Agricultural Knowledge: Linking farmers, advisors and researchers to boost innovation.

\textit{AgriLink’s multi-level conceptual framework}

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Summary

The H2020 AgriLink project (Agricultural Knowledge: Linking farmers, advisors and researchers to boost innovation) seeks to stimulate sustainability transitions in European agriculture through better understanding the roles played by farm advice in farmer decision-making. This conceptual framework builds on the State of the Art described in the AgriLink proposal, to provide further detail and depth to the theorisation, providing a foundation for methodological development and data analysis in the empirical workpackages (WPs). Consortium members have contributed their expertise (both practical and academic) from a wide range of disciplines in the form of ‘primers’ (Appendix A). The Conceptual Framework is a living document, evolving in response to new empirical research. This Conceptual Framework outlines the primary theories that are anticipated for use in AgriLink.

AgriLink is part of a series of projects commissioned by the European Commission to consider how to improve farm efficiency, sustainability and innovation up-take, through improved agricultural knowledge and innovation systems. These projects include FP7 SOLINSA, FP7 FarmPath, FP7 PRO AKIS, FP7 VALERIE, H2020 AgriSpin, H2020 PLAID, H2020 AgriDemoF2F, and H2020 NEFERTITI. As such, AgriLink is part of a broader initiative by the European Commission to foster “interactive innovation”.

AgriLink addresses the question of the role of farm advice regarding farmers’ decisions to adopt (or not) various types of sustainable innovations (technological, process, market, social or organisational). AgriLink acknowledges that there is no straightforward relationship between innovation and sustainability. Innovation can have positive effects on certain dimensions of sustainability and adverse effects on other dimensions. Moreover, the effects of innovation are context dependent: they can be positive for certain farmers and negative for others. AgriLink also acknowledges that there is a risk for farmers’ decision-making to be more driven by path dependency mechanisms than by a thorough assessment of innovations. This path dependency could be linked to the innovation process itself, but also to the infrastructures that link farmers, knowledge and innovation systems. In such a complex situation, the role of advisory services is of first importance for farmers, but also for society in general.

AgriLink will analyse the role of advisory services at different stages of farmers’ decision-making. Following the key concepts of the Triggering Change Cycle, AgriLink will assess the role of farm advice at three different stages of farmers’ decision: i) in ‘triggering’ change processes, ii) during the active assessment of innovation options, and iii) during the implementation of new innovations. We will assess the role of advice vis-à-vis other sources of knowledge, but also try to better understand which advisory organisations play which role, and with which method. Knowledge intensive business services (KIBS) typologies of advisory organisations will be developed in that respect.

AgriLink will also produce knowledge about the factors explaining the relations between farmers’ decision-making and advisory services. AgriLink will develop the key concept of microAKIS: the knowledge-system that farmers personally assemble, including the range of individuals and organisations from whom farmers seek
services and exchange knowledge, the processes involved, and how they translate this into innovative activities (or not). Empirical research will utilise case studies framed by innovation areas, selected to represent the European Commission’s Strategic Approach to EU Agricultural Research & Innovation. Research will be undertaken in focus regions, and evaluate how characteristics of farming operations, the nature of the innovation and the regional context influence microAKIS and the relationships between different types of farmers and advisers.

The landscape of farm advice is characterised by a growing pluralism, with new players competing or collaborating with traditional actors. These new players include SMEs and firms from upstream and downstream industries, but also from high-tech of KIBS sectors, as well as new forms of innovation and peer-to-peer learning between farmers. Our hypothesis is that these new suppliers of services could induce particular changes in farmers’ decision making. AgriLink will produce knowledge about the role played by the different providers of farm advice in decision making. AgriLink will also explore further the transformations of advisory services on the supply side, in two complementary directions.

- AgriLink analysis of the full range of farm advisory services at regional level (R-FAS) will enable to understand the service innovation and new business models of advisory service suppliers that emerge in different regional contexts and/or innovation areas. AgriLink will develop new typologies of advisory suppliers. AgriLink will also assess how the new models of advisory provision play on the quality of services, and on the function advice can play along the decision cycle.

- AgriLink will also analyse the transformation of the governance structures of farm advisory systems, which may change the institutions, rules, and resources framing advisory activities. AgriLink will assess, with a comparison across seven countries, how these governance structures play on the access to common resources, knowledge, for a diversity of advisors and other AKIS actors. The analysis of governance will be focused on the back-office of services and how governance structures shape knowledge platforms, training schemes and networking in different contexts. AgriLink will assess the effects of a EU policy instrument on the back-office of advisory services, namely the EU-FAS regulation.

A key dimension of sustainable development is that it implies new forms of linkages between actors. AgriLink will improve understanding of the dynamics of these linkages at different levels (micro, meso, macro). We will support an empirically-informed and theoretical discussion about i) the role of advisory services in these linkages and ii) how these linkages contribute to sustainability transitions. Our hypothesis is that the economical and sociological mechanisms at stake are context dependent, and that there is a need to consider the best fit of advisory systems rather than to identify best practices (or ‘silver bullets’).

As a consequence, AgriLink considers that interactivity and transdisciplinarity are needed. AgriLink will experiment with two methodologies to set transdisciplinarity into practice. First, in six ‘Living Labs’, scientists will work with advisors and farmers to design new methods of advisory service provision. Participants will reflexively develop and test these methods. Second, through Socio-Technical Transition Scenario workshops, national groups across Europe will debate with multiple actors the possible trajectories of evolution of advisory services towards better fit.
1 Introduction

The H2020 AgriLink project (Agricultural Knowledge: Linking farmers, advisors and researchers to boost innovation) seeks to stimulate sustainability transitions in European agriculture through better understanding of the roles played by advice in farmer decision-making.

1.1 What is a conceptual framework?

Conceptual frameworks typically represent an initial step in European Commission-funded research. The state of the art has briefly been described at proposal stage in the Description of Work, which forms the foundation for the Grant Agreement. The Conceptual Framework builds on this state of the art, to explore further detail and depth to the theorisation, providing a foundation for methodological development and data analysis in the empirical workpackages (WPs). In the case of AgriLink, consortium members have contributed their expertise (both practical and academic) from a wide range of disciplines in the form of ‘primers’, which are appended to the overall conceptual framework. The conceptual framework also facilitates interdisciplinary discussion through the definition of terms for project use. The purposes of the conceptual framework are thus:

- To integrate and advance academic and practical understanding of the role of knowledge and formal advisory service provision in farm-business decision-making;
- To provide a consistent theoretical foundation for methodological selection and data analysis;
- To define terms for common use in the AgriLink project;
- To provide a resource to consortium members for the development of publications and other outputs.

The Conceptual Framework is a living document, evolving in response to new empirical research. This initial framework outlines the primary theories that are anticipated for use in AgriLink.

The Conceptual Framework has been designed to be read by a variety of audiences. Section 1 outlines the context to the AgriLink project. Section 2 presents the key challenges addressed by AgriLink (sustainability, innovation and AKIS). Section 3 elaborates the theoretical approaches and considerations underpinning this research; the bulk of this section is primarily intended for social science audiences. More details on concepts can be found in the various theory primers in the appendix. Other readers may wish to focus on the ‘Application to AgriLink’ sections, which summarise the practical use and application of the theoretical concepts. Section 4 presents the transdisciplinary components of AgriLink. We conclude with research questions and next steps in Section 5.

First, we identify the foundations for AgriLink: related projects and key concepts.

1.2 The Research Context for AgriLink

AgriLink is integrated into a set of topics that “focus on innovation as driver for rural development, with a particular emphasis on developing framework conditions for innovation and new business models adapted to the rural context, and support for skills development in rural communities” (Source: original call text). AgriLink specifically addresses the contribution of farm advisory services to this innovation dynamic.

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1 Primers can be reached directly by clicking on the orange hyperlinks.
AgriLink is one of a series of projects funded by the European Commission to consider how to improve farm efficiency and innovation up-take, through improved agricultural knowledge and innovation systems.

- **7th Framework Programme SOLINSA** (Support of Learning and Innovation Networks for Sustainable Agriculture) (2011-2014): SOLINSA aimed to identify barriers to the development of ‘learning and innovation networks for sustainable agriculture’ (LINSAs). It explored how research, education, advisory services, policy instruments and financial arrangements might support LINSAs in cost-efficient and effective ways, undertaking collaborative case study research across Europe. SOLINSA findings are relevant to understanding knowledge network formation, and how these networks evolve over time.

- **FP7 FarmPath** (Farming Transitions: Pathways towards regional sustainability of agriculture in Europe) (2011-2014) utilised the multi-level perspective to assess how niche innovations became mainstream in European agriculture. FarmPath also developed transition scenarios for 7 case study regions across Europe. FarmPath utilised the multi-level perspective (MLP), applying to the assessment of niche mainstreaming. Findings about applying the MLP to agrarian change processes underpin the use of the MLP in AgriLink.

- **FP7 PRO AKIS** (Prospects for Farmers’ Support: Advisory services in European AKIS) (2012-2015): PRO AKIS undertook an inventory of agricultural advisory services across Europe, comprised of national reports, an overall synthesis, a searchable database and searchable director of advisory organisations. PRO AKIS also undertook empirical research into the new knowledge networks of small-scale farmers, options for bridging scientific research and farmers’ demands, and how to offer appropriate supports for diverse rural actions that form networks around innovations in agriculture. PRO AKIS findings are important for informing understanding of the different types of knowledge networks that farmers develop for different kinds of innovation.

- **FP7 VALERIE** (VALorising European Research for Innovation in agriculture and forestry) (2013-2017): VALERIE focused enabling innovation transitions on six theme topics: crop rotation, soil cover management and integrated pest management; ecosystem and social services in agriculture and forestry; management of agricultural soils; water management; integrated supply chain and innovative farm management; and recycling and smart use of biomass and food waste. VALERIE developed a process for assessing the interaction between science, advisors and farmers, which underpinned their analysis of how scientific findings could be “co-translated” for use by practitioners.

