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Learning and Innovation Networks for Sustainable Agriculture: processes of co-evolution, joint reflection and facilitation

Editorial

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There is growing recognition that the technological and organizational solutions the agricultural sector has undertaken in the past are not always compatible with the constraints and opportunities that the rural economy and society will face in the next future. This has generated an increased emphasis on transition towards new business, technological and policy models that address the challenge of sustainability. Innovation is key to transition, but the institutions that are charged with fostering innovation are often locked into old approaches and methods of intervention. The linear view of knowledge transfer as a top-down process from research to advice and practice is still predominant. Increasingly, this view is challenged and partly replaced by systems approaches in which agricultural producers are seen as important actors, rather than merely consumers of technologies that are generated by agricultural research and development and transferred by extension services for subsequent adoption.

Such a systems approach has been discussed and further developed in this Journal (see e.g. the special issue 2014 (3) edited by Koutsouris and Cristovao; and Knickel et al. 2009) and in other publications, including Röling and Engel 1991; Hall et al. 2003; Sumberg and Reece 2004. The systems approach has also inspired a recent document of the EU Standing Committee of Agricultural Research (EU SCAR 2013) and many of the aspects of this approach can be found in the recent European Innovation Partnerships policy (EU Commission 2010).

This special issue synthesizes the findings of the three-year European funded research project SOLINSA “Agricultural Knowledge Systems in Transition: Towards a more effective and efficient support of Learning and Innovation Networks for Sustainable Agriculture” (GA No. 266306). The special issue assembles papers that explore new ways of learning and knowledge co-production for sustainable agriculture and rural development and critically reflect the role of research and policy for supporting sustainable innovation in rural Europe. In particular, it discusses the institutional aspects of joint learning and reflection in what has been coined as Learning and Innovation Networks for Sustainable Agriculture or LINDA, and how joint learning and innovation in these LINDA has actually been supported and can be supported to further enhance sustainability. . For this matter SOLINSA specifically evaluated the evolvement of interactions between LINDA and publicly funded research,

education and extension services or AKS and how AKS as a support system can be further enhanced. Over a period of two and a half years, 17 LINSA were studied in eight countries (and one pan-European LINSA), applying an action research approach.

The approach

The SOLINSA project started from the awareness that the new understanding of innovation for sustainable rural development is far from being consolidated in Europe, and less so at national and regional levels. LINSA have developed in response to the changed knowledge environment and, in many cases, outside and not seldom in conflict with the AKS in place (Brunori et al., 2013). This special issue therefore in particular looks at the institutional aspects and processes of learning and innovation networks for sustainable agriculture and rural development.

Basically, a network consists of individuals and organizations and the relations between them (Wasserman and Faust, 1999). The strength and power of network members (actors) is determined not only by their individual resources, but moreover by the relations they establish with others. A network can thus be seen as a relational pattern through which material and immaterial resources flow. Not only direct and strong ties of one actor to another (powerful one) are relevant, but also indirect ties and weak ties play an important role for the strategic use of network structures by an actor (Granovetter, 1973).

In institutional economics, the conceptual metaphor of a network is used to describe a specific form of market organization that is in contrast to hierarchical organization, and in which horizontal relationships are more important than vertical ones. Following recent concepts of innovation as a systemic activity (e.g. Knickel et al., 2009; Klerkx et al., 2012) SOLINSA research used a network approach in addressing the issue of learning and innovation, which allows acknowledgement and integration of various knowledge sources, types and processes, and learning modes. Thus, we shift from monoculture of scientific knowledge towards ecology of knowledge, which assumes the diversity of knowledge and its composite character (Santos et al 2007). The network model allows introducing into agricultural knowledge system analysis a whole range of agents: not only farmers, but also consumers, rural residents, market enterprises, NGOs, policy makers and other actors who also make their diverse knowledge inputs to agricultural development (Knickel et al., 2008; Oreszczyn et al., 2010; Leeuwis and Aarts, 2011). All together they represent a great diversity of available knowledge resources which are used in agricultural and rural development practices: technical and economic, production and marketing oriented, codified and tacit, local and distant, farmers and expert created, issue specific and more generic, necessary for the solution of specific problems and systemic transformation, etc. Innovation occurs when material and immaterial resources flow

through a network, and actors strategically use the potential such a network provides (Brunori et al. 2013).

The network model revises also the examination of the learning process, that is, what is learning and how new knowledge is gained. Instead of the linear knowledge transfer model which considers individual farmers as learners who are presented as passive absorbers of the purposefully disseminated knowledge, the network model rather advocates active social learning (Wenger 2000; Leeuwis and Aarts 2011). The central proposition of social learning theory is that knowledge is acquired in interaction.

