the trust and support of their fellow members.
- Agri Academy. This is an innovative knowledge transfer delivery mechanism aimed at the most progressive farmer. There are two strands to the Agri Academy – the Business and Innovation programme and the Rural Leadership programme. Both are aimed at developing individuals by taking them on a group based course which includes tasks, visits, inspirational talks and challenges.

The success of any group activity relies heavily on the facilitator. A strong facilitator makes effective use of available resources, including expert speakers, to support and challenge farmers to realistically assess their current situation and to base decisions on sound knowledge that is applicable to the development of their future businesses. The facilitator needs to 'understand' the farming community and relate to their way of thinking in order to communicate relevant messages. The facilitator needs to be a well respected individual within the area and needs to be able to speak the language of the people. There is also a continuous need to provide training and support for facilitators. Being a facilitator, operating on a local basis, is often a lonely experience and providing effective back up for facilitators is essential for project success. One of the key methods developed by MaB to address this is to allocate a mentor for all new Agrisgôp Leaders who is experienced and also currently working as an Agrisgôp Leader. This buddy system, whereby the mentor's role can include coach, sounding board, supporter, challenger and advisor is colloquially known, after the famous television game show *Who Wants to Be a Millionaire?*, by Agrisgôp Leaders as 'my phone a friend'.

Selecting facilitators and measuring the impact

The intention here is to briefly outline two relevant studies undertaken by MaB. The first was undertaken in 2011 as a result of the high turnover in Agrisgôp Leaders for a variety of reasons including the insular nature of the work, difficulty in recruiting groups, high levels of stress/responsibility and in many cases an overriding desire to act in a consultancy or advisory role as opposed to following the Agrisgôp rationale of facilitating groups to reach their own conclusions. Consequently, a study was undertaken with a view to considering whether personality measures could be utilised to predict individuals who would be effective facilitators of organisational change.

Participants in this study (n=37) were all either currently working as Leaders on the Agrisgôp programme or had previously worked as Agrisgôp Leaders. They completed two personality questionnaires namely a questionnaire administering the 100 item set of IPIP Big-Five Factor Markers (Goldberg, 1990) and the Myers-Briggs Type Indicator (MBTI), (Myers-Briggs, 1982). A third questionnaire was utilised in this study, namely the Consultant Effectiveness Questionnaire developed by Hamilton (1988) based on the requisite competency clusters deemed necessary for consultants working with organisational change. The questionnaire employs nine, five-point Likert scales and was completed by a manager who scored each participant according to the degree to which they believe the change agents 'measured up' to each of nine questions relating to organisational effectiveness.

Multiple regression was used to examine relationships between the dependant variable 'consultant effectiveness' and the combined effect of the other factors measured by the responses on the Big 5 and the MBTI. The main findings of this study indicated a strong correlation between consultant effectiveness and the factor of 'agreeableness' on the Big Five scale. The results also indicated a less strong yet significant relationship between 'extraversion' and 'consultant effectiveness'. However, no evidence was found that the MBTI in any way predicted effective organisational change facilitation.

The second study instigated in September 2011 came about as a result of increasing pressure from several quarters, not least the funders, to quantify the impact (financial, perspective, attitudinal and continuing) of group-based organisational change programmes such as Agrisgôp. Consequently, a mixed-measures longitudinal tool is currently completed by all Agrisgôp group members pre-, mid- and post-group and the data will be analysed at the end of 2013 when the current Farming Connect tender ends. It is hoped that this tool will become a useful indicator of the impact of the process whilst also developing knowledge regarding original means of measuring and evaluating these types of programmes. Again this outlines innovation and knowledge transfer at several levels in that the mindsets of the farmer clients are certainly being changed; however the success of this novel approach is also influential in that it changes the mindsets of the facilitators who engage with the clients and potentially the programme managers and even the policy makers.

Conclusions: the challenges going forward

What has been learnt, what is still to be discovered or addressed and how should this be best implemented? Currently the changing nature of Welsh (and European) agricultural businesses, further CAP reforms on the horizon, the perennial issues of succession for farming families, economic viability/sustainability and on-going issues with encouraging farmers to collaborate are all major issues in relation to groups, knowledge transfer and innovation. Based on MaB's experience of utilising groups for knowledge transfer and innovation as discussed in this paper, the following conclusions have been drawn to underline the main points discussed:

- Group-based processes can certainly be a very effective means of knowledge transfer and instigating innovation with farmers, not least because the combined support and challenge approach affects mindsets and attitudes to change;
- Longer-term relationships and smaller groups have proven effective with Agrisgôp in terms of farmer engagement and commitment to the group, and consideration should be given to utilising some of these methodologies with more traditional knowledge transfer groups;
- It is important to consider group dynamics when establishing and facilitating groups; with factors to consider including age, gender, proportion of innovators and size of groups;
- Action Learning as a process is in itself effective in encouraging commitment to the group with confidentiality and trust being key components in developing and sustaining this commitment;
- Whilst Action Learning is very effective as a group facilitation technique, other methods such as Appreciative Inquiry are also valuable and more research is required into alternative approaches, their utilisation and application;
- High turnover of group facilitators is common and more research is required into effective methods for their selection, training and mentoring;
- Empirically based best practice should be more effectively integrated into programmes such as Farming Connect. Furthermore, programme providers such as MaB need to become more involved in conducting such research, in implementing the findings and sharing them with a wider audience.

In summary, MaB's experience indicates that the establishment of small, close knit groups with a dedicated experienced facilitator and utilising Action Learning methodology can result in extremely effective and sustainable innovation and knowledge transfer. Analysis of the results of the longitudinal mixed-measures study will hopefully yield quantifiable evidence of the true impact of Agrisgôp methodology. However, success is currently indicated by regular feedback from the farmer clients, the on-going recruitment of new groups and the continued involvement of MaB with the delivery of the Farming Connect programme.

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Boosting the competitiveness of agricultural production in Hungary through an innovation system

The final versions of the European Union's (EU) support schemes and funding instruments for the 2014-2020 budgeting period have not yet been prepared. What is final, though, is that the ten-year Lisbon Strategy which aimed at strengthening the competitiveness of the EU ended in 2010. In addition to three priorities (smart, sustainable and inclusive growth), the recently launched Europe 2020 Strategy has set five headline targets to be reached, one of them being an increased investment in research and development. This is evidently a difficult challenge owing to the limited economic capacity of individual EU Member States. A considerable share of agricultural production activities are performed by small- and medium-sized enterprises and farmers who face difficulty in reaching the level of concentration need to gain market advantage. Consequently, it is imperative to establish a system that can maintain close connections with producers and improve innovation activities. Without such a system, a significant growth of added value cannot be foreseen in Hungarian agriculture. This paper describes a technology development system that incorporates three elements (measurement of inputs in space and time, market-focused technology development and a self-teaching information system for farmers) and that could be used in rural development, primarily in the area of agricultural production. While developing the system, we relied on experience gained from the operation of previous agricultural production systems and also considered the specific local conditions with the aim of offering a potential solution to meeting the objectives of the Europe 2020 Strategy.

Keywords: cooperation, farmers, markets, public goods

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Introduction

The driving force behind the formation of agricultural production systems capable of development has always been the challenges and opportunities emerging in agricultural markets. The 1867 Compromise established a huge food market in the Austro-Hungarian Monarchy. For Hungary this led to an unprecedented agricultural development which established a system consisting of medium-sized and large estates where mechanisation played a key role. This in turn fostered the rapid development of the domestic farm engineering industry leading to a growing need for knowledge and a deeper understanding of production. As a result, the role of agro-education institutions considerably strengthened and by the end of the century (due to the efforts of Darányi Ignác, then Minister of Agriculture) a research network was established, the traces of which can still be seen today (Romány, 2002). These institutions later functioned as knowledge transfer centres. At the turn of the 19-20th century, agriculture played a crucial role in national economies, including that of Hungary.