- **H2020 AgriSpin** (creating SPace for INnovation in Agriculture) (2014-2016): AgriSpin focused on identifying the ‘blind spots’ in innovation projects (e.g. between farmers and advisors). AgriSpin built a network of advisers, researchers, organisational experts and innovation companies. AgriSpin also identified and contrasted the differing roles of advisory services at differing stages of the innovation process (from initial idea to embedding). These findings will be further developed in the AgriLink analysis of microAKIS.

- **H2020 PLAID** (Peer to Peer Learning: Accessing Innovation through Demonstration) and Horizon 2020 AgriDemoF2F (Building an interactive AgriDemo-Hub community: enhancing farmer to farmer learning) (2017-2019): These projects were commissioned under the same call, and are collaborating to produce and inventory of on-farm demonstration across Europe. The projects will also identify and promote good practices in facilitating farmer learning through demonstration. Demonstration is one tool utilised within Agricultural Knowledge and Innovation Systems. Policy recommendations from PLAID and AgriDemoF2F will feed into the AgriLink governance WP.
H2020 NEFERTITI (Networking European Farms to Enhance Cross Fertilisation and Innovation Uptake through Demonstration) (2018-2021): NEFERTITI will build on the PLAIID and AgriDemoF2F inventory to establish ten networks of demonstration farms across Europe: grassland and carbon sequestration; data driven decisions for dairy farmers; organic livestock systems; soil quality in arable crops; arable crop sensing and variable rate applications; organic arable crops; nutrient efficiency in horticulture; water use efficiency in horticulture; reducing pesticides in grapes, fruits and vegetables; and increasing farm attractiveness to new entrants. NEFERTITI will implement the best practices recommended by PLAIID and AgriDemoF2F, providing useful cross fertilisation with AgriLink’s innovation areas.

Members of the AgriLink consortium have been involved in all of these projects. Relevant forthcoming calls in the 2018-2020 Horizon 2020 work programme include RUR-13-2018: Enabling the farm advisor community to prepare farmers for the digital age.

AgriLink plays a unique role within the set of European Commission-funded projects. As a Research Innovation Action, AgriLink has the strongest research focus of the set: the other projects are largely Coordination and Support Actions, which focus on assembling existing knowledge, rather than conceptual development and new empirical research. AgriLink is also the second largest project (NEFERTITI has a budget of €7 million, the others are in the €1.5-2 million range). This budget demonstrates the importance that the European Commission places on improving the understanding and functioning of advisory services in Europe. It was also expected explicitly from the very call that AgriLink contributes to the evaluation of European policy instruments, and to arenas where they are debated.

1.3 The Policy Context for AgriLink

It is not common to find a section on policy in the conceptual framework of an H2020 project. However, in the case of AgriLink it is important to recognise that the project is being undertaken in an evolving policy context that has the possibility of generating previously unanticipated opportunities for dissemination and exploitation.

There are several elements to be aware of in this policy context. First is the legal framework that imposes specific obligations upon the EU-28 Member States in the form of the European Farm Advisory System (EU-FAS) regulation. The EU-FAS has been mandatory since 2007 (EC Regulations N° 1782/2003 and EC N° 73/2009) and requires that all Member States establish or maintain a Farm Advisory System (FAS) to ensure farmers have access to relevant information, knowledge or services on the cross-compliance rules connected with EU farm support payments. However, the EU-FAS regulation remains controversial. An evaluation of the 2007 regulation (ADE 2009), followed by an European Commission (EC) report on the state-of-play with the FAS, highlighted the very limited impact of the EU-FAS and led to a new version of the EU-FAS (EC Regulation N° 1306/2013) being introduced for the period 2014-2020. Further studies are needed to better understand the effects of this new, more flexible and open version of the regulation.

Second, there is a complex financial framework for targeting public funds at the on-going development of agricultural knowledge and innovation systems (Figure 1). All H2020 projects focussed on agricultural knowledge and innovation systems are effectively part of a broader initiative by the EC to foster “interactive innovation” in which the EC recognises that innovation is a social process involving a range of actors, rather than a top-down linear transfer of knowledge from science to implementation (SCAR AKIS SWG 2015). The European Innovation Partnership “Promoting Productivity and Sustainability” (EIP-AGRI) was launched by the European Commission in 2012 and is positioned as a tool for speeding-up innovation in the agricultural, forestry and rural sectors by streamlining and better coordinating

2 PRO AKIS, AgriSpin, PLAIID, AgriDemoF2F and NEFERTITI are all Coordination and Support Actions. SOLINSA was also a Research Action. Some empirical research was undertaken in PRO AKIS, and will be in AgriDemoF2F and PLAIID, but the main focus of these projects is their respective inventories.
existing policies and instruments. The stated objective of the EIP-AGRI is to enable innovation that ‘achieves more from less’ input and works in harmony with the environment. The focus is on ‘bottom-up’ approaches and fostering cooperation between farmers, researchers, advisors, businesses and other actors (Ibid).

The EIP-AGRI is implemented primarily through two EU policies: the H2020 research framework programme and EU rural development policy (as financed under Pillar 2 of the EU Common Agricultural Policy). The interaction between these two policy domains can be visualised as follows (Coffey, 2016):

![Figure 1: EIP-Agri Implementation](image)

Under H2020, two new instruments were developed that support the EIP-AGRI: i) Multi-actor Research and Innovation (RIA) projects that aim to develop innovative solutions ready for application, and; ii) Thematic Networks that connect and communicate ready-to-use best practice. **As a multi-actor RIA project, AgriLink seeks to combine practical and scientific knowledge to address the needs, problems and opportunities of farmers, generating interactions between researchers, farmers and other actors throughout the project.**

AgriLink will interact with both relevant multi-actor Research Innovation Actions (‘RIA’s e.g. those listed in Section 1.2) and also ‘Thematic Networks’. Some Thematic Networks that are directly relevant to AgriLink include:

- **AGRISPIN** on analysing innovation case studies, particularly the role of intermediaries (recently concluded);
- **SKIN** on promoting collaboration in demand-driven innovation in short supply chains with the aim to generate inputs to policymaking through links to the EIP-AGRI;
- **4D4F** on data and sensor driven decision-making on dairy farms;
- **SMART-AKIS** on farm management information systems, precision agriculture and agriculture automation and robotics;
- **EURODAIRY** on relevant innovations in support of a sustainable future for EU dairy farmers.

One very interesting new element of EU rural development policy for the 2014-2020 period is the provision of funding (under Measure 16 of EC Regulation No. 1305/2013) for the establishment of so-called ‘EIP-AGRI Operational Groups’. These are an entirely new structure in rural development policy. They are project-based partnerships between diverse groups of actors (e.g. farmers, advisers and researchers) which form specifically to tackle a certain (practical) problem or opportunity which may lead to an innovation. Funding for these
Operational Groups is provided via national or regional rural development programmes (RDPs) with the precise criteria / conditions for funding defined according to the national / regional priorities for rural development. A total of 3,200 Operational Groups are planned in 27 Member States and 97 RDPs for the 2014-2020 period. Some 200 to 300 are currently running.

The EIP-AGRI also includes provision for the establishment of ‘EIP-AGRI Focus Groups’. These are temporary groups of selected experts (including farmers, advisors, and academics) focusing on a specific subject, to share knowledge and experiences. Each group explores specific problems or opportunities, taking stock of the state of the art in research and practice, identifying needs from practice and directions for future research, and highlighting priorities for innovative actions. The Focus Groups meet twice and producing a final report and recommendations. Recent Focus Groups of direct relevance to AgriLink include:

- Organic Farming
- Precision Farming
- Protein Crops
- Short Supply Chains
- High Nature Vale Farming

As background to all of this is the work of DG AGRI’s Standing Committee on Agricultural Research (SCAR), in particular the Strategic Working Group on AKIS (SCAR AKIS-SWG). The SCAR AKIS-SWG is currently undergoing a transition from working in a largely “analytical mode” to a more “active advisory mode”. For example, the SCAR AKIS-SWG recently published a Policy Brief on the Future of Advisory Services (SCAR-AKIS, 2017). This role is likely to develop more as the European Commission and Member States begin preparation for the post-2020 Common Agricultural Policy (CAP). One key driver is the clear indication from DG AGRI of the European Commission that there will be additional incentives provided under the CAP to “support the strengthening of farm advisory services within the AKIS systems” (EC 2017). This is clearly of great relevance for the dissemination and exploitation of the AgriLink project results. It was also explicit from the call that specific relations are expected to be established between AgriLink’s consortium and the members of the SCAR AKIS-SWG.

In summary, AgriLink is well-positioned to contribute to understanding of interactive innovation processes in the European agricultural sector. AgriLink’s focus on the role of advisors in enabling sustainability can usefully inform – and be informed by – a range of projects and policies oriented towards enabling farmers to take up sustainable innovations.

1.4 AgriLink Foundations

The overall aim of AgriLink is to stimulate transitions towards more sustainable European agricultures through better understanding the roles played by a wide range of advisory organisations in farmer decision-making, and by enhancing their contribution to learning and innovation.

Multiple publications, including the European Commission’s “Strategic Approach to EU Agricultural Research & Innovation” (2016a) identify the societal and political pressures to make agriculture more sustainable. Farmers are faced with contradictory challenges, such as reducing emissions and input use, increasing animal welfare, producing environmental goods, enhancing social cohesion in rural areas, as well as securing their traditional roles in food and fibre production, and securing income in a period characterised by prices volatility and economic uncertainties.