Changes emerge when actors reconsider their actions through critical thinking and interactions with others. This involves questioning the assumptions that underlie human actions and concepts (Woodhill and Röling 1998). The concept of social learning has been applied frequently to the study of sustainable agriculture (Schneider et al. 2009; Sol et al. 2013) and in this context has been defined as simultaneously transforming the cognitive, social and emotional competences, including attitudes and values related to collective or individual social actors (Rist et al. 2006). During those learning interactions they co-create new meanings, develop their practices and rebuild their identities.

Finally, the study of LNSA raises the question whether there is something specific to innovation and learning when related to sustainability. As known, the meaning of sustainability is ambiguous. Sustainability as a concept and practice is interpreted in many different ways, and hence the concept of sustainability needs to be negotiated (Koutsouris 2008; Hermans et al. 2010). Learning and innovation in relation to sustainability means assuming sustainability not as a set of given rules, but as an object – a ‘boundary object’ as we have put it – around which interaction occurs, so that learning and innovation is measured in terms of achievements in understanding the dynamics of coupled social-ecological systems, in setting criteria to evaluate sustainability and improving sustainability performance. Learning and innovation can also be measured as increase in the degree of consensus, and transformation into practice, over the concept of sustainability. As a process of social construction, this alignment may need to take into account not only internal network perspectives, but also broader societal concerns.

LNSA as a special type of network

SOLINSA provided some answers to the question of how a network can become a LNSA (for the cases studied, see table below).

1. There has to be an integration between diversity and commonality; merely diversity of actors is not enough, they have to engage in common activities.

2. The general shared goal of innovation is also a discriminating factor in which actor belongs to LINSA and who is not a part of it.
3. Equal distribution of engagement (participation, commitment) is important in LINSA, although not all actors participate at equal extent.
4. A minimum level of governance and organization of network is necessary.
5. Reflexivity is an important characteristic of LINSA – network participants have to steward learning activities, reassess innovation objectives and evaluate sustainability performance.
6. Innovation and sustainability are to be connected and embodied in LINSA activities and practices of their members.

The concept of LINSA further develops the notions of communities of practice, networks of practice towards complex learning and innovation partnerships in agricultural and rural development contexts which embrace actors across institutional, social and cognitive boundaries who learn and innovate together. On characteristics and dynamics of LINSA, the SOLINSA project concluded that (i) LINSA are diverse and complex in form and structure and in the empirical study were grouped into those that are consumer, non-food or agriculturally oriented networks; (ii) LINSA vary in the degree of formality, modes of learning, size and degrees of consensus. LINSA grow for knowledge, economic and accreditation reasons. As they grow they tend to formalize but not all LINSA wish to become mainstream; (iii) LINSA can have a strong relationship with the AKS or not be connected to the AKS at all; or a relationship that lies between these extremes. The nature of links between LINSA and AKS is related to the nature and level of innovation the LINSA pursues; and (iv) Learning becomes more diverse, the more diverse the constituency of the LINSA. Diversity and complexity must be balanced with commonality otherwise the LINSA might become unstable. Co-ordination and facilitation can help this balance.

Transition to sustainable agriculture through learning and innovation: three integral features

In three years of research on a variety of 17 LINSA (see the table below for a short description), we studied several examples of social learning processes: within LINSA, between LINSA members and researchers, and among researchers. We identified three integral features that need to be taken into account for enhancing transition towards sustainable agriculture: processes of co-evolution; joint reflection; and facilitation of these interactions and processes.

Processes of co-evolution

The (co)evolutionary perspective is crucial for several reasons. Learning in networks happens through recurrent processes of social learning. From this it follows that networks are not static structures, but evolve over time, changing according to variation in actors' resources, and strategies, as well as

reacting to outside pressure (changing context). Understanding learning and innovation therefore is only possible when we are aware of the inherent dynamics and apply a research method that takes these dynamics into consideration. The importance of processes in SOLINSA has shown at various levels. First, the processes that take place within the LINSA: LINSA are interacting with the AKS, and are influenced by changes in that system, thus have to adapt their strategies accordingly. Social learning occurred in the LINSA, i.e. processes of negotiation about sustainability and innovation are important. Boundary objects and boundary work are relevant here. Second, processes of researcher-LINSA interaction. SOLINSA applied a participatory action research approach (Moschitz and Home, 2014), so processes of researcher-practitioner interaction played an important role and co-determined the research outcomes. Third, the co-evolutionary perspective was relevant to understand the evolution of the whole research project. The changing role of researchers from being a source of knowledge to engaging in knowledge exchange processes required process management at project level (Moschitz, 2013). Researchers had to reflect and adapt to the outcomes of the fieldwork with LINSA, and this dynamic determined the research progress and outcomes importantly.