During the interwar period the activity of the food market was not only maintained at the pre-war level but it grew stronger, consequently boosting agricultural production. This market-driven development was fostered both by the development of local trade (market system) that had the capacity to fully supply the domestic demand and by the birth of internal trading formations (the so-called Ants Cooperative) based on purchasing activities. The increase in demand brought about by the strengthening economy laid the foundations for sustainable growth. Under the influence of market-focused production development based on the further growth of mechanisation and a stable knowledge transfer system, smaller estates could also benefit from the changes (in the following years the majority of farmers running a family estate emerged as the so-called 'kulaks').

The post-war era introduced many political constraints which also influenced ownership structures, the use of land and the method of production. As a result of the market pull, a suitable production system was built, primarily under the auspices of Dimény Imre, Minister for Agriculture and Food. The system was basically a production solution (production system) built along agricultural supply chains which in turn were based on integrators. In addition to providing inputs and professional advice based on continuous learning, it also played an important role in processing. It was the responsibility of the integrators to provide the inputs and also to gather and understand the experience gained from the production process i.e. a kind of autodidactic system took shape which monitored the expectations of the market of the mid-20th century (Dimény, 1975; Dimény *et al.,* 2004). Similar integrators (such as KITE, IKR etc.) are well known across the world in expert circles. The operation of the system required in-depth knowledge, thus the number of research institutes and universities increased. However, their high quality work was basically limited to responding to orders. As a result, a number of institutes with expert staff were established but they had neither the initiative required by further changes nor the research capacity that could have been realised in production.

By the beginning of the 21st century both the production structure and the market had undergone considerable transformation and Hungary has not yet found a production system that is suitable to meet the new challenges. Takács *et al.* (2008) and Takács and Baranyai (2010) analysed competitive virtual large estates, identified the factors hindering their development and conducted model-based investigations. Today, almost every country is characterised by the diversity of agricultural producers and estates while the most pronounced change in the past decade has been the formation and increasingly significant role of vertically integrated agricultural supply chains (Csáki, 2012).

Based on the extrapolation of the historical trends above, the present study outlines an autodidactic production system which is adapted to the present situation and prevailing conditions. It incorporates three elements: measurement of inputs in space and time, market-focused technology development and a self-teaching information system for farmers.

At present there are great market opportunities but the risks are perhaps even greater. Although the agricultural industry is still productive, it has become more fragile owing to the profit optimisations stakeholders wish to achieve at a future time and to the fact that they have been losing ground in the domestic market. This situation calls for the more active participation of researchers. Since the relationship between producers and input suppliers is to a large extent determined by space, input users are tightly controlled by a network of agents representing manufacturers and traders while their relationship is defined by the efforts of traders to maximise profits. This is unfortunate since producers have few opportunities to review the full supply portfolio and make use of the most favourable offers by comparing all the offers available on the market (e.g. minimum purchase price, best quality, etc.).

Dimény (1975) states that 'the technical development of agriculture rests on four pillars, namely biological, chemical, technical and human factors, among which technical includes mechanisation and architecture, too'. The total annual turnover of inputs (pillars) amounts to an estimated HUF 4-600 billion. On the one hand, experience suggests that the pressure exerted on the input side generates a profit margin of about 15-20% for traders and this is basically financed by producers, thus reducing the possibility for the latter to realise that profit for themselves. On the other hand, the annual subsidies allocated to the agricultural industry are mostly used by those who purchase produce at depressed price levels. Consequently, the profit realised by the agrarian sector is small and this prevents the increase in production. It is of crucial importance to improve the position of farmers and to exploit the opportunities emerging in the field of output sales. These issues also constituted the core objectives of our research. The model we developed offers a way out of that deadlock by improving the purchasing options available for agriculture, thus offering a chance to increase production.

Methodology

Economic growth is generated by continuous technical-economic innovation which is based on basic and applied research (Husti, 2009). Research (basic and applied), development, production and market together form the agricultural production system. If this connection cannot be formed within a specialty, the completed research result cannot be utilised. The essence of our method lies in the fact that in the course of research and development we concentrate on the products and services instead of focusing on the activities of various professional fields (such as research in mechanisation). The core objective of our system is to establish the ground for competitive production. The 'bridge' between the basic research and production is provided by the sector research institutes in each country. Consequently, the main task of research activities conducted in various professional fields is to improve the marketability of production and to increase added value. The organisations for applied research involved in various stages of the production process perform their activities and solve research problems with the aim of fostering success in the market. Besides the institutions conducting basic research related to arising hypotheses, farms experimenting with the realisation of research findings also play a key role (Figure 1).

This model is both a research and a production management system. The results we present observe the complexity of agricultural production including the differences in the use values of inputs applied in various fields, the characteristics of biological processes, the necessary cooperation of several different professional fields and the dynamic nature of the food market. The production management system spontaneously creates horizontal development directions as several segments may be identical in the course of the development that occurs along agricultural supply chains and activities, the management of which is then performed in a similar way. The fact that research findings are realised by the producers guarantees that R&D activities are useful and take the right direction. The research thus realised in the production process ensures its success in the market while the successful technologies introduced in this way set a 'spontaneous' example to other producers. The system has horizontal and vertical connections with the research and development centre and, ideally, each producer receives the production information that is relevant for them.

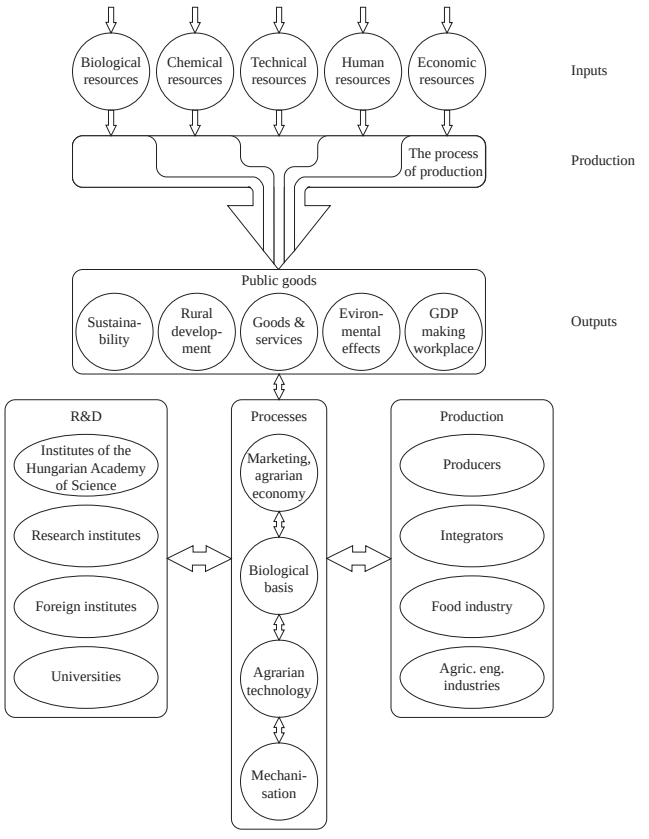

Figure 1: A model of production with the market-focused technology development system.

Results

Measurement of inputs in space and time

In order to foster efficient sustainability and economic production, we must be aware of the use value of technology which also influences the value indicators of public goods as external effects (Zheng Zhou *et al.,* 2005). The efficiency of agricultural production influences public goods as well, the value indicators of which are reflected in the environment, human health etc. Thus the analysis of the use value of inputs is given priority since these tend to change depending on the given production and utilisation conditions. Only by being aware of the multidimensional nature of use (technological) values are we able to select the most favourable input which may lead to the optimisation of utilisation (and technology).