Transitions towards sustainable development thus imply the need to support innovations that integrate different dimensions. This situation is associated with the increasing complexity and uncertainty associated with innovations. As a result, there is a need to combine different
types and sources of knowledge in agriculture: disciplinary and interdisciplinary academic knowledge, evidence from experiments (applied research), farmers' local and lay knowledge, and knowledge carried by emerging stakeholder in agricultural debates (consumers’ groups, environmental associations, etc) but also by actors developing technologies outside agriculture (e.g. ICTs companies supporting the development of data-driven agriculture). There is a wide agreement among scholars that social interactions and linkages between actors are necessary to combine such diverse knowledge (Bilbao-Osorio and Rodriguez-Pose 2004, Caloghirou et al. 2004).

Agricultural advisory services across Europe are also changing: widespread privatisation of advisory services (Labarthe 2009, Sutherland et al. 2013), fragmentation (Garforth et al. 2003), new businesses entering the sector (ranging from local consultancies to transnational companies) and reduced access to advice in situations where service provision is less commercially viable (Labarthe and Laurent 2013). As a result, current agricultural knowledge and innovation systems (AKIS) are characterised by a plethora of service provision models and of new forms of partnerships (public-private, etc.). This has led to a number of new challenges facing agricultural advisory services that AgriLink will address, including:

- Commercialisation: increasing competition between providers, emergence of new players and of new business models of farm advice (Prager et al. 2016);
- Digital revolution: the increasing role of ICT as a tool and expectation of advisors and farmers (e.g. decision support tools, knowledge platforms, Facebook, social networks) (EU SCAR SWG 2015);
- Increasing recognition of farmers as sources of innovation and the growing diversity of farm structures and businesses that manage European farms, characterised by an increase in farm size, a growing share of farm employees in agricultural labour, and a role for collaborative forms of farming (Nguyen and Purseigle 2012);
- Disconnection between advisory services and research, and mismatch between practice conditions and recommendation from research (Pullin et al. 2004).

To tackle these challenges adequately, there is an urgent need to better understand the business models and performance of new types of advisory organisations as well as the diversity of farmers’ micro-AKIS and sources of knowledge. New approaches to advisory service provision are needed, in order to connect research and farmer-based interactive innovations with advisory services and to boost innovation co-creation. The effectiveness of the governance of farm advisory systems also requires review and up-dating.

The major tasks in AgriLink are thus:

- to provide a better understanding of the roles of advisory services in farmers’ decision-making, accounting for the diversity of farming structures and styles. This will be achieved by undertaking a social network analysis of farmers’ microAKIS in 8 innovation areas across 26 European regions, where the configurations of Regional Farm Advisory Systems (R-FAS) will also be described;
- to set up six Living Laboratories to develop and test new advisory methods and tools (particularly ICTs based) to better link research and practice. AgriLink will integrate the reflexive monitoring of these six Laboratories to provide insights in the quality of collective learning, from a transdisciplinary perspective;
- to assess the effects of governance of farm advisory systems on their contribution to knowledge assemblage at various level, from farmers’ perspectives, up to national and European policies. Specific attention will be placed on the back-office of advisory

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3 As defined in the Glossary (see page 188), in AgriLink we distinguish between the EU FAS (the advisory services funded through the European Union) and RFAS: farm advisory systems (which include a range of actors who provide formal advice to farmers at regional level).
services: that is advisors' training and their contribution to research and development (data basis, experiments) and to knowledge networks and platforms;

- to identify promising configurations of farm advisory services in a multi-level perspective. Participatory workshops will be set up to identify transitions pathways towards service configurations that fit with the diversity of contexts and histories of European agricultures and AKIS.

In AgriLink, our contention is that farmers assemble knowledge from within and outside of what has been conceptualised as agricultural knowledge and innovation systems (AKIS – the collection of agricultural information providers, the flows of information between them, and the institutions regulating these relations). To better understand farmers’ decision-making processes we need to zoom in on the varied sources from which farmers and farm managers assemble knowledge, and the mechanisms they use, particular ICT (e.g. internet searches, mobile phone apps), in a broader perspective than within sectoral innovation systems. We then need to zoom out to better understand the role of advisory services in micro AKIS, and how these can be better governed.

The AgriLink workpackage (WP) structure demonstrates this range of tasks and scales (Figure 2):

![Figure 2: AgriLink WorkPackages (WP) Structure](image)

**AgriLink will thus work at a range of scales**: farm-level micro AKIS (WP2), regional farm advisory services (WP2), and European and national level governance of farm advisory systems (WP4), and the connections between. The Living Laboratories will transect these scales to develop and test new advisory practices (WP3). Transition pathways for the future development of advisory services will be developed in WP5.

1.5 Structure of the Conceptual framework

In reviewing the state of the art for proposal development, it became clear that there is no single overarching framework which adequately addresses the range of topics and scales of work proposed by AgriLink. In particular, there is a disconnection between literature on decision-making at farm level, innovation in advisory service provision and the governance of agricultural advisory services at national and European levels. In the description of work, specific objectives of WP1 ‘Multi-level framework’ are:
• Develop a nuanced, multi-level conceptualisation of farm advisory systems based on literature review and empirical validation that improves understanding of farmer decision-making and knowledge assembly, and allows the analysis of ‘linking’ between micro and macro level processes;

• Develop a theoretically informed foundation for the establishment and assessment of farmers’ micro-AKIS and R-FAS (WP2), Living Labs (WP3), analysis of governance structures including the EU-FAS review (WP4) and Socio-technical Scenario Development (WP5);

• Facilitate the development of a theoretically informed assessment of ‘well-connected and effective advisory systems’, including novel communication techniques and business models that translate and preserve both practical and scientific knowledge.

The AgriLink Conceptual Framework is thus already oriented towards connecting micro-level farmer decision-making processes to the governance and functioning of the farm advisory sector. Key terms and concepts to be defined include: microAKIS, regional FAS, focus regions, Living Labs, governance structures of back-office, evaluation of EU-FAS, multi-level perspective (MLP), socio-technical transition scenarios, and interactivity (see the Glossary for further details).

In this document, we first address the definitions of AKIS, innovation and sustainability, as core challenges for AgriLink. We then outline major concepts in the three levels of conceptual and empirical work (farm, advisory system and governance). We then present the AgriLink’s transdisciplinary dimension, undertaken through Living Labs and Transdisciplinary Scenario Building. The multilevel perspective (MLP) is presented as an option for linking between the three levels, but also for supporting the development of transition scenarios.
2 Sustainability, Innovation and AKIS: Conceptualizing the challenges addressed by AgriLink

AgriLink was funded under H2020 call RUR-14-2016 “Advisors' roles in the functioning of AKIS and advisory policies boosting innovation in sustainable agriculture”. The definitions of “innovation”, “sustainable agriculture” and “AKIS” are thus key to achieving project objectives, and are elaborated in this section.

2.1 Sustainability

The sustainable development of agriculture is a longstanding European Commission policy principle (see Council Regulation (EC) No 1257/1999, Marsden, 2003, Wilson, 2007). The notion of sustainable agriculture particularly gained prominence through the Brundtland Report (World Commission on Environment and Development, 1987), ‘Our Common Future’, where sustainable development was defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. It is widely agreed that increasing the sustainability of agricultural systems is a necessary and important objective (Pretty 2002). However, the definition of sustainable agriculture is highly contested (Robinson 2008).

2.1.1 Key concepts about sustainability

Sustainability is widely conceptualised as comprising three facets: environmental, economic and social (Velten et al. 2015, Kuhlman and Farrington 2010). Early work on sustainable agriculture emphasised environmental sustainability, particularly the benefits of organic farming and low input agriculture. The Commission of the European Communities (1999) communication “Directions towards sustainable agriculture” has a strong focus on environmental sustainability, suggesting that sustainability is about balancing the use of natural resources for long-term agricultural production with the protection of the environmental and cultural heritage in line with society’s values.

In response to the 2007 world food crisis, the productivity of agriculture has increasingly been emphasised in sustainability debates. Terms like ‘sustainable intensification’ and ‘ecological modernisation’ have gained traction. The potential for agriculture to provide viable livelihoods for its producers, and to support vibrant local communities, has also been recognised. This ‘triple bottom line’ of environmental, social and economic sustainability typically also includes a provision that development must not compromise the ability of future generations to meet their own needs. The multi-faceted definition inevitably creates grey areas where one aspect of sustainability is traded off against another. This is further complicated by recognition that particular actions or technologies can contribute to sustainability in some contexts but not others. For further background on sustainability see Primer 25 (Elzen et al. Primer on Sustainable Development).

2.1.2 Application to AgriLink

In AgriLink, we proposed to utilise the three-fold definition of sustainability. For agricultural practices to be sustainable, they must be economically viable, environmentally beneficial, yield appreciable benefits to society (e.g. local employment, access to common pool resources), while not compromising the potential of future generations to meet their own needs. This ‘triple bottom line’ model of including environmental, economic and social aspects of sustainability has been widely used in the sustainable agriculture literature (e.g. Rasul and Thapa 2004, van Calker et al. 2005) and provides an imperfect but practical option for conceptualising sustainability.
In AgriLink, we do not propose to formally measure the sustainability of the innovations developed or adopted by farmers or advisory services. Sardain et al. (2016) argue that over 20 years after sustainability was identified in Agenda 21 as a principal objective for nations, there is no agreement on how to measure sustainability. For AgriLink, a key problem is that farming advice typically addresses individual farmers while sustainable agriculture should be defined at the farm system level (Frater and Franks 2013, Ryan et al. 2016). Sustainability can only be accurately assessed through observing how the innovation is applied within the overall farm system, not by assessing any characteristics of the innovation itself at the farm where it is initially applied. Thus the focus of research on the advisory system and the objective of assessing innovation for sustainable agriculture are not readily compatible. Rather than addressing sustainability at farm level, we will include the apparent potential for innovations to contribute to sustainability as part of our criteria for selection.

We operationalised this idea by choosing innovation areas that combine (positively or negatively, with synergies or trade-offs) different dimensions of sustainable development (see Table 1 below). The innovation areas were selected to represent the challenges identified in the Strategic Approach to EU Agricultural Research & Innovation (EC, 2016a) (identified in the columns in Table 1). Each innovation area illustrates the difficulties of combining different dimensions of sustainable development, and the need to combine knowledge from different sources and of different types.