Joint reflection

The dynamic processes are related to a second feature that characterized work in SOLINSA: joint reflection. In essence, learning processes involve recurrent reflections on what someone is learning, and how this learning occurs. Innovation is often produced in groups of different actors, but these groups only become LINSA when they reflect on what they are doing, how learning is happening and what exactly they conceive of sustainability. Joint reflection therefore implicitly includes second order learning, which is essentially reframing (Tisenkopfs et al. 2014). Going beyond what is happening within a LINSA, the reflective aspect was built into the project at three levels: the interaction within LINSA, the researcher-LINSA interaction, as well as the researcher-researcher interaction at the project level.

Facilitation

Reflection processes in dynamic networks cannot be steered and predetermined. But they need to be enabled. This is the task of considerate facilitation, which respects the needs of all actors and basically empowers them to negotiate between each other. Such a perspective seems unusual in research projects that follow a stated objective, and in the end are evaluated in terms of research achievements. We have opposed this view by emphasizing facilitation as one of the key principles to guide our research. In the fieldwork, researchers have acted as facilitators of social learning within the LINSA, and between researchers and LINSA. At the project level, researchers engaged in

facilitated processes of reflection about research progress; while facilitation was shared across the researchers. Facilitation was thus the key to reflective research.

The articles assembled in this issue

The papers in this special issue all take up these three integral features, and will illustrate the importance of them.

The first paper (Tisenkopfs et al.) presents a conceptual conclusion from the project work. It explores the role of boundary work and boundary objects in enhancing learning and innovation processes.

Boundary work helps to achieve a network's goals in many ways: it promotes learning processes and new knowledge, strengthens the network's internal structures, involves new supporters, and stimulates network ideas and innovation. The paper provides insights into the roles, dynamics and outcomes of boundary work in LINSA in three key domains: developing shared knowledge, co-producing innovation, and negotiating sustainability.

As shown above, SOLINSA is a project that aimed to contribute to the further development of the established institutions of the AKS and seek ways that they can integrate the systems approach.

Therefore, Hermans et al. investigate how the structural conditions found in the eight participating countries, and in particular the established institutions of the AKS, affect their potential functioning in terms of opportunities for collaboration and social learning. They show how recent trends this have affected the main actors' roles and functions as potential participants in multidisciplinary innovation networks.

Understanding the different processes of interaction between LINSA and the predominant institutions of the mainstream agricultural regime is the focus of the third paper in this issue (Ingram et al.). They conclude that the level of LINSA-regime compatibility influences the extent of the diffusion of LINSA ideas and practices into the regime, and suggest that the transition to sustainable agriculture might be understood as a complex of interactive processes leading to a series of adaptive changes, rather than as regime change.

Continued joint reflection and learning was an important feature in the project's work. To make our experience meaningful for future research, an evaluation of these processes was built into the project. The last paper of this special issue (Home and Rump) presents the results of this evaluation of participatory action research. They found that joint reflection; facilitated by a member of the research team and in collaboration with the LINSA, stimulated the various learning processes in the project at both LINSA and researchers' levels. Researchers and participants expressed that collaborative action research can be considered successful when both parties give and gain benefits, such as new knowledge or improved practical solutions.

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Table 1 List of LINSA studied

Agricultural production
Réseau Agriculture Durable– Network for a Sustainable Agriculture, France (F RAD) The Sustainable Agriculture Network is an informal network of farmers groups, created and developed outside the AKS. The main objective of the RAD is improving the effectiveness of the systems regarding ecological, social and economic issues. It emerged as an alternative way of thinking about agriculture in response to gaps in AKS knowledge and practice. RAD involves 3000 farmers (from 2000 farms), mainly from the west of France, gathered in 32 groups. Learning is a top priority of the RAD who gives value to bottom-up view of innovation and participatory learning processes in farmer groups. The RAD is facing different opportunities of development and needs to choose how to growth and expand its knowledge.
Charter of Good Agricultural Practices in Livestock production, France (F Charter) The Charter for Good Agricultural Practices promotes the quality of the cattle profession in France. It accompanies farmers in their practices (traceability, herd's health, food, milk quality, animal welfare and environment), helping them to meet the expectations of both their partners and citizens. The Charter is the leading farmer quality assurance scheme in Europe and brings together 105 000 farmers: over 90% of milk and over 77% of beef produced in France come from a farm that adheres to the Charter. The Charter benefits from the expertise of engineers from the French Livestock Institute and about 2500 technicians from extension organization and food industry. It was launched after the mad cow crisis in a context of mistrust between food production and society; after twelve years of existence, the Charter needs to define new actions and strategies to answer food chain's, farmers' and society's needs.
Bavarian Rural Women's Association, Germany (G Women) The Rural Women's Group of the Bavarian Farmers Union in South Germany has a long learning and innovation culture. The group was founded in 1948, as a subpart of the Bavarian Farmers Union. Today it numbers ~6.500 local women groups, 72 local chapters, 7 district chapters, and one State Executive Committee. An essential part of the group is a diversified educational work based on topics of direct relevance to farm women. The LINSA has a good, acknowledged standing in society, but is considered as a small player in the AKS. They link the farm sector with the health-, nutrition- and education-sectors
German Agricultural Association, Germany (G DLG) The German Agricultural Association (DLG) is a LINSA with a very long history of learning and innovation around agriculture. It was founded in 1839 and very soon became the most important knowledge broker in the German AKS. Today membership is ~25.000, these are mainly farmers but also