In addition to the growth of private goods, one of the main aspirations of the new European agricultural policy is to produce more public goods and facilitate the creation of a liveable, developing rural area. By reducing and eliminating harmful environmental effects, available resources and a healthy life can be sustained. The case of public goods can be best served through innovation taking place by uniting active research, development and successful marketing activities. For example the appropriate production and use of bio-energy have favourable effects that go beyond the boundaries of the industry. The profits thus potentially available for producers are further increased by the development and improvement of trade in public goods (e.g. by reducing the emission of greenhouse gases, commercial profit and income can be realised).

The idea of utilising the local knowledge of inputs also constitutes a fundamental principle in Integrated Crop Management (ICM) (Lancon *et al.,* 2007). ICM is a system of crop production which conserves and enhances natural resources while producing food on an economically viable and sustainable foundation. It is based on a good understanding of the interactions between biology, environment and land management systems. ICM is particularly appropriate for small farmers because it minimises dependence on purchased inputs and makes the fullest possible use of indigenous technical knowledge and land use practices (Ángyán *et al.,* 2003). Since this model does not focus on technical inputs or the values defined by the common good, we need to concentrate on these issues.

Market-focused technology development

It is important that all hypotheses formulated during basic research as well as tasks carried out during applied research are linked to market-focused technology development, in other words, should directly serve agricultural production. As with chemicals and seed grains, technical and technology systems represent one of the inputs of agricultural production. Food safety, among other issues, can be effectively enhanced through the continuing improvement of agricultural technology (Popp and Molnár, 2010).

The innovation system defines the starting aims and tasks then continuously corrects them (Figure 2). So a 'self-teaching' structure has been prepared which always approximates the optimal solution. The squares with Arabic numbers symbolise the certain work-boards which carry out the above-mentioned analysis. The Roman numerals show the tasks-groups with consortium members. The first (1) group, where the market analysis takes place, should be underlined. The suggested way to start a research project is as follows:

- A coefficient is estimated (0-1 scale) which represent the value in use of the analysed expected research result (E);
- A similar coefficient is calculated which represents the difficulties of solving the process (K);
- The decision number (D) can be formed by: $D = E\,K$;
- The decision should be made by this 'D' level. If:
  - $D \leq 0.5$ the planned R&D programme is dropped;
  - $0.5 < D \leq 0.7$ detailed analysis of the estimated coefficients is conducted;
  - $0.7 < D \leq 1$ the programme is agreed.

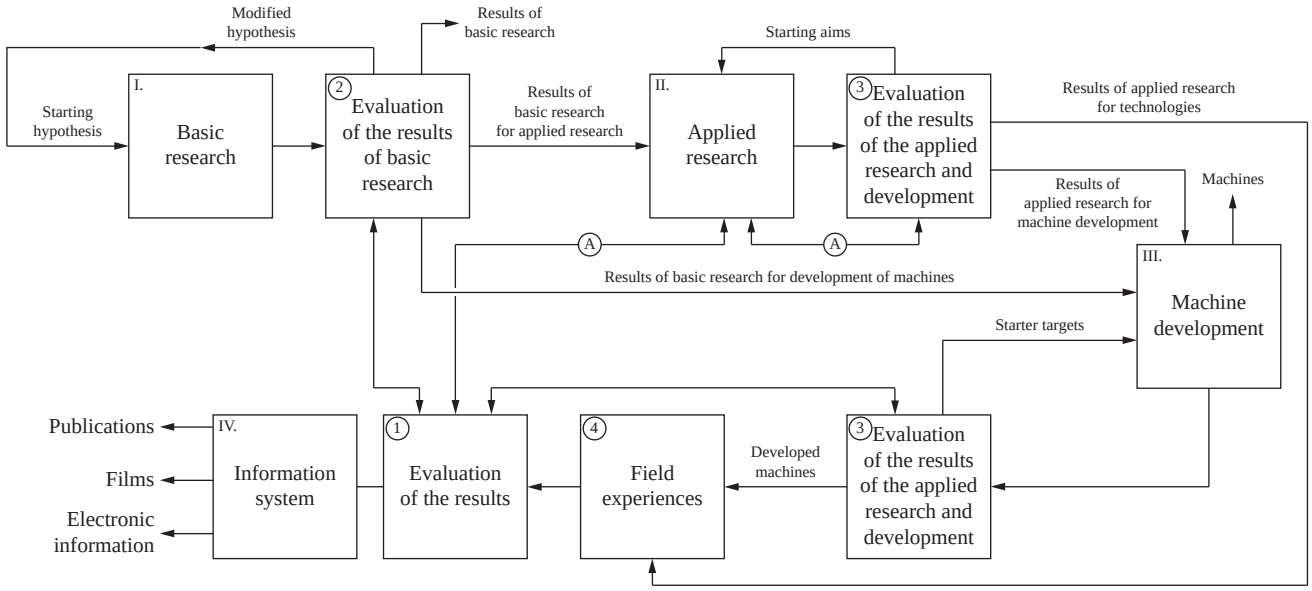

Figure 2: Managing and quality assurance system of the cooperation
Source: Redrawn from Dimény *et al.* (2004)

The method has contributed to the competitiveness of open-field vegetable production in Hungary. In the frame of machine development the main domestic invention is a special foil tuner maker and remover with salvation pipe layer. There have been excellent results in fresh green pepper technology development through which income per hectare has been significantly increased. The development of sweet corn production technology has contributed to a doubling of the yield in the last decade. So this part is the biggest in the Hungarian and European sweet corn production.

'Self-teaching' information system for farmers

A crucial element of the optimal operation system is the development of 'self-teaching' information technology (IT) consisting of traditional areas (e.g. training, professional advice, publications etc.) and electronic solutions. The central part of this development is a new digital information database that can also be conceived as a trade and production system in agriculture observing the following stipulations:

- Producers are perceived as being autonomous and equal persons and organisations who shall be empowered to make the best possible decisions and whose decisions relating to production are not restricted;
- Market relationships are a determining factor, thus activities and production shall meet the conditions defined by the market;
- The system shall also comply not only with the demands of the market but also with all of the other conditions that regulate its operation (e.g. environmental protection provisions, subsidies). Nevertheless, these basic conditions shall define only the conditions of operation and not the way the system operates;
- The system shall also act and think in the interest of the producer, providing opportunities for more successful production instead of imposing constraints with the aim of realising market benefits in each segment of agricultural production (regardless of the size of the estate, the production system, etc.).

The new IT gathers offers for its users (producers) and assists them with writing purchase and sales tenders thus forcing suppliers and buyers to compete. The number and circle of individuals offering supply may gradually increase since the system counts on new players entering the market. This leads to strengthened competition and an increase in the number of products being offered together with an improvement in their quality. Although the stakeholders of both the supply and demand markets will inevitably face competition in this system, they can also gain benefits since in this way the demand and supply markets of input products become more transparent, offering the possibility of systematic planning and a simple identification of market players which leads to more efficient trading activities. Through the information system, accurate data can be accessed about the use of inputs including their characteristics related to time, quality and quantity. The use and sales of quality products are guaranteed by quality management and standards while the faster flow of information leads to a reduction in costs. By embracing the full spectrum of producers, the system also provides the conditions for efficient information flow.

The users of the system may belong to different branches of the industry (plant production, livestock breeding or mixed farms). With the help of the system farmers may jointly indicate their intention to purchase input material regardless of their size and location. The information system motivates producers to cooperate. With the involvement of an increasing number of producers the coordination of production intensity may take place at a significantly higher, more extensive level. Cooperation may involve the harmonisation of their joint use of technical tools and a more efficient access to funds while the techniques of accessing market information would also improve. The joint coordination of research – development – innovation management tasks embracing a wider production structure provides a common ground for the application of innovation systems. Porter (2000) defined a cluster as a 'geographic concentration of inter-connected companies and institutions working in a common industry'. The cluster-based economic development model represents a synergy, a dynamic relationship and a network not only between the companies that comprise a cluster but also the successful partnering of the stakeholders in a knowledge-oriented system (Lagendijk and Charles, 1999; Gergely, 2006). The cluster organisations are not typical but some initiations have already started in Hungary.