### Table 1: AgriLink Innovation Areas

<table>
<thead>
<tr>
<th>Environment, climate and resilience</th>
<th>Growth and Jobs</th>
<th>Food security</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate change</td>
<td>Eco-efficient</td>
<td>Pests &amp; diseases</td>
</tr>
<tr>
<td>Technological Innovations (focus on ITs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. ICTs in vegetal production</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2. IOTs in animal production</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Process Innovations / Farming Practices (focus on integrated ecological farming)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Biological pest control</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>4. Soil improving cropping systems</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Market and financing Innovations (focus on diversification)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. New products, markets and services</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>6. Innovation in value chains</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Social and organisational innovations (focus on collaborative organisations)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Collaborative management</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>8. Particip. support tools and services</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

The eight innovation areas have been chosen to cover the diversity of innovations at stake in agriculture: from technological innovations (with Information and Communication
Technologies – ICTs- and Internet of Things – IOTs) to organizational and social innovation, for instance associated with new forms of collective management of land or labour within and between farms. The eight innovation areas also address the three pillars of sustainability: economic (technological and market innovations), environmental (process innovations/farming practices) and social (social and organisational innovations).

These innovation areas raise different questions or challenges for farm advisory services that are described with more detail in Box 1 (page 20).

**A second implication of AgriLink’s view on sustainability is that AgriLink will thus consider the identification of ‘best’ or ‘good’ practices to be context dependent** (i.e. the ‘ideal’ role of advisory services in sustainability transitions is expected to be different in different situations, following recent development about the ‘best fit’ of advisory services, see Birner et al. 2009 or Prager et al. 2017). For further information on the definition of ‘good practices’, see Primer 2 (Laurent’s Primer on “Binging” and “Not Binding” Good practice).

### 2.2 Agricultural Innovation

The European Commission’s Standing Committee on Agricultural Research AKIS SWG reports draw on OECD (2009) definitions of innovation:

> An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations. Innovation activities are all scientific, technological, organisational, financial and commercial steps which actually, or are intended to, lead to the implementation of innovations. These activities themselves need not to be novel, but are necessary for the implementation of innovations.

#### 2.2.1 Key concepts about agricultural innovation

In considering innovations in AgriLink, we are concerned both with the process of producing new innovations and the adaptation and up-take of existing innovations (either on farms or in advisory services). It is widely recognised that innovations are rarely produced in isolation, or adopted without modification (either to the innovation itself or how it is utilised or implemented).

In line with the general innovation research, early work on innovation in agriculture focused on the up-take of technologies. Technological innovations were conceptualised as being developed through research, and disseminated by agricultural advisory services, or in some cases directly to farmers. Work by Rogers (1962, 2010) and others promoted the ‘adoption/diffusion’ model. It became the primary model for agricultural extension. The approach identified different rates and types of adopters, following an S curve: a small number of innovators, followed by a larger number of early adopters who became opinion leaders, convincing the ‘early majority’ to follow and ultimately the late majority (who remain somewhat sceptical) (Padel, 2001). This work emphasised the transfer of knowledge about innovations from advisors to farmers, and from innovator and early adopter farmers to other farmers.

Smith et al. (2010) argue that innovation studies broadened from a focus on promoting cleaner technologies in the 1980s to system-level changes in production and consumption. As such, innovation studies expanded from a technology focus, to current definitions which include methods and concepts. Smith et al. (2010) also identify a broadening of understanding of how innovations emerge: early work emphasised economic price signals, whereas more recent

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4 The Oxford English dictionary defines ‘to innovate’ as to “make changes in something established, especially by introducing new methods, ideas, or products”. ‘Innovation’ is defined as the action or process of innovating.
work utilises innovation systems perspectives. Systems perspectives emphasise co-
development of innovations, involving multi-actor processes and partnerships. Learning and
cycle are shared and responsive to contexts (Klerkx et al. 2012). The iterative processes of
innovation development and mainstreaming are developed particularly within the multilevel
perspective (MLP), explored in Section 4.2.

One of the aims of AgriLink is to understand and actively stimulate innovation processes. However, as Klerkx et al. (2010, p. 458) point out – agricultural innovation is not inherently
good or value free. It is driven by different views, and is normatively laden. In addition, both
costs and benefits must be assessed, as well as their distribution among social groups. Innovation for agriculture is typically linked to the concept of sustainability – innovations are
assumed to address at least one aspect of sustainability (economic, social or environmental).
While this is fair - an innovation which does not have the potential improve either the economic,
social or environmental condition of the farm unlikely to be taken up in any case – it also
illustrates the point that there are sustainability trade-offs in what innovations can be
expected to achieve (Nelson and Nelson 2002, Tuomi 2002). Inevitably, some innovations
will achieve one aspect of sustainability at a cost to another. These trade-offs contribute to
explanations of variable adoption rates.

2.2.2 Application to AgriLink

To account for these multiple dimensions of the innovation debate, AgriLink’s foundations incorporate four important pillars:

a) AgriLink does not restrict the definition of innovation to technological innovation, but
integrates process, marketing and social or organisational innovations;

b) AgriLink will study innovation areas where the contribution of innovation to
sustainability is a matter of debate, hence there is a specific role for advice to play in
that respect;

c) AgriLink will explore innovation at different scales, and includes farmers who did not
adopt innovations in the analysis;

d) AgriLink does not only analyses innovation but also aims to promote participatory
methods for the innovation within and through services, through six Living Labs5.

The empirical research in WP2 will address four key focuses of sustainable
innovations: technological, processes and farming practices, marketing, and social
and organisational, following classical taxonomies on innovation (OECD 1992). To account
for this variety of situations, AgriLink will assess the role of advice in 8 innovation areas. The
eight innovation areas were chosen to represent the challenges identified in the Strategic
Approach to EU Agricultural Research & Innovation.

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5 A Living Laboratory is a gathering of partnerships in which businesses, authorities, citizens and other relevant stakeholders work together to create, validate, and test new services, business ideas, markets and technologies in real-life-contexts.
Box 1. The eight innovation areas of AgriLink

Innovation areas 1 & 2: ICTs in vegetal production & IoTs in animal production: Information and communication technologies (ICTs) provide different functions for farmers and advisors: monitoring practices, supporting decision (how much nitrogen, water or pesticides to use?), networking with other farmers, etc. They come with various support (software, smartphones, etc.) and use different sources of data. These technologies are often claimed to provide a more efficient use of resources, for instance by taking into intra-field heterogeneity to better adjust spraying. Internet of Things (IoT) implemented in animal production has enabled the automatic monitoring of individual animals and groups of animals for meat, milk and egg production, as well as monitoring of animal behaviour, health and welfare, productivity and reduction of emissions. ICTs and IoT are brought to farmers by very diverse actors (SMEs, agro-industries, farmers’ cooperatives, applied research institutes, universities, or even farmers themselves), many of which have recently taken on new roles in advice provision, changing the farm advice landscape.

Innovation areas 3 & 4: Biological pest control & Soil improving cropping systems: There are many debates around new agricultural practices that could combine productivity goals with societal aims like pesticide reduction or climate change mitigation. Biological pest control is a typical example. It includes the use of natural auxiliaries – acting as predators, parasites, pathogens, and competitors – to control pests and reduce the damage they cause on plants and animals. Soil quality management is another example. The quality of agricultural soils in the EU is under severe pressure due to declining soil organic matter, erosion, compaction, salinization, desertification, etc. More sustainable cropping systems and agronomic techniques are therefore needed, including new types and combinations of soil-improving crop rotations, reduced tillage, intercropping and under-sowing, crop varieties, farm machinery, etc. For both practices, the challenge for advisory services is to lead farmers to change their farming strategy and combine new scientific knowledge and tools with local ones to implement them into their specific farming systems.

Innovation areas 5 & 6: New products, markets and services & Innovation in value chains: Examples of new products include the introduction of new crops to take advantage of demand growth, products differentiation and labelling (DOP, organic, free range, carbon zero, low water footprint, etc.) addressing niche and specific market segments. New services result of farmers’ diversification strategies (such as tourism). They include new ways of delivering the products to the consumers (direct-sell of baskets using ICTs, opening farms to consumer’s direct pick, etc.). There is a need to address new business models and multi-actors co-innovation at local level aiming at capturing the add-value of products and services (club of producers, crowdfunding, food hubs, etc.). This type of innovation tend to be interactive by nature and involve farmers, farmers’ associations, different types of advisors (local development organisations, etc.), consumers, local communities, NGOs, retailers, tourism operators, scientists, policy makers, etc. Advisory functions are thus taken in very complex assemblages within value chains, involving new categories of actors and direct relations with consumers.

Innovation areas 7 & 8. Collaborative management & Participatory support tools: The profitability of many crop and livestock enterprises depends to a great extent upon the willingness and capacity of farmers to collaborate and pool their resources. Numerous examples of collaborative action exist for optimizing the use of on-farm capital assets (e.g. “machinery rings” for sharing farm equipment), and/or off-farm natural resources (e.g. communal grazing of mountain grasslands) and/or labor (e.g. collective farm tenure). A common feature is that the management of certain farming activities can become a shared task between farmers, or between farmers and other actors. Social and organizational innovation also concern the collective development of participatory tools and services by and for the farmers. This includes collaborative pest warning management systems, where farmers and advisors contribute to data collection and dissemination about the presence of pest on a territory, or participatory breeding systems, for instance in organic farming. This collaborative dimension of farming changes not only the functions of advisory services (facilitation, data quality management, human resources management, etc.), but also potentially their clientele, as the persons in charge of farm management and implementation might not be the owner of the farm (but managers, employees, associates, etc.).
In AgriLink, we are considering three types of innovations: innovations that increase the sustainability of farms, innovations in advisory service provision and innovation in the governance of advisory services. We are also interested in how innovations are initially produced, and how they are developed and disseminated. As such, we are interested in innovation at multiple levels.