researchers or representatives from agribusinesss. Its main tasks are to collect, discuss, and rearrange information and innovations related to agriculture and disseminate them among its members. Effective networking is considered to be the key for successful dissemination of information and innovations.

Fruit Growing Network, Latvia (L Fruit)

The Latvian Fruit-growers network formed more than a decade ago around the goal of developing integrated fruit-growing in Latvia. This includes objectives on production, marketing, research, advisory, policy making, consumer education, environmental management. There are about 400 members, both individuals and organizations: producers and their cooperatives, research, business companies, NGOs, etc. The network is nation-wide, with several centres of closer connections around research institutes, the Fruit-growers' Association, regional cooperatives. The network is strong on peer-learning among farmers as well as inter-institutional learning and collaboration between researchers and practitioners. There is a shared set of norms on proper fruit-growing. Innovation is oriented towards private and public good.

Sustainable Dairy Farming, Netherlands (N Dairy)

This is a regional network of dairy farmers experimenting with the implementation of low external input farming practices. The network started in the Dutch province of Drenthe supported by provincial policy, but similar networks have started in other provinces as well. The farmers' goals are to improve the environmental and economic situation using low external input practices (managing and closing nutrient cycles). Over a period of 10 years different projects were organised that applied the concept of low external input farming using farmer study clubs facilitated by a number of expert consultants

Association for the development of fodder production, Switzerland (S ACDF)

The association brings together some of the AKS (research, education and advisory) institutes, seeds firms and farmers with the objective to foster fodder production and conservation based on the natural resources of Swiss farms. The board of its technical commission "CT-ADCF" enables experts with different interests (research, education, extension, seeds sale) to exchange knowledge and to develop practical solutions (based on scientific evidences and field experiences) to address the needs of farmers. Solutions are then shared inside this network through so-called boundary objects, such as labelled seeds-mix for pastures and grasslands, technical datasheets on fodder production, training for extensionists and visits dedicated to farmers.

The European Organic Data network (EU Organ)

This organic market data network consists of a core group of members who formed an OrganicDataNetwork project, and stakeholders, including data collectors and end users, who are involved with organic market data in Europe. The network emerged to enable access to relevant

organic market data and seeks to involve stakeholders in the network formation by conducting surveys and hosting workshops.

Alternative food marketing

Consorzio Vacche Rosse, Italy (CVR)

Consorzio Vacche Rosse (CVR) is a cooperative dairy that produces Parmigiano Reggiano (P-R) cheese from milk of Reggiana breed cows delivered by its members. Like most of the local dairy farms and milk processing plants of the territory, CVR belongs to the larger Community of Practice (CoP) whose geographical coverage is defined by the Code of practice of the PDO cheese "Parmigiano Reggiano". The community is strongly aligned with membership to the "Consorzio di tutela del formaggio Parmigiano Reggiano" (CFP R) that is the depositary of the PDO collective brand.

Association for Solidary Economy Crisoperla, Italy (I Crisop)

The network is a cultural non - profit Association (formalised in 2009) operating in provinces in Tuscany and Liguria regions. The network aims to create an alternative system of knowledge and practices around sustainable production and consumption of food. The network is hybrid and comprises: organic farmers (producers of vegetables, honey, wine, oil, beef), two fishing cooperatives, a cooperative for social farming, two agronomists (initiators of the network), consumers organized in a consumers' association. In addition it increasingly interacts with local institutions and other networks. The main functions are: creating and reinforcing the links between consumers and producers; organising farmers' markets, interacting with public institutions and civic movements, to promote initiatives at a local level; providing technical assistance and brokerage activity; lobbying role and promoting a vision for more fundamental change.