Cooperative solutions facilitate the application of cutting-edge technological solutions and the results of innovative developments. At the same time the joint use of various types of machinery may improve the efficiency of the purchase and use of machines.

The external information transfer is based on GIS structures (e.g. land registration, animal registration systems) that cover the whole country and which also maintain the traditional forms of information provision (e.g. displays, training). The maintenance of the system would not involve additional costs since the research tasks of small- and medium-sized agricultural enterprises and their funding are mostly the responsibility of the state. On the other hand, the funds spent on these tasks could be more efficiently used since the operation of the system can be permanently monitored and its results can be easily measured.

Discussion

The system we have defined as market-focused technology development focuses on the marketing activities of the agricultural industry and on increasing the success of agricultural products. Phillips (2001), Kok *et al.* (2003) and Zheng Zhou *et al.* (2005) have also analysed market-driven production and market-oriented product development. The objectives of the system we have developed are as follows: inducing competition between input suppliers, increasing supply, loosening rigid trading structures, fostering the optimisation of mechanisation (investments, maintenance, etc.) and ensuring the possibility of appropriate technology development.

Within the framework of the system, the use value of inputs is important, i.e. what produce quality can be reached by using specific machines and how do these machines affect

the environment and the sustainability of production (in the case of technical inputs)? The system also enables us to gain valuable knowledge that enhances the development of technologies and the investigation of environmental sustainability. By becoming aware of use values, Hungary will be able to exploit its domestic conditions and capacities, leading to a competitive advantage. The potential yield could be further increased by using both the innovation opportunities driven by the market and the research opportunities generated by innovation. The most important consideration in the field of agricultural innovation is not restricted to research but it also involves the task of making the end product or a rural development service more successful through the cooperation of various professional fields. Thus, the task is to conduct basic and applied research in each field such as mechanical engineering, the results of which can be directly utilised on the market. Successful innovation can be achieved through the cooperation of universities, research institutes and producers in the course of performing each production and rural development task.

On the basis of the results of the last decade it can be established that the developed system can be effective in the Hungarian environment. The self-teaching information structure guarantees that the solution we have worked out opens the door to the intensive development of Hungarian agriculture. By reducing the distorting effects of the funding system, innovation takes on a more important role which is efficiently supported in several fields by the system (e.g. investments, optimisation of operation, reduction of costs, enhanced research activities). By introducing an up-to-date IT solution Hungary can make better use of its unique agricultural potential, providing a competitive edge for its agricultural production and food industry which in turn would have a favourable effect on the domestic input production. Production-based research leads to the birth of new technologies and machines.

Our innovation development method can be successfully applied to systems developed for arable lands, livestock breeding, energy production and rural development. The biggest beneficiary of the system is the rural area since this is where the greater part of agricultural and food production takes place and where most environmental resources are found.

As far as the international scene is concerned, the model integrates the main production trends developed outside Hungary. It contains the logical elements of the integrated agricultural production concept but it does not limit the creation of the system to a single field. Instead, it offers a solution that involves the option of spatial transformation. It fits well into the Living Lab (Eriksson *et al.,* 2005) model but, in addition, it provides for the optimisation of the stakeholders both in the field of research and implementation. The modelling module of the system is easily extendable offering the option to build into the system the advantages of organic production. Consequently the system provides a unique solution which integrates the main international agriculture development trends (e.g. market-oriented technology development programmes). Furthermore, with the harmonisation of funding systems, the optimisation of the incentives of various sizes become more precise and professionally grounded, which may contribute to the optimisation of European Union and national funding.

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João REBELO* and Dorli MUHR**

Innovation in wine SMEs: the Douro Boys informal network

Globalisation needs to be perceived by wine small and medium enterprises (SMEs) located in wine regions characterised by a terroir model as a challenge and an opportunity to innovate. The aim of this paper is to present a business strategy that can be adopted by wine SMEs located in regions with high production costs and where tradition and innovation are relevant factors to be introduced in the decision process. To achieve this goal, the case of five small wine producers (Douro Boys), located in the Portuguese conservative Douro Demarcated Region (DDR), that are adopting an informal horizontal network is presented. The conducted analysis allows us to conclude that Douro Boys is a very simple and informal structure of prospectors, with a high culture of innovation, searching for niches in international wine markets.

Keywords: Douro, wine, small and medium enterprises, organisational strategies

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Introduction

Since the beginning of the 1990s, as a consequence of the astonishing export performance of the New World countries (NWC), i.e. Australia, New Zealand, Chile, Argentina and South Africa, the long dominant and established market position of the traditional wine producing countries (France, Italy, Spain and Portugal) has been under threat. Indeed, while for the four European countries the growth in volume of exports, as a percentage of world wine production, rose from 15 to 32% between 1988-1990 and 2001-2009, an impressive growth rate, by historical standards, for the NWC this ratio rose from 3% in the late 1980s to 37% by 2009 (Anderson and Nelgen, 2011). These new countries increased the competitiveness based not only on large investments in vines, wineries and wine marketing, but also by building and disseminating knowledge among players, through close collaborative networks among businesses and including the development of supportive industry-wide institutions to create public goods in the form of generic promotion and research and development (Anderson, 2010).

The organisational strategies adopted by NWC, such as Australia and the United States (Napa Valley), to foster innovation and competitiveness in the wine industry have been used as benchmarks by the traditional European wine regions. However, due to differences in historical and cultural behaviour and production structure, the issue of adopting these strategies in Europe calls in favour of case studies. A typical example is Portugal, a small country with 11 demarcated wine regions, shared by 26 sub-regions. The oldest (created in 1756) and best known is the Demarcated Douro Region (DDR), located in the northern interior of Portugal, where the famous Port wine is produced, and based on a *terroir*[1] model (Rebelo and Caldas, 2011).

In traditional wine producing countries, it is common to debate between conservative and liberal positions (Touzard, 2010). While the conservative side emphasises a tradition and *terroir* orientation (a focus on the grape growing site and wine practices of the region), trying to restrain the legal use of technical innovations which can harm the cultural image of wine (e.g. no chips, no genetically modified wines), the liberal side, using terms such as modernity, and new technologies and brands, proposes an open use of innovations, as in other commodities, arguing that conservative positions are the source of the wine crisis. These two perspectives raise questions about the role of regulatory institutions as well as research and business strategies adopted by wine SMEs. Another question that has been highlighted is the high transaction costs associated to the top-down complementarity between grape growers, wine makers and wine traders. In fact, while the perspective of getting an *Appelation d´Origine Controllé* (AOC) label encourages players to enhance production quality, it may lead to a reduction of efforts to maintain product quality once the label has been obtained, interfering with the overall image of the *terroir* and raising suspicion amongst consumers regarding product quality.

The main aim of this paper is to present a business strategy that can be adopted by wine SMEs located in regions with high production costs and where tradition and *terroir* are relevant factors to be introduced in the decision making process. To achieve this goal, the paper presents the case of five small wine producers located in the DDR that are adopting an informal horizontal network.

Innovation and networks in the wine industry: an overview

The economic development of a country or a region is strictly linked to the innovation process**.** OECD (1995) considers four types of innovation: product innovation (which involves a good or service that is new or significantly improved); process innovation (which involves a new or improved production or delivery method); marketing innovation (which involves a new marketing method, including significant changes in product design or packaging, product placement, product promotion or pricing); and organisational innovation (introducing a new method in the firm's business practices, workplace organisation or external relations). These types of innovation can be new to the organisation or industry.