In AgriLink WP2, we will be assessing the adoption and spread of specific innovations on and between farms. It will be important that these innovations are clearly definable (i.e. so that we can readily distinguish adopters from non-adopters). This is fairly clear cut in relation to technological innovations, but less so for innovations involving new practices or network engagement. Also in WP2, AgriLink will identify good practices in advisory service provision. These practices are expected to reflect the particular characteristics of the innovation (e.g. innovations involving ICT may require different supports than innovations involving environmental collaboration.

In AgriLink WP3, the Living Laboratories will specifically develop innovations in innovation support services (Figure 3). The topic of innovation in service provision will be addressed in Section 2.3.

Figure 3: Living Labs in AgriLink

2.3 Agricultural Knowledge and Innovation Systems (AKIS)

The term AKIS (Agricultural Knowledge and Innovation System) is commonly utilised in current European policy documents, and the text for the AgriLink call. However, the term is not consistently defined. The original construction of AKIS as ‘Agricultural Knowledge and Information Systems’ was developed by Röling and others in the 1980s and 1990s (Röling 1988; Röling and Wagemakers 1998). Röling (1991) defined AKIS as:

The persons, networks and institutions, and the interfaces and linkages between them, which engage in or manage the generation, transformation, transmission, storage, retrieval, integration, diffusion and utilisation of knowledge and information, and which potentially work synergistically to improve the goodness of fit between knowledge and environment, and the technology used in agriculture. (1991, p. 10)
2.3.1 Key concepts about AKIS

The current usage of the term AKIS (where “I” is short for Innovation) more accurately represents the literature on AIS (Agricultural Innovation Systems), a concept which emphasises a broader network of organisations and the focus on new products, processes and forms of innovation. The two approaches to AKIS can be considered competing (Dockès et al. 2011) or complementary (Klerkx et al. 2012). Recent SCAR AKIS working group reports utilise the term AKIS to refer to the definition of AIS identified in Dockès et al. (2011), original source Leeuwis and Ban (2004):

a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect the way different agents interact, share, access, exchange and use knowledge.

For the purposes of consistency, in AgriLink we will define AKIS simply as: “the collection of agricultural information providers, the flows of information between them, and the institutions regulating these relations”. For further information on the history and conceptualisation of AKIS, see Primer 1 (Sutherland and Labarthe Agricultural Knowledge and Innovation/Information Systems primer).

The AKIS concept thus identifies a wide range of actors, processes and policies influencing agricultural innovation. The relevant actors are pictured in Figure 4.

![Figure 4: Actors involved in contemporary AKIS (source: SCAR 2012)](image)

Critical theory has been applied as a theoretical underpinning of AKIS by Röling to criticize the linear (realist) process of innovation as ‘applying’ of scientific findings to practice (see Primer 3: Van Hulst’s primer on Communicative Action and Agricultural Innovation Systems). The idea of an AKIS explicitly acknowledges diverse objectives, including social and environmental sustainability.
Within the definition of AKIS/AIS, there are two broad perspectives that have been adopted, distinguished by Klerkx et al. (2012) as the infrastructural and process approaches. The infrastructural approach focuses on the innovation support infrastructure, essentially a static image of the actors (e.g. advisory services, research institutions) and infrastructure (rules, regulations and physical infrastructure) which directly influence innovation outcomes. The PRO AKIS FP7 project is an example of this approach (Knierim et al. 2015): the inventories collected provided static images of the actors in the national AKIS and how they were governed and funded (see Figure 5 for an example).

Figure 5: Example of AKIS Diagram from PROAKIS - Denmark case

Source: http://www.proakis.eu/inventory

Process approaches emphasise the interactive development of technology, practices, markets and institutions. AKIS is seen as largely self-organising, and focused around achieving a particular end (Klerkx et al., 2010). This is most consistent with the approach to AKIS adopted in the FP7 SOLINSA project (Moschitz et al. 2015). This project focused on the processes (i.e. how knowledge was created, exchanged and implemented), albeit primarily in relation to ‘alternative’ agricultural practices (in contrast to mainstream commercial agriculture). Case studies included farmer study clubs that integrated a variety of actors to improve the sustainability of dairy farmers, and a co-operative of ‘care farmers’ in the Netherlands.

In AgriLink, the infrastructural and process approaches will be utilised together, to assess the structure of the R-FAS, and the processes involved in microAKIS.

Other options for considering the array of actors (including objects like technology) include assemblage theories. Assemblages are heterogeneous collections of elements (material and immaterial, sentient and non-sentient) that are constantly evolving. The appeal of ‘assemblage’ thinking is that it identifies entities as heterogeneous and evolving, embodying the ongoing coexistence of diverse power arrangements (Allen, 2011). Assemblage theory is an alternative to ‘systems’ thinking of ‘agricultural knowledge systems’: both include a wide range of actors and the role of technologies (particularly digital) in mediating knowledge flows. For further information assemblage theory see Primer 10 (Sutherland et al. How farmers assemble knowledge for innovation). For further information on the impact of ‘Big Data’ on farming and advisory service provision, see Primer 5 (Micheloni's primer on Digitalisation of agriculture and big data).

Klerkx et al. (2010) also identified a ‘functionalist’ view, but this is not well developed.
2.3.2 Application to AgriLink: Infrastructural and process approaches

In AgriLink we propose to utilise both the infrastructural and process approaches described in Section 2.3.1. The infrastructural approach identifies the actors and associated rules (including regulations) of AKIS; it is important to understanding the structure and functioning of the regional farm advisory services (R-FAS), and how they are influenced by the EU farm advisory regulations. The process approach emphasises the interactive development of technologies, practices and institutions. It is important to understanding on-farm innovation and microAKIS. Having both perspectives is particularly useful in a multilevel perspective, and will be applied in different WPs.

In WP2, AgriLink will identify a set of farmers who have, have not or have ceased adoption of a particular innovation (described in Box 1). The data collection will have several foci. The first is to identify the sources of the information and support farmers drew on in deciding to (or not to) implement a particular innovation (i.e. the structure of their microAKIS). The second is to analyse the processes in which innovation decisions are embedded (e.g. informal networks, decision-making approaches, sequences of events). The third is to analyse the farm-level constraints and opportunities for engaging with innovations. These include the geographical features of the farm (e.g. land capability), the technological preparedness (e.g. ICT access) and the history of farm-level engagement with advisory services of various forms. The concept of microAKIS is further elaborated in Section 3.1.2.

In WP3, AgriLink will establish or develop six ‘Living Laboratories’, where scientists, advisors and farmers work together to develop new advisory techniques, in response to particular industry issues. This approach will focus on the processes of knowledge exchange. The concept of communicative rationality is particularly relevant here – it is the process of facilitating communication between scientists, advisors and farmers that new forms of advisory technique or service provision are expected to emerge.

In WP4, AgriLink will evaluate the EU-FAS, using a combination of structural and process approaches to assess how specific policies and governance approaches influence the structures and processes of advisory services ‘on the ground’ in the case study countries. The three different discourses proposed by Röling (2009b), based on Habermas, may be useful to identifying the different ways that power is understood and exercised in the EU-FAS system.

In WP5, the transition scenarios are expected to address both infrastructural and process approaches: the desired infrastructure under particular scenarios, and the processes associated with reaching these infrastructures, and characterising the associated AKIS.
3 AgriLink Multi-level Framework: Key concepts for better understanding the role of advice in decision making

Figure 6 demonstrates the interplay of AgriLink concepts to better understand the role of farm advice in farmers’ decision making regarding different innovation areas. At the centre are farmers (and farm households), making decisions about how to manage their businesses. Major decisions are conceptualised as occurring cyclically, in stages, largely in response to ‘trigger’ events. During these change processes, farmers influence and are influenced by advisory services, researchers and other sources of knowledge (inside and outside of the agricultural sector). A key feature of AgriLink’s model is its dynamic dimension that enable to capture both path dependency and transition mechanisms.

In our model, the sources of farmers’ knowledge are conceptualised as farmers’ ‘micro-AKIS’, developed within the Innovation Environment. In our conception, these microAKIS are both dependant on a given innovation or technology adoption process, but they are also partly determined by structural characteristics of the farms. A key feature of the project is that decision making will be described both form farmers who adopted innovations and farmers who did not (either because they could not or chose not to adopt).

Central to AgriLink is then to understand the role of farm advisory organisations in this dynamic model of decision making. By advisory organisations we understand the set of organisations that enable farmers to develop farm-level solutions, enhance skills and coproduce knowledge with advisors, are included in the enabling environment. Farm advisory services include traditional advice providers (chambers of agriculture, public bodies, etc.), farmer-based organisations (unions, associations, cooperatives, etc.), independent consultants, NGOs, upstream or downstream industries, and high-tech sectors. They can provide a range of services, including R&D, advice and brokering. In other words, they can be active at different steps of the decision making, and use different methods at these different steps.

The actors in the innovation environment are influenced (e.g. and sometimes funded) through the broader policy and institutional environment, which includes EU legislation and EIP Agri activities to enable innovation in the agriculture and forestry sectors.

Figure 6: Representation of AgriLink key concepts
3.1 Processes of farm-level decision-making

“Improved understanding of farmers’ decision making processes across the EU” was the first specific impact requested in the AgriLink (RUR-14) call. In this section, we consider two aspects of decision-making: the general process of farm decision-making, and the role of knowledge and networks in farm decision-making.