Naturli Co-operative Cheese marketing platform, Switzerland (S Naturli)

The Natürli co-operative has evolved around the regional trademark "Natürli aus der Region Zürcher Berggebiet". A regional entrepreneur-cheese maker and the regional development manager of the Zürcher Berggebiet, a mountainous region in the vicinity of Zurich, Winterthur and St. Gallen, initiated the network in 1993. The main aim – to collect, bundle, distribute and promote high quality regional dairy products in order to keep alive the regional dairy structures – only could be achieved through multifaceted collaboration. The 15 municipalities of the region own the trademark "Natürli" but nowadays e private entrepreneurs, cheese dairies and milk producers, the regional development center and shops are member of the co-operative "Natürli" accesses sporadically public funding and grants of private foundations for specific sub-projects but it also tries to work economically successful on its own.

Non-food focus

The NATURAMA Alliance, Hungary (H Nat)

NATURAMA Alliance is a loose, informal network of networks of 9 Hungarian LEADER Local Action Groups (LAGs). Created through a transdisciplinary action research project in 2009, - NATURAMA soon became a self-maintaining domestic network, with a strong transnational interest. Its main aim – creating knowledge, learning from each other and from best practices in the EU – is in line with the LEADER approach, Hungarian AKS did not support such activities. NATURAMA keeps regular meetings, organised study tours, ran shared development projects, organised big events and provided expertise on various levels of rural policy making and implementation.

Biogas Production Network, Latvia (L Biogas)

The Latvian Biogas network was formed around 2006 to develop production of on-farm biogas, in response to renewable energy policy goals and subsidies. The network is small and dispersed, actor interactions are motivated by the need of technological, economic, agricultural learning to localise the use of borrowed biogas technologies. It is constituted by a diverse range of actors: biogas producers, scientists, equipment suppliers, service providers, investors, consultants, banks, municipalities, environmental agencies, NGOs and demonstrates a new diversified composition of agricultural innovation networks. Currently the sector is based on limited number of state distributed production quotas and it is unlikely that the producer network will extend or that biogas production will increase its scope. A period of rapid up-scaling stimulated by state support has been followed by a period of uncertainty, following debate about efficacy of support.

Cooperative Boer en Zorg: Care Farmers in the Netherlands (N Care)

The ‘Boer en Zorg’ (Farmers and Care) co-operative currently connects over 130 care farmers in the Mid-Eastern part of the Netherlands. Care farms use their animals, plants, gardens, forests and the landscape to create recreational or work related activities for people in need of care. Work on farms delivers evident results, focusing on the capabilities of each individual patient, resulting in an alternative vision of health care and therapy. The Boer en Zorg cooperative operates on the intersection of two existing policy fields; the agricultural sector and the health care sector. These two sectors provide both opportunities and constraints for innovation.

Alternative food systems

Brighton and Hove Food Partnership, England (E B&H)

This ‘network of networks’ was established to create a network of organizations, businesses and residents with a mission to improve the patterns of both food consumption and production in a large urban area. It aims to work across the community to develop a localised food system which promotes social equity, economic prosperity, environmental sustainability, and the health of all residents. There are strong links between voluntary organizations (concerned with school food, organic food and over

60 community food growing projects) and the local state. It now embraces over 200 organizations in the state, private and voluntary sectors concerned with all stages of the food chain. The LINSA is a social movement or social innovation which is calling for a step change in the food system..

G7 (Local Food Council of Gödöllő), Hungary (H G7)

G7 is an informal network (voluntary partnership) of local organizations, entrepreneurs and citizens in Gödöllő, a major city of the Budapest agglomeration, hosting the largest agricultural university of Hungary. The main objective to which actors in this voluntary partnership are all committed is to achieve a more sustainable and healthy food system for the town. They intend to realise this through: (1) acting as information brokers – organising events, disseminating information and building databases, connecting producers, customers, organizations, entrepreneurs who want to support food sovereignty and sustainability; (2) acting in the political domain, building social support and negotiating with local authorities for a local sustainable food strategy.

Permaculture Community (Permaculture Association and the Land Project), England (E Perm)

The LINSA studied comprises: the project Leaning And Network Demonstration (LAND), its parent body The Permaculture Association (PA), and the wider community of Permaculture practitioners in England. The Permaculture community has originated outside of mainstream agriculture and is operating outside public funding and established policy and knowledge frameworks. It is a diffuse network of individuals, projects and groups all interested in, or practicing, Permaculture (defined broadly as a design system for creating sustainable human environments).