[1] *Terroir* is defined as a clearly identified and homogeneous territory endowed with a strong identity which is characterised by all of the natural and cultural resources (Rastoin and Vissac-Charles, 1999), generally backed up by a certificate of guaranteed origin label (Ditter, 2005).

From an economic perspective, research on innovation in the wine industry has followed two main approaches (Touzard, 2010): (a) the institutional analysis pointing out the influence of technology and institutions on economic changes in the industry, contributing to build economic regimes and major conventions of quality (e.g. table wine vs. AOC wine); and (b) the analysis on innovation project, such as launching a new wine, adopting a new technology or process by grape growers or wineries. The predominance of research has been the analysis of one component of the whole process of innovation, and especially on topics related with technology and product, the research on organisational models being scarce.

Together with the growth of the wine industry, in the NWC a systemic research on innovation appeared. This research was initiated by Porter (1998) in the California wine cluster and followed by studies in Australia (Alyward, 2004, 2006), Argentina (McDermott, 2007), Canada (Wolfe *et al*., 2005) and Chile (Gwynne, 2008). Most of these works (a) show that the characteristics of the wine clusters vary across countries and regions in each country; (b) underline the role of innovation systems in the emergence and high performance of these countries in the international wine market, highlighting the relationships between firms and public research centres; and (c) use the notion of cluster in order to assess the relationship between economic players (grape growers, wineries, traders etc.), research and development, government and professional organisations.

Following the example of the NWC, the European Union (EU) also developed research using the cluster approach, examples being in France (Ditter, 2005; Remaud and Couderc, 2006), Spain (Larreina and Aguado, 2008), Italy (Morrison and Rabelloti, 2010) and Portugal (Rebelo and Caldas, 2011). The generality of these studies are mainly concerned with the analysis of the regional innovation systems, paying little attention to the networks between SMEs as a winning strategy in a globalised wine market.

The literature suggests that it is relevant to know more about the innovative behaviour of SMEs, specifically for those located in traditional wine regions, where the connection between tradition and innovation is crucial for international competitiveness. Generally, innovation is framed and fostered at a higher level but occurs at the firm level within networks (Caffagi and Imacieli, 2010), in the sense that it is characterised by a common collective interest that can, or not, coincide with individual ones, and a contractual design (formal or informal) that needs to solve conflicts of interests concerning both the means and ends of the coalition. Distributional conflicts concerning the allocation of benefits, costs and risks among the partners may also arise, influencing the incentives to integrate the network. In terms of structures and governance the networks need to be adapted to the external and internal environments that shape the observed activity of the main players and above all the trustiness between them.

In the wine industry the networks, either vertical or horizontal, are more frequent in the upper part of the chain, linking grape growers and wine makers, i.e. production networks, but are also found in stages of distribution and supply of services (Caffagi and Imacieli, 2010). The wine networks can be contractual, organisational (e.g. cooperatives, for profit and not-for profit enterprises) and mixed. Contractual relationships tend to be relatively more informal than organisational, using not highly detailed contracts. Contracts, even oral, are generally enforceable, litigation is low and disputes are normally solved through negotiations and not through the judicial process, reducing the transaction costs.

As a business strategy, the adoption of a specific network depends on the characteristics and profile of its members. Based on a theoretical review, Remaud and Couderc (2006) characterised the wine SMEs profile according the firms' behaviour as (a) *defenders*, firms that strive to protect their mature markets and their main objective is to improve competitiveness; (b) *prospectors* or searchers for new market opportunities, improving constantly the product portfolio and basing their activity on a strong culture of innovation and entrepreneurial orientation; (c) *analysers*, firms that search for stability of their offer, preferring to stay and compete in low competitive markets and being well prepared to respond to unexpected market changes; and (d) *reactors* or firms that show passive behaviour and a complete lack of strategy for searching for new markets. They conclude that a differentiation strategy based on prospector behaviour and on product quality image is more profitable that the one based on defender, analyser or reactor behaviour.

The Demarcated Douro Region

Archaeological records indicate the presence of vineyards in the Douro region since Roman times. However, the emergence of the present DDR dates from 1756, when it was recognised as one of the first demarcated regions in the world, already applying a legislative framework similar to that currently used in the most famous traditional wine regions. The DDR is a region where the *terroir* characteristics are present, as clearly expressed by UNESCO which classified part of this region as a cultural evolving landscape and a world heritage site, according to the following criteria: *(iii) The Alto Douro Region has been producing wine for nearly two thousand years and its landscape has been moulded by human activities; (iv) The components of the Alto Douro landscape are representative of the full range of activities associated with winemaking - terraces, quintas (wine-producing farm complexes), villages, chapels, and roads; (v) The cultural landscape of the Alto Douro is an outstanding example of a traditional European wine-producing region, reflecting the evolution of this human activity over time.*

The DDR covers an area of 250,000 hectares, of which about 18% is occupied with vines. According to the Centre for the Research, Study and Advancement of Mountain Viticulture, the DDR is the largest and most heterogeneous mountain wine region in the world, characterised by valleys strongly embedded by steep high slopes along the Douro river and its tributaries, dominated by shale and cold winters, hot summers and low rainfall. We are in the presence of hillside vineyards, more than 40% of the vines being in plots with a slope steeper than 40% (Quaternaire Portugal/ UCP, 2007), which makes mechanisation very difficult and requires manual labour, consequently leading to high production costs. As with the oldest wine regions of Europe, the

Table 1: Wine production in the Douro Demarcated Region, 2005-2009.

Year	Port wine (hl)	Still wines (hl)	DDR Production (hl)	Port wine / DDR production (%)	Port wine / Portuguese production (%)	DDR production / Portuguese production (%)
2005	845,169	873,604	1,718,773	49.2	11.6	23.7
2006	867,107	850,766	1,717,873	50.5	11.5	22.8
2007	877,405	562,786	1,440,191	60.9	14.5	23.7
2008	871,864	502,047	1,373,911	63.5	15.3	24.2
2009	773,718	552,657	1,326,375	58.3	13.2	22.6

Source: Authors' computation from data collected by the *Instituto de Vinho do Douro e Porto* and the *Instituto da Vinha e do Vinho*.

property structure in the DDR is skewed. The 45,160 ha of vineyards are distributed amongst 39,506 viticulturists, an average farm size of 1.14 ha. However, roughly 35% of the DDR area is owned by just 810 viticulturists, an average of 19.7 ha. Most of these farms belong to wine producers and traders of Port wine. In contrast, most small and medium size viticulturists are members of wine cooperatives (Rebelo *et al*., 2010).

Two categories of wines are produced in the DDR: Porto wine and still wines. The regulatory entity (*Instituto de Vinhos do Douro e Porto - IVDP*) supervises the production and commercialisation of both wines. Historically the main production of the region is Port wine, a product highly regulated[2] since the creation of the DDR. In recent years the total annual DDR production has averaged 1,515,425 hl (an average of 34.6 hl ha^{-1}), around 24% of the Portuguese wine production (Table 1). Port wine represents 55% of the DDR production and 13% of the domestic production.

Port wine and still wines have different market positions. The Port wine has a story of more than two centuries of being exported, albeit with cyclical movements. Recent data (Table 2) shows that presently the Port wine is witnessing a negative phase, expressed by a 11% sales decrease in volume and 13% in value between 2009 and 2005 (Rebelo and Caldas, 2011). The domestic demand remained relatively stable, around 13-14%, in quantity and 15-16% in value. Unquestionably, it is a globalised product, sold around the world, although the main market is the EU followed by the United States and Canada.