3.1.1 Key concepts about farmer decision-making

Numerous studies in recent decades have considered farmer decision-making, but primarily in relation to outcomes. Actual processes of decision-making are difficult to quantify, as decision-making processes are typically iterative, informal, and farmers themselves may not be conscious of the processes involved. Several theories of human behaviour coexist in social sciences. Some economic approaches rely on methodological individualism, assuming that decisions are made through an internalised cost-benefit analysis process. Policies to encourage farmers to make particular decisions (e.g. to engage in agri-environmental schemes) tend to be based on this approach. However, this approach of the economic behaviour does not reflect the complexity of the drivers of decision-making (Sneddon et al. 2011). Other economic approaches (e.g. evolutionary economics, institutional economics) analyse how economic decisions are embedded in specific technological paths, institutional frameworks or socio-cognitive norms. They have built tight collaborations with other disciplines in order to make the most of the recent advances of studies on behaviour. AgriLink is an illustration of such a pluri-disciplinary perspective.

In recent decades, social psychology theories have increasingly been applied to the analysis of farmer decision-making. Ajzen’s (2005, 2011) Theory of Planned Behaviour, for example, draws attention to social norms and practical limitations, in addition to the attitudes or values associated with the objective of the decision-itself (see Sutherland 2010, 2011 for applied examples). In the Theory of Planned Behaviour, the decision to make a change is actively planned – the decision-maker has clear motives for considering a particular action, and actively considers the practical limitations (e.g. planning restrictions, financial barriers) as well as social considerations (what the neighbours or other people of importance would think of the action).

Other research focuses more strongly on particular aspects of this three-fold model. For example, work on the social construction of the ‘good farmer’ has focused directly on the role of social norms and identity in influencing farmer behaviour (e.g. utilising Bourdieu to conceptualise normative identities as ‘good farmers’, Burton 2004, Sutherland 2013). In van der Ploeg’s (1994) work on farming styles, he argues that farms are limited in their ‘room for manoeuvre’ by their degree of technology and market integration. Markets, technology and social norms do not determine what type of farming will be carried out, but they provide the context in which different trajectories are possible.

In the AgriLink Description of Work, the Triggering Change Model was identified as a key approach for further development. In developing this model, Sutherland et al. (2012) argue that owing to the path dependency of farms, major changes in farming trajectory occur largely in response to trigger event(s) (e.g. crop failures, low commodity prices, succession, retirement). In response to these trigger events, farmers become more active knowledge seekers, choosing and implementing a new course of action. If successful, these new actions become part of a new path dependency (see Figure 6).

The model draws on social psychology theory (the ‘elaboration likelihood model’ – Petty and Cacioppo 1986) to demonstrate that while farmers are locked in path dependency, they engage largely in ‘peripheral route processing’ of new information – giving it superficial attention but storing it for potential later use. Changes are incremental. Following a ‘trigger event’ (which can range from the gradual integration of a successor or recognition of long-term financial losses to more sudden shifts such as loss of staff or the emergence of new market opportunities), farmers more actively seek and assess information using ‘central route
processing’, which leads to more durable change. New changes are implemented but take time to develop and consolidate. If unsuccessful, the period of active assessment continues; if successful, the changes become the new norm and farmers become path dependent on using the new innovation.

It is important to note that the triggering change conceptualisation represents an idealised process. Triggers are often unpredictable, and thus may occur at any stage in the change process, or may indeed be removed, leading to an early return to path dependency or active assessment. This can result in deviations from the process as outlined above.

3.1.2 Application to Agrilink: Knowledge and Advisors within MicroAKIS

One of the aims of AgriLink is to further develop the Triggering Change Model in relation to farmer microAKIS and advisory service provision (see Figure 7). This model is based on social psychology. Path dependency represents the steady, current trajectory characteristic of most farms. Farmers are typically heavily invested in infrastructure of various forms (e.g. buildings, knowledge, labour) that are suited to their current production practices. Farmers accumulate information during this phase, but typically give it minimal attention. It is through a trigger event (e.g. successor wanting to take an active role in the business, ongoing financial losses, new opportunities) that the farm decision maker(s) start to actively acquire information and seek out options to change the farm trajectory. New innovations are actively considered and evaluated, and then implemented. The implementation phase is fragile, as the innovation is adapted for on-farm implementation and new knowledge is being consolidated. Once the new pathway is embedded in the knowledge, practices and technologies of the farm business, the farm returns to path dependency.

There are several entry points for developing the model in AgriLink: formation of the microAKIS, the role of advisors and the role of non-knowledge related factors in decision-making. There is also potential to utilise the Triggering Change Model to understand transitions in advisory service provision.

Micro-level agricultural knowledge and information systems (micro-AKIS) is the knowledge-system that farmers personally assemble, including the range of individuals and organisations from whom farmers seek services and exchange knowledge, the processes involved, and how they translate this into innovative activities (or not). The ‘Active Assessment’ process identified in the model is where the farmer(s) actively form the microAKIS associated with the innovation they are considering adopting. The microAKIS is further revised through
the implementation and consolidation phases, forming part of the path dependency in terms of information access for future innovation processes.

Advisors can play a role at any stage – general awareness-raising during the path dependency stage, active advice provision during ‘active assessment’ and ‘implementation’. H2020 AgriSpin findings demonstrate that advisors are particularly important during the development of innovation implementation (see also www.agrispin.eu). Advisors may also be part of a trigger event, making farmers aware of particular activities or performance issues (e.g. accountants reporting poor financial returns may actively encourage farmers to consider different courses of action). Advisors can also strategically target farmers who are likely to be undergoing a transition process (e.g. farmers who are approaching retirement, have recently identified a successor, or who are in an industry which has been experiencing a financial downturn).

Decision-making at each stage is also influenced by motivations, social norms and the constraints of the farm household and farm itself. An innovation that addresses a particular issue in one context (e.g. to undertake a new type of production) may not suit a different context (e.g. owing to limitations on land capability or labour availability within the household). It is important to recognise that in these circumstances, the lack of information, or connection to particular networks is not the only driver. Although knowledge plays an important role in decision-making, it is not the sole determinant.

The Triggering Change Model may also be helpful for assessing change processes in the farmer/advisor/researcher interactions in the WP3 Living Labs. Advisory services and research institutions can be expected to have path dependency (i.e. to be invested in particular patterns of service provision and stakeholder engagement). Triggers may be necessary to initiate a major change in the way these institutions interact; considerable active information seeking can be expected before a change in trajectory occurs. For further information see Primer 27 (Sutherland’s primer on Triggering Change.)

3.2 The role of knowledge and learning in decision-making

Although the Triggering Change Model identifies different types of information seeking and processing which occur at different points in farming trajectories, it does not address the specific processes farmers undertake to acquire and adapt new knowledge, or the role of intermediaries (human and technological) in those processes, for farmers adopting innovation as well as for those who do not (either because they cannot or because they chose not to adopt). These are areas in which AgriLink will develop the Triggering Change Model. In this section we consider how conceptualisation of knowledge and learning and inform development of the Triggering Change Model for use in AgriLink.

3.2.1 Key concepts about the role of knowledge in farmer decision making

Several generations of theories of knowledge, knowing and learning can be identified, with different focuses and epistemological assumptions (i.e. about the nature of knowledge). Many have gradually been extended to include collective as well as individual learning. Distinctions of knowledge, knowing and learning are much contested so one person’s ‘learning approach’ might not be the same as another’s. Theories distinguish between those that take account of interaction such as knowledge exchange and co-creation or co-production of knowledge and the more linear idea of ‘knowledge transfer’. Approaches to knowledge, knowing and learning draw on a range of different traditions and many different theories. All these approaches have important roles to play in the context of AgriLink but care is needed in drawing out their underpinning assumptions to recognise what to draw on when, including in design for learning see Primer 16 (Blackmore’s primer on Theories of knowledge, knowing and learning).

When assessing knowledge exchange and development, two general forms of knowledge are typically identified: tacit (implicit) and codified (explicit) knowledge, a
distinction which can be traced back to Polanyi (1958). Implicit knowledge or ‘know how’ is acquired through practice and experience, and is not necessarily related to cognitive learning (Curry and Kirwan, 2014). Riding a bicycle is a frequently mentioned example where people successfully undertake an activity without necessarily being able to explain how they do it. In contrast, explicit or codified knowledge can be easily reported and documented (e.g. through scientific reports), although it may require translation into more adapted knowledge, suited to practical application (see EU SCAR 2012). The two types of knowledge are associated with different types of learning (Nonaka and Takeuchi 1994): tacit knowledge is gained through experience, whereas codified knowledge is gained through more formalised training or education7. However, it is not always easy to distinguish between the two types of knowledge, as they develop interactively – innovations developed tacitly can be tested and developed scientifically, or generalised for communication to other actors. Codified knowledge can be adapted into tacitly understood practices.

Considerable research in recent years has addressed the way that knowledge (amongst other resources) flows and is altered through networks. Conceptualisations of the structure and influence of these networks often draw on the concept of ‘social capital’, which can be defined as “the features of social organization […] that can improve the efficiency of society by facilitating coordinated actions” (Putnam 1993, p. 167). Social scientists have long since rejected the notion that linear knowledge flows from scientists to extension agents to farmers are the best way to ensure innovation in the sector (van Crowder and Andersen 1997; Chambers et al. 1989; Dockés et al. 2011, Röling and Wagemakers 1998). The SCAR AKIS SWG and EIP Agri similarly emphasise the importance of ‘interactive innovation’, whereby innovation is conceptualised as a social process involving a range of actors.

Garforth et al. (2003, p. 324) argues that “an almost universal finding from studies of farmers’ sources of information and influence is that ‘other farmers’ are their most frequently reported source”. Recent research has emphasised that both knowledge gained through experience and exchange with peers and scientific knowledge are important for achieving sustainability in agricultural systems (Curry and Kirwan 2014, Labarthe and Laurent 2013, Tovey 2008). Instead, innovation and up-take of new farming technologies or practices are widely accepted as resulting from iterative engagement in non-linear knowledge networks or systems. In line with this, recent literature emphasises the importance of advisors as facilitators of knowledge exchange within these systems (Österle et al. 2016, Cristóvão et al. 2012). Owing to the privatisation of many advisory services across Europe, farmers tend to rely increasingly on ‘free’ advice offered by various private companies (e.g. as part of input supply or specialised procurement, see for instance Compagnone et al. 2015 for an overview in France). This situation raises many questions regarding the reliability of farm advice and ‘trust’ has been found to be particularly important. Both Sutherland et al. (2013) and Bartoli et al (2012) found that private advisors based in commercial supply companies built up trust over time with their clientele (i.e. that long-term customer relations were valued more than short-term profits through heightened sales). The apparent bias of ‘free’ advice associated with input sales is thus not necessarily realised in practice.

The concept of ‘LINSAs’ (Learning and Innovation Networks for Sustainable Agriculture) was developed in the FP7 SOLINSA project as an alternative to traditional understandings of AKIS, specifically as a means to understand transition pathways ‘alternative’ agricultural approaches, which are likely to be more sustainable (such as organic farming). In SOLINSA, LINSAs were defined as “networks of farmers, food producers, consumers, NGOs, experts and local administrations, looking for alternative ways to produce food and contribute to rural sustainable development” (Ingram et al. 2013). LINSAs primarily develop outside of the traditional AKIS, and develop organically on the basis of perceived need, typically starting with informal collaboration between individuals, and becoming more formalised through time. The identified networks are explicitly goal-oriented in terms of increasing the sustainability of agriculture. Processes of social learning (learning in specific contexts, including tacit knowledge) and innovation are key. Within the LINSAS conceptualisation, knowledge exchange

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7 Kitchener (1983) identifies a third level of learning: knowing about the nature of knowledge.
and co-production are understood as leading to innovation up-take and development. There is an implied assumption that up-take of particular actions is a matter of learning (i.e. that learning occurs through the adoption process). While tacit knowledge certainly is gained through active engagement with an innovation, it is important to note that farmers can legitimately reject a potential innovation, not as a refusal to learn, but as a legitimate assessment that the innovation does not fit their needs or capabilities (for further information see Primer 18 (Kunda’s primer on LINSAs and www.solinsa.org).

Numerous studies have shown the role of geographical proximity and the importance of spatial relations in the process of information and knowledge transfer, and in the diffusion of innovations (e.g. Audretsch and Feldman 2004, Boshma and Frenken 2011, Capello 2014). DiMaggio and Powell (1983) point to a phenomenon of "institutional isomorphism" which refers to a convergence and homogenization of actors' behaviours in the same sector or territory. This reflects localised rules and norms and the spatial characteristics of the region. Geographical proximity effects are thus particularly strong within sectors. Social networks may also be lodged in particular spaces (see Primer 7, Galliano primer on Geography of innovation and farmers' adoption behaviour).

Science and technology studies focus on investigation of science as a social phenomenon, including the processes of scientific knowledge (co)creation and technological innovation. Recent decades have seen critiques of the dominance of science as the provider and distinguisher of valid knowledge, emphasising instead the validity of dialogue-based practices of knowledge co-creation (see Primer 24, Adamsone-Fiskovica’s primer on Science and technology studies).

3.2.2 Application to AgriLink: Infrastructural and Process MicroAKIS

AgriLink will focus on specific decisions made by farmers in relation to adoption or non-adoption of specific innovation areas (technologies or methods selected for empirical research in WP2). **We will focus particularly on the assembly of information from a range of sources (the ‘micro-AKIS’ each farmer/decision-maker assembles in the process of adoption).** Our concept of microAKIS enables us to bridge process and infrastructural view in farmers’ decision marking (see Figure 8).

![Figure 8: Integrating the Triggering Change model and farmers’ microAKIS](image)

The **infrastructural micro-AKIS** encompasses the sources of knowledge on which farmers draw to make decisions surrounding adoption, implementation or non-adoption of a particular innovation (see the discussion of ‘infrastructural’ perspectives in Section 2.3). These can be drawn as a diagram. They are thus specific to the farmer (or farm decision-making body) and the particular innovation.

The **infrastructural micro-AKIS** also includes the characteristics of the farm, farmer and R-FAS. These include development goals of the farmers, available labour, technologies, skills, internet access, land capability and available advisory services of various forms (e.g. fee for service, public/private). As such, the infrastructural micro-AKIS details the capability of the
farm and farmer, and the available resources, particularly as they relate to information access and knowledge exchange.

The **process micro-AKIS** addresses the interactions that occur over the period of time in which the farmer considers developing or taking up an innovation. These processes include the active consideration of options, interactions with peers and advisors, and the facilitative role played by technologies (e.g. mobile phones, internet access) in mediating these relationships. AgriLink's microAKIS concept thus enables integration of both sources of codified (Decision Support tools, etc.) and of tacit knowledge (peer-to-peer learning, etc.).

In developing a methodology for assessing microAKIS and the influence of advisory service, there are issues in identifying the sample population. In developing the Triggering Change Model, interviews were conducted with the ‘primary farmer’ or ‘primary decision-maker’ on farm holdings. This term is increasingly problematic. As a methodological issue, it is highlighted here to raise awareness (see Box 2).

### Box 2: Who is the ‘decision-maker’?

*Who makes the decision?* Although most research into farmer decision-making recognises that decisions are commonly made by households (as part of ‘family farms’), the empirical research almost exclusively focuses on the ‘primary farmer’ as the unit of analysis. This is complicated by the increasing diversity of structures in agriculture: no longer is family farming necessarily the norm. **Decisions could be made by individuals, partnerships of various forms, board of directors, farm managers, employees or a combination.** ‘Decisions’ may also be dictated by suppliers or regulators. An important paper by Farmar-Bowers and Lane (2009) demonstrates that different types of decision within the same farming business may be made by different groups (e.g. some decisions are made at household level, whereas others are made by formal business partners). Focusing on the ‘primary farmer’ may discriminate against spouses (particularly women) and younger household members who play a major role in decision-making.

Demographic characteristics, particularly gender and age, are also important considerations. The individual identified as the ‘primary farmer’ is typically an older man. Spouses and successors of either gender could be involved in the decision-making processes, and may indeed have final say. Protection of the male spouse’s identity as a farmer (even in cases where a female spouse has substantial influence and/or financial control due to off-farm employment) has been demonstrated in the gender in agriculture literature.

This situation calls for pragmatic methodological choices when studying microAKIS: i.e. to adapt the perimeter of the analysis (data collection and processing) to the actual pattern of the decision making for the studied innovation.
3.3 Conceptualising the R-FAS

The Regional Farm Advisory Service (R-FAS) is the full range of farm advisory organisations in a given region, and their connection to wider AKIS organisations. Change in advisory practice can be addressed at the level of the relation between a farmer, at the level of the advisor collective (e.g. those sharing some professional norms), at the level of the organization (in line with new business models) or at the policy level (how are some advisory practices institutionalized). In this section we first present options for characterising farm advisory service (KIBS) suppliers, based on the functions that these services can play regarding farmers’ decision making and innovation. AgriLink also acknowledges the fact that advisory service suppliers act in the context of evolving systems.

3.3.1 Key concept about service providers within R-FAS: KIBS

In the AgriLink Description of Work, it was proposed to analyse farm advisory services as Knowledge Intensive and Business Service (KIBS) organisations (Gallouj 2010, Miles et al.1995), “whose primary value-added activities consist of the accumulation, creation, or dissemination of knowledge for the purpose of developing a customized service or product solution to satisfy the client’s needs” (Bettencourt et al. 2002, p. 100). KIBS are depicted as essentially relational activities (Gadrey 2000). For many authors, this specificity of services as an economic activity implies the need for specific analytical frameworks (Drejer 2004), in both economics (Gadrey 2000, Hill 1999) and management sciences (Sundbo 1996, Sørensen et al. 2013). A strong emphasis of this research track is put on the specificities of innovation dynamics within KIBS. KIBS are also increasingly acknowledged as important contributors to the performance of the sectors who are their clients. The debates now focus on KIBS impact on growth and smart specialisation at regional level (Corrocher and Cusmano 2014); but also about how innovation in KIBS play on innovation dynamics in other sectors (Muller and Zenker 2001). Nevertheless, this work tends to concentrate on the role of KIBS on innovation in urban areas (Simmie and Strambach 2006). The role of KIBS in rural areas and agriculture needs to be further understood (Klerkx and Proctor 2013).

Different authors have developed, based on empirical studies, some original typologies of organisations and innovations in services, including KIBS (Gallouj and Savona 2009, Hipp and Grupp 2005). A decisive added value of such frameworks is to identify the effects of various types of suppliers on the performance of services (Djellal and Gallouj 2009). These studies are based on quantitative and qualitative data. A key dimension in these typologies relies in providers' conceptions of where the customer fits in the service delivery, both in the relational dimension of the activity (front-office) and in the investments for knowledge updating (back-office). It often leads to typologies differentiating technological KIBS organisations (based on industrial models of diffusion of services based on ICTs) from professional ones (based on relational models supported by the specific competences of advisors). Members of AgriLink’s consortium have started to adapt such frameworks to the agricultural sector (Labarthe et al. 2013, Prager et al. 2016). A specificity of the relations between demand and supply for KIBS in agriculture is that they cannot be depicted as classical consultancy markets where private firms compete. They involve much more complex settings where various forms of organisations (consultancy cabinets, cooperatives, chambers of agriculture, upstream and downstream industries, farmers’ associations) compete and/or collaborate to provide services (Knierim et al. 2017). Further information on KIBS is available in Primer 14 (Marques and Labarthe's primer on Knowledge-intensive business services and related literatures).
3.3.2 Key concepts about the changing roles and methods of Advisors within R-FAS: Knowledge brokering

Agricultural innovations, particularly those innovations leading towards more sustainable agriculture, are increasingly seen as emerging in and best advanced by multi-actor learning networks where different stakeholders with their various kinds of knowledge meet, and negotiate and institutionalise new meanings and new farming practices (Šūmane et al. 2017; Moschitz et al. 2015; Wood et al. 2014; Oreszczyn et al. 2010, Knickel et al. 2009). Knowledge or learning networks make explicit the interactive and participatory character of knowledge generation and innovation, with all the stakeholders, including the farmers, being active partners and knowledge co-producers. In order to reach different stakeholders’ mutual understanding and learning, and enhance the generation of innovation, the interactions between and within these groups of actors need to be facilitated. Knowledge brokerage or intermediary activities to reduce knowledge gap is key in enabling multi-actor learning networks and in integrating various knowledge cultures (Tisenkopfs et al. 2015).