Regarding still wines, only a part of the total production is sold as AOC wines (Table 3). In the 2005-2009 production period, the share of AOC in still wines increased, reaching the maximum (71%) in 2008. The remaining production (table wine) is essentially vinified by cooperatives (Quaternaire Portugal/UCP, 2007). In 2009, the exports of the DDR´s AOC wines represented around 26% in volume and 30% in value, with an average price per litre of EUR 2.97 in the domestic market and EUR 3.59 in external markets, averaging EUR 3.13.

Over the last five decades, important structural changes have occurred in the DDR wine industry, making it more horizontally/vertically integrated. In the 1960s, the formation of cooperatives introduced significant changes in the supply chain, becoming intermediaries between viticulturists and traders. Until the mid 1980s these cooperatives were mainly focused on vinification and storage activities, selling almost all of their wine production in bulk to traders. After the entry of Portugal into the EU in 1986, cooperatives began to sell in bottles, especially still wines. Moreover, firm concentration accelerated in the Port wine sector (Rebelo and Correia, 2008) along with the upstream integration of traders, who planted new vineyards and built new wine facilities. At the same time the still wines witnessed a phase of downstream vertical integration, since the larger grape growers also became wine producers, yielding the so-called wines of *quinta* (farm).

Following the complex nomenclature adopted in the DDR, the IVDP registers 81 entities with economic status in the Port wine subsector and 269 in the still wines subsector (Quaternaire Portugal/UCP, 2007). Concerning Port wine,

Table 2: Sales of Port wine, 2005-2009.

	2005	2006	2007	2008	2009
Domestic market					
Volume (hl)	129,330	130,860	128,430	125,100	110,160
Value (10^3 EUR)	63,029	64,224	61,704	59,578	51,874
EUR $litre^{-1}$	4.87	4.91	4.80	4.76	4.71
Exports					
Volume (hl)	807,750	785,250	814,050	767,070	725,940
Value (10^3 EUR)	341,930	331,685	342,550	316,222	300,266
EUR $litre^{-1}$	4.23	4.22	4.21	4.12	4.14
Total					
Volume (hl)	937,080	916,110	942,480	892,170	836,100
Value (10^3 EUR)	404,959	395,909	404,254	375,800	352,100
EUR $litre^{-1}$	4.32	4.32	4.29	4.21	4.21

Source: IVDP (www.ivdp.pt)

Table 3: Sales of in the Douro Demarcated Region, 2005-2009.

	2005	2006	2007	2008	2009
Domestic market					
Volume (hl)	230,481	268,956	308,520	279,369	222,453
Value (10^3 EUR)	51,866	62,374	70,070	70,645	66,156
EUR $litre^{-1}$	2.25	2.32	2.27	2.53	2.97
Exports					
Volume (hl)	49,545	58,140	69,822	74,646	77,202
Value (10^3 EUR)	16,853	20,717	25,243	26,977	27,680
EUR $litre^{-1}$	3.40	3.56	3.61	3.61	3.59
Total					
Volume (hl)	280,026	327,096	378,342	354,015	299,655
Value (10^3 EUR)	68,719	83,091	95,313	97,622	93,836
EUR $litre^{-1}$	2.45	2.54	2.52	2.76	3.13
Sales of still wines / Production of year	0.32	0.38	0.67	0.71	0.54

Source: IVDP (www.ivdp.pt)

[2] The grapes used to produce Port wine are selected according to quality criteria based on a scoring method that considers soil, climatic and other agricultural parameters. Based on sales, stocks, yields forecasts and commercialisation expectations, every year the IVDP issues the 'statement of grape harvest' or *Comunicado de Vindima*, defining the amount of must that can be used in Port wine production (*benefício*) and how it is distributed by plots.

31 are traders (firm or group of firms that trade wine products, including grapes to process, in bulk or retail), and 50 are wine producers (firms that make and bottle wines from fresh grapes from its own farm or bought from other grape growers, but assuming the exclusive responsibility for the final product, the bottled wine). In the case of still wines, 196 are wine producers, 42 are traders and 31 are wholesalers (firms or groups of firms whose activity include the wholesale of wine and by-products of wine, in bulk or bottled). Some players have simultaneously more than one statute.

Rebelo and Caldas (2011) concluded that, as with other traditional European wine regions, the DDR shows a typical *terroir* model where (a) the number of critical actors is low and the firm size is dominated by micro and SMEs; (b) there is some innovation, albeit not continuously, classified between low and high, that can be fostered through an increase in the level of trust; (c) the levels of skills and technology are medium-high; (d) there are some links between the players of the cluster, but the knowledge transfer circuits can be improved and more extensive; (e) there is some cooperation between the players; (f) during recent decades the segment of still wines suffered important changes and the exports are inserted in the medium-high segment; and (g) cooperation through networks between the different cluster players needs to be amplified for a generalised and improved diffusion of knowledge and skills.

The Douro Boys informal network[3]

With Portugal's entry into the EU in 1986, a high number of DDR grape growers started to develop their own labels and bottle their wines rather than selling the grapes to Port wine shippers as they had done for nearly two centuries. These new start-ups produced predominately red still wines. While these new brands made by well known Portuguese consumers found heavy demand in Portugal, the entry into international markets became quite difficult, as the Douro wine region was not known at all, and therefore did not represent a category to be included in the wine lists and shelves.

In 2003, five top-quality wine producers of the Douro region (Table 4) discussed how they could pool their efforts to gain more weight and importance in the international market. The decision was taken to concentrate on public relations (PR) only: events, press releases and communication for wine experts (such as media, trade and gastronomy) in the target markets. The group also decided not to build an association or formal organisation – the Douro Boys were and are an informal network: just five firms that on some occasions show their wines together, and in many others work individually and even compete against each other to gain market share.

Table 4: Main economic characteristics of Douro Boys' members.

Name	Description
Quinta do Vallado	Quinta do Vallado was first mentioned in 1716. Since its foundation and until 1987, the main activity was the production of Port wines (Ferreira). After 1990 the main activity became the production and commercialisation of still wines, under the brand 'Quinta do Vallado'. When starting with the Douro Boys project in 2003, Quinta do Vallado was cultivating a total wine growing area of 63 ha. In 2011, 105 ha of vines are cultivated. In 2009, the winery was increased and a new fermentation warehouse and aging warehouse, with a capacity to hold up to 1,200 barriques, were built. In 2005 Quinta do Vallado inaugurated a 'Country Hotel' in the historic main Quinta building. In 2012 more guest rooms will be added.
Niepoort	Niepoort was established in 1842 and was a classic port wine shipper until the late 1980s when it opened a still wine range. In 1987 Niepoort started to have vineyards on its own (25 ha of old and new planted vineyards). The first red wine 'Robustus' was vinified in 1990. Redoma, Batuta, Charme and Vertente followed in the upcoming year. Now the vineyard area is 70 hectares. The wines of Niepoort were already known in international markets before the foundation of the Douro Boys. Niepoort itself has created a new table wine with exciting labels for each different market, Diálogo in Portugal, and set the base for an export success with this typical Douro wine. Since the 2007 harvest, the wines are vinified in a new and luxurious winery in terms of space: throughout 5,000 m^2 of space, there is plenty of room for many small details that function perfectly and are remarkable in quality.
Quinta do Crasto	Quinta do Crasto was first mentioned in 1615. Since 1994 it has been an independent self-marketing quinta and, apart from the Port wine, for every Douro quinta, started with red wine vinification. Now, only the very best Port wines are bottled under the label of Quinta do Crasto, the remaining wines are sold in bulk to Port shippers. In 2002 the vineyard area was 70 ha, now it has increased to 230 ha. Besides the winery, Quinta do Crasto is also investing in wine tourism, in 2011 opening a wine shop.
Quinta Vale D. Maria	The history of the brand 'Quinta Vale D. Maria' started in 1995, when Cristiano van Zeller purchased his first vineyard 'Quinta de Vale de Mina', to which he added Quinta do Vale Dona Maria in 1996. In 2002 he had 15 ha of vineyards. Now he produces wines from 40 ha. In 2010 a guesthouse was constructed and the old lagares remodeled along with the construction of a new press house and a maturing cellar.
Quinta do Vale Meão	The history of Quinta do Vale Meão dates back to 1877. In 1998 Francisco Javier de Olazabal, former president of A. A. Ferreira, and his son developed the project 'Quinta do Vale Meão' and launched the first wines in 1999. The area of vineyards increased from 50 ha in 2002 to 81 ha presently. The winery is also modernised.

Public relations strategy

The fact that the Douro region was not known for the production of still quality wines can be considered an advantage: the image and positioning of the region was not set. Port wine is connected mostly with the big traders (or shippers), not to the *terroir*, who dominate the world market and very often led to heavy price competing wars. From the very beginning it was clear that the group would focus on (red) AOC wines and adopt a 'top down' strategy: positioning the Douro as a high-end wine region and as a new discovery for wine experts and wine lovers.

The PR strategy was split in two chapters: All 'theory' (communication about the wines themselves) has to be very serious, rather technical, trying to explain the natural and scientific background conditions of the very individual character of Douro wines. In contrast, the 'praxis' (moments of

[3] The contents of this section is mainly based on knowledge that the co-author Dorli Muhr gathered as a consultant in the conception, design and implementation of the Douro Boys project and also in unstructured oral and written information provided by each firm of the group.

where and when the wines are consumed) will be relaxed, informal and driven by friendship. The 'informal' praxis was an important differentiating decision. The 'serious' and more scientific approach to wine is usually adopted by French châteaux or big companies that serve and consume wines (black tie dinners, elegant cocktail receptions). The five wine producers wanted to highlight their small family-owned structures and their direct connection to the earth by a more relaxed and distinctive attitude. It was agreed that no artificial title should be created for the group. As the main goal was to 'put the Douro on the map' it was clear that 'Douro' should be the focus of their title. Adding 'Boys' to the Douro was the way to highlight the informal attitude.

Douro wines are not 'easy drinking' ones. Due to their high acidity and tannin contents they are mostly appreciated by experienced wine lovers. Therefore it was agreed that PR efforts should focus primarily on mature markets (Western Europe, United States) as well as on Portuguese speaking countries/territories (Brazil, Angola, Macau), where the character of Douro wines is already known. Within those markets 'generation treaters' (experienced wine lovers with high knowledge and regular consumption of rather expensive wines) are the chosen target group.

Public relations activities and outputs

Activities and outputs consist of 'theory', 'praxis' and 'press support', as follows.

'Theory': an in-depth presentation was created that explains the very special climate and soils of the Douro, the great potential of the original varietals, the historical development of the Douro wine industry, as well as the individual manners of wine making in Douro. This presentation is shown to the trade, to the press and to the sophisticated sommeliers in seminars and workshops around the world in order to provide them with sales support, stories and background data. Wine professionals in all leading markets attended seminars in Germany (Hamburg, Munich, Frankfurt, Düsseldorf), Switzerland (Zurich), UK (London), the United States (New York, Washington, Chicago) and Denmark as well as in Angola, Macau, Japan, Hong-Kong and Shanghai.

'Praxis': the Douro Boys have become famous for their parties and unconventional events. Legendary is a 'pool party' organised regularly during the Vinexpo in Bordeaux. While most companies with high-end wines focus on high-end events, the Douro Boys invite their customers to jump into the refreshing water and have a relaxed garden party in swimming trunks instead of wearing white ties and formal dresses.

'Press Support': little was known about the Douro and only a few people have visited this spectacular and world heritage region. Therefore the most important duty was to deliver tailor-made information to the press and, most of all, impressive pictures. When the Douro Boys started their press relations, in 2003, from the very beginning they achieved a sensational media output due to PR material that was perfectly adapted to the requirement of wine and travel journalists. In the past eight years the wines of the Douro Boys members have been highly rated in national and international magazines and newspapers, and have won many awards (Muhr and Rebelo, 2011).

Economic evolution and self assessment

Closely related to the Douro Boys PR strategy and inherent increase in wine sales, its members have been expanding their production capacity, both in terms of grapes and winemaking facilities. Until 2010 the Douro Boys together have grown from 240 to 526 ha of vineyards, and from 460,000 to 2,300,000 of bottles of still wines.

In terms of market, in 2002 the domestic and export markets had almost the same weight and the average ex-cellar price per bottle was almost the same in both. Comparing 2010 with 2002, the average ex-cellar price per litre for export has fallen from EUR 6.42 to EUR 4.68 (to the DDR, this price is EUR 3.13). But the exports in bottles increased from 200,000 to 1,450,000 and in value from EUR 1,300,000 to EUR 7,000,000. In 2002 the exporting destination was Europe (UK, Germany, Switzerland and the Netherlands) and the United States. Until 2010 the Douro Boys increased the range of exporting countries mostly to Europe, Brazil, China and the United States. Otherwise, some of the Douro Boys created special brands for the world market with a slightly lower export price, assuming a clear top-down strategy, i.e. they started to increase their image in the exporting countries and sold mostly high-priced wines, than sold wines with lower ex-cellar prices, and increased both bottle units and value. Some of them have 'only' doubled their sales in bottles since 2002, but ex-cellar prices have increased as well. Relative to the domestic market, while the production has increased by 227%, the average price per litre is almost the same (2002: EUR 7.17; 2010: EUR 6.91, 2.2 times the average DDR price).

As nine years have elapsed since the beginning of the network and the size of the firms has increased significantly, each firm was asked to make a brief, critical analysis of the coalition, highlighting most relevant aspects as well what should be the path and future developments, taking into account the present international wine environment. The opinions expressed are as follows:

- **Quinta do Vallado**: "*Although built in 1716, and belonging to the same family for many generations, the first real challenge, in terms of the marketing of our wines, only happened approximately 20 years ago. In fact, until then, our activity was limited to the production of Port wines, which were sold 'in bulk' to our family's Port House- Ferreira. But when we decided, in the 1990s, to start a new project, involving not only the production, but also the bottling, and marketing of our wines, focusing on dry wines, and with a new brand, we soon found out that we were too small, and with limited means, to show to the world a new brand, from a region which was not 'on the map' for still wines. By chance, we found out that, at the same time, a few other producers, with similar size, and 'business culture', were facing similar challenges. Therefore we joined our forces. The idea was good, we made a plan, and it was successfully implemented, namely: access to the most influential wine experters and ratters, travel and generalist media in the world; great exposition in these media; great ratings to our wines, result of the quality, but also of the public 'exposition'; strong contribution to*

the image of the 'Douro Valley'; strong impact in the recognition, and image, of our brands. And all this was achieved with 'limited and affordable' means". (João Alvares Ribeiro, Quinta do Vallado).