While all actors potentially can become knowledge brokers, it is expected that agricultural advisors take a central mediator role and facilitate connections and knowledge exchange among various stakeholders for joint learning. In such multi-actor environment or networks, all the actors are co-creators of innovation. The notion of knowledge brokerage has changed. Knowledge brokering involves facilitating interactions, learning and co-creating of innovation among various stakeholders. Brokering refers not only to overcoming knowledge gap, but a range of social, ideological, cognitive and other kind of gaps. Therefore the concept of innovation broker and systemic facilitator appears. Innovation brokering is no longer associated systematically with agricultural advisors, it can be whatever actor performing these functions of innovation facilitation.

Knowledge brokerage is organised around boundary objects - entities “shared by several different communities but viewed or used differently by each of them, being both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites” (Star and Griesemer 1989, p. 393). Boundary objects are tangible or intangible - a trademark, a publication, a code of practice, a website, a strategic paper, an idea etc. – and are of shared interest for participants and therefore create interfaces for their communication, interaction and coherence (ibid). Boundary work and objects can be viewed in three domains: learning, innovation, and sustainability. The dynamic and outcomes of boundary work in innovation networks develop a shared knowledge base, coproduce innovation and help to negotiate sustainability (Tisenkopfs et al. 2015). [See Primer 15: Šūmane and Tisenkopfs’ primer on Knowledge brokering, network learning, transition from ‘advisor’ to ‘facilitator’].

In more general terms, AgriLink will enable to produce new empirically grounded knowledge about the methods used by advisory organisations at different step of decision making, including new forms of knowledge brokering. It will be a task in the development of WP2 methodology to develop typologies of these activities.

3.3.3 R-FAS as system

Primer 26 (Lane’s primer on Systems and Complexity) describes systems thinking (or systems practice or systems thinking in practice) as an approach to thinking about and acting in the world that recognises interconnections and contexts by creating systemic (holistic) representations of what ‘we’ perceive about situations. Systems thinking deals with understanding inter-relationships, engaging with multiple perspectives and reflecting on boundary judgements (i.e. where the boundaries between systems are set, and how these are negotiated or traversed).

Lane argues that in identifying ‘systems of interest’ in any particular situation it is helpful to appreciate three broad areas in which ‘systems’ are generally understood and used by people, practitioners and academics alike:
• Natural systems ─ individual living organisms or wider biophysical entities like ecosystems, the planet Earth or the solar system.

• Engineered (purposive) systems ─ mechanical equipment, vehicles, computers, heating or irrigation systems etc., and

• Human (purposeful) systems ─ organizations (agricultural advisory agencies, NGOs, government departments, community services etc.), the food economy, agricultural education, agricultural policies, programmes, projects, etc.

Across these three broad areas the first two are usually approached using more systematic and scientific methods and methodologies as the systems are more often seen as ontological realities while the third area is more often treated through a systemic lens where ‘soft’ representation of the system of interest is used as an epistemological device and the systemic inquiry framed as supporting a learning system (Checkland 1999, Blackmore 2010). Any such typology is subject to challenge and in recent years there has been much interest in social-ecological and socio-ecological systems which tend to merge the first and third types mentioned here and which also bring the fore the tensions between those disciplines focusing on ecosystems and earth systems as real entities with those disciplines focussing on human activities who take a more fluid focus on ‘systems of interest’. In this categorisation, the R-FAS is a human system.

The core systems concept is that of an adaptive whole (a ‘system of interest’) with irreducible properties that is able to create and maintain itself in response to its changing environment (Checkland 1999). Such wholes can be regarded as complex adaptive systems or more simply defined as a collection of entities that are seen by someone as interacting together to do something (Morris 2009). The underlying philosophy of purposeful systems thinking is to be holistic, to look for wholes at the highest appropriate level, rather than to reduce things to ever smaller components. This concept is both simple to state and yet complex to enact because of differing philosophical and practical approaches to the concept of a system.

3.3.4 Application to AgriLink: R-FAS in relation to AKIS

Within AgriLink, the R-FAS and EU-FAS (farm advisory services formally supported by the EU) are part of the broader AKIS. We will identify the membership of the R-FAS in part by integrating the microAKIS identified by farmers, but also by interviewing established AKIS members. Better understanding the linkages between actors, at different levels, is a core task of AgriLink.

The R-FAS can largely be considered the infrastructural AKIS – they are the sum of the different sources of advice available to farmers in a specific region, but also the linkages between these actors. They do not necessarily need to be located in the region; through the internet and other sources, farmers can readily access information from outside their regions. A challenge for AgriLink is to improve understanding of advisory systems at a time when the supply of services tend to be more and more pluralistic and when AKIS is becoming decentralised or even fragmented (Knierim et al. 2015, 2017). AgriLink will embrace an holistic approach as described above by i) proposing typologies of key actors involved in advisory systems (and their relative strength in the system); ii) proposing soft description of the evolution of the boundaries of the advisory systems. Such description will be useful both for further research on the governance of farm advice (see Section 3.4), but also for transdisciplinary tasks aiming at co-designing services innovations within these systems (WP3). These descriptions may also inform debates on the transitions of these systems (WP5).

AgriLink will utilise the concept of knowledge intensive business services (KIBS) to characterise the different types of institutions and businesses that are involved in advisory provision across the reference regions. KIBS research offers examples of how particular types of service provider perform, and in which types of situations they are most effective in enabling innovation to occur. KIBS will also help to identify the particular market
and non-market niches that are filled by different advisory service providers. KIBS will also be useful for assessing the front-office and back-office activities of different types of advisory service provider. For example, farm advisors are typically classified into four groups: Public, Private, Farmers’ based organisations (FBOs), non-governmental organisations (NGOs). However, as demonstrated in PRO AKIS, many advisory services represent hybrids of these groups (e.g. public/private advisors, who are partly state funded but also offer fee-for service supports). Using the KIBS approach generates the following typology:

- **Type 1:** independent consultants, who sell only advice. With a distinction between Professional services (P-KIBS) versus Technological services (T-KIBs) oriented consultants.
- **Type 2:** client-owned advisory organisations. With same distinction as above.
- **Type 3:** Embedded advisory organisations, where services come together with another commercial activity for the farmers (e.g. input suppliers, traders, bookkeepers, machinery rings).
- **Type 4:** Public or semi public KIBS.
- **Type 5:** NGO not controlled by farmers.

The systems approach, as well as institutional analysis, are useful for understanding **how the different advisory services within the broader AKIS interact.** They allow for the systematic identification of different actors and how they function. For instance, the diagrammatic approach characterising systems theory could be quite useful for producing mental maps and other representation diagrams for analysis and communication.

Knowledge brokering is a specific, relatively new, function of the R-FAS. It is a key function for linking farmers with various actors in the innovation environment. AgriLink will build on this literature to identify the range of approaches that are currently being undertaken by R-FAS, particularly in relation to microAKIS formation, and how these can be understood in practical and conceptual terms (see Figure 9 above). In other words, AgriLink will seek to better understand how some characteristics of the R-FAS system (types of advisory organisations within these systems, linkages between them, brokering methods, etc.) play on farmers’ decision-making processes.
3.4 Conceptualising the governance of agricultural advice

The impact of farm advice on boosting innovation is also influenced by the governance of agricultural advisory services (i.e. it is more than the sum of the impact of each individual provider of services). Governance is understood as “the totality of interactions, in which government, other public bodies, private sector and civil society participate, aiming at solving societal problems or creating societal opportunities” (Meuleman 2008, p.11). Another broad definition adds the normative dimension: Governance is “a collection of normative insights into the organization of influence, steering, power, checks and balances in human societies” (In ‘t Veld 2011, p. 9). Governance thus comprises the structures and interactions that make effective the formal and informal ‘rules’ that determine people’s behaviour and organisations’ activities and facilitate transactions. These rules can be set through policies, markets, organisations, or peer groups. Individuals and organisations can chose the “contractual format” for carrying out transactions (i.e. governance structures) from a wide variety of possibilities ranging from simple spot market transaction (market as the governance structure), to a long term relational contract of a transaction within an organisation or firm (hierarchy as the governance structure) (Slangen and Van Tulder 2009). Organisational solutions that sit between market and hierarchy are called hybrid governance structures (e.g. a farmer partnership funding common advisory service, long term contracts). The differences between these governance structures lie in the differing importance of coordination mechanisms of the transaction, e.g. with regard to the distribution of power (Slangen and Van Tulder 2009) between different groups of actors (public, private, farmers’ based organisations).

The governance structure can be studied from the point of view of coordination mechanisms and the fit of the governance structure to the institutional environment and other components of frame conditions (Birner et al. 2009).

There is an important gap in academic literature regarding the situation in the EU. There are numerous studies about transitions in agriculture, but very few of them address the effects of the governance on farm advice. Most of the studies about the governance of agricultural advisory services are conducted in the context of developing countries (Faure et al. 2012). In this section we outline the key concepts relating to governance of agricultural advice provision in Europe.

3.4.1 Key concepts in the governance of agricultural advice

In relation to AKIS, the provision of advice is influenced by the standards and rules that frame advice as an economic activity (e.g. marketisation and privatisation of advisory services), and by the coordination of the relations between advisory organisations and other AKIS actors (Klerkx and Jansen