- **Niepoort**: *"Niepoort was always a small company that did not own any real estates (not even the lodge in Vila Nova de Gaia). The change started by buying the Quinta de Napoles in 1987 to produce ports and still wines. In the first phase (1987 to 1999) Niepoort had no financial resources and made everything under bad conditions. Phase 2 (until 2004) created better conditions for making and aging the wines. Phase 3 started with the entrance of a fine oenologist, Luis Seabra, and going more and more natural and making better, finer more distinctive wines. Phase 4 consists in building a new winery at Quinta de Napoles and buying the Osborne Cellar in Villa Nova de Gaia, both, giving space, capacity and logistic capacity to grow.*
  Creating the group of Douro Boys was important for the Douro, for Portugal and for Niepoort in helping the Momentum of phase 3 and phase 4. Niepoort more than doubled turnover from 2002 to today and is about 4 times the size in turnover from 1987. The Douro Boys have done more for Douro and Portugal in seven years than all the other producers together in 20 years. The great thing about the Douro Boys is the fact that we are not too many. We have five fantastic wine producers each with a different style, which is important and healthy. We got a driving force that keeps the 'organised' and working in the right direction with meticulous work and creative actions". (Dirk van der Niepoort, Niepoort Vinhos).
- **Quinta do Crasto**: *"The new marketing project of Quinta do Crasto started in 1994, with the first production of a still wine and selling older stocks of Vintage and Late Bottled Vintage Ports. Until 2002 we had great challenge and tremendous efforts to succeed in the international market, once Portuguese and Douro wines were practically unknown. With the creation of the Douro Boys new opportunities came along and we were able for the first time to gain access to key media and opinion makers in the wine world. With the recognised high quality of the Douro Boys wines, although some wines are produced in very small volumes, we were able to create a critical mass for Douro wines around the world and today we can clearly see very positive results, although there is still a great deal of work to be done. With the unique natural conditions of the Douro Valley, our indigenous native varieties and historical background of each of our family Quintas, we can certainly aim for higher goals in the future and the potential is enormous"*. (Miguel Roquette, Quinta do Crasto).
- **Quinta Vale D. Maria**: *"At the end of 1993, when leaving do Port producer Quinta do Noval, it was my ambition to contribute to the development of independent producers in the Douro, thus not only contributing to the establishment of a new and strong wave of innovation in the region, but also complementing, and at the same time diminishing, the region's dependence on Port wine. The richness of the Douro Region and its promotion could be developed into new fields using the different characteristics that make it unique in the world - its geography, soil and microclimate; the numerous different high quality native grape varieties; the different style of wines those grapes can produce, from all styles of Port and other fortified wines (Muscatels) to white and red still wines; all the different Quintas and their ancient history. All serve to accentuate and enhance the uniqueness of the region.*
  Following these guidelines, I started to develop different wines and Ports produced exclusively from grapes grown in different Quintas. After having started, in 1994, helping projects owned by different wine producers, namely Quinta do Crasto and Quinta do Vallado, it was natural to start looking at having my own vineyards. Quinta do Vale D. Maria was acquired from my wife's family in 1996. Here, with its old vineyards full of an extraordinary diversity of grape varieties, I was able to consolidate the idea of the Douro's uniqueness in producing completely differentiated wines of a world class quality. This was achieved also by complementing the most modern oenological technology with the most traditional way of making wines in the Douro: using lagares and foot treading. Both at Quinta Vale D. Maria and at the other projects I was working with back then, it was very clear to me and the rest of all our friends that only a full cooperation between all of those in full motion in the Douro, Niepoort and later in 2001 Quinta do Vale Meão, would enable the region and all of us to create the sufficient critical mass to present ourselves into the world of wine with the maximum strength.
  The birth of the Douro Boys came as the natural step by turning the original very informal cooperation between all of us into a more formal, organised and thus effective group of producers. As a group we were able to spread our actions across the wine world, both together and in our different individual travels. We were also able to show around that the Douro wines' quality was not just a matter of luck or individual achievement but a real movement across the region, with a capacity to extend many different quality brands around the world". (Cristiano van Zeller, Quinta Vale D. Maria/Van Zellers & Co).
- **Quinta do Vale Meão:** *"When the Douro Boys project started we had just launched our first wines one year before, so practically for us there is no 'before and after'. Wine is probably the most scrutinised product in the world. When you aim at the high end of the market you must gain access to the different media that deal with wine in order to have your wines favourably reviewed, and this implies not only a total commitment towards quality but also to attract the attention of those media. The Douro Boys formula has proved to be very effective since we obtained coverage in the media that would be unthinkable if each of us would act individually and definitely contributed to 'put the Douro on the map'. Our main strengths are*

the quality and originality of our wines but also the historical background of our Quintas and our families, the attractiveness of the Douro landscape, and the fact that our visitors are welcomed by the very owners of the estate. I see the use of social networks and the promotion in the emerging markets (Far East, South America and Eastern Europe) as the main opportunities we should exploit". (Francisco Javier Olazabal, Quinta do Vale Meão).

Conclusions

Globalisation is a challenge but also an opportunity for the wine SMEs located in regions characterised by a *terroir* model. The literature review shows that inter-firm networks are able to take advantage from knowledge-based interdependence, connecting the several enterprises as knots of the networks. This normally creates an environment in which participants are prone to cooperate and discouraged from exiting or defecting. For it to be profitable and enforceable is necessary to adopt an adequate governance model.

The Douro Boys case shows how a very simple and informal network can be the engine of a sustainable development of small wine producers located in an old, traditional and unknown wine region. This informal association has been active in the international wine market through collective presentation of its wines in tastings, fairs and other events. A coordinated strategy for the distribution of wine abroad is not an objective and has appeared only by chance. The possibility of more formal coordination has been discussed, but not advanced, due to the difficulties in defining and sharing reciprocal obligations, both in terms of costs and benefits.

The positive economic results of the initiative can be associated with (a) a clear objective (concentration only on public relations, essentially in marketing differentiation) and an adequate model of governance (simple and informal network); and (b) members that are prospectors (looking for new market opportunities), having a strong export orientation and a high culture of innovation on product, process and marketing.

The authors are aware that the paper only presents an exploratory analysis of a complex issue that deserves more empirical research, for instance via standardised interviews of actors (grape growers, wine producers, distributors and retailers) with different viewpoints and subsequent statistic and econometric analysis.

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Agroeconomic Book, published 2012

The study summarises the assessed impacts on agriculture in Hungary of the changes to the Common Agricultural Policy for the period 2024-2020. It gives an insight into the agricultural policy analysis and the modelling work carried out by the Research Institute of Agricultural Economics, which can provide a basis for developing the country's negotiating position.

ALICZKI Katalin

The expected impact of the upgrading of battery cages on egg production in Hungary

Agroeconomic Study, published 2012

The change in the legislative requirements regarding the type of cage has caused a transformation in egg production in the European Union (EU). The cage egg producers are obliged to make very costly investments to meet the welfare needs of hens. The consequent drop-out of the producers who are unable to finance the transition has radically changed the structure of egg production in the EU: the number of layers and the production of eggs have declined, and this has affected the price, the external trade and the processing of eggs. We studied the impact of the regulation on egg production in the EU and Hungary.

JANKUNÉ KÜRTHY Gyöngyi

The support indicators of Hungarian agriculture based on EU internal market prices between 2000-2010

Agroeconomic Study, published 2012

The study presents the most recent modifications of the OECD's PSE/CSE subsidy indicator system and analyses the trends in Hungarian agricultural supports between 2000 and 2010. Its main purpose is to compare the level of support for agriculture before and after Hungary's accession to the European Union (EU). In order to carry out an objective analysis of the two periods, Hungarian farm gate prices and the EU's agricultural prices have been compared. Except in 2004, the MPS (Market Price Support), which is the price gap multiplied by the quantity of produced or consumed products, was negative during the entire period, which means that the Hungarian producers' prices were lower than the EU's prices. But the budgetary payments compensated for this; the direct support provided to agriculture increased from 2000 to 2010, therefore the Hungarian PSE indicator also increased. The percentage PSE was 6.5 per cent prior to Hungary's accession to the EU in 2004 but increased to 15 per cent in 2010. The structure of the Hungarian agricultural support system changed dramatically during the surveyed period. Prior to 2004, most of the budgetary payments were subsidies linked to commodities, but the role of these payments has since been reduced. Our conclusion is that owing to the lack of sound demand and the decline in the standard of living, the difference between Hungarian and EU agricultural prices has rather increased, encouraging imports. Sectors which received significant support before 2004 still suffer from the consequences of the previous favourable position and still have to adapt to the new situation.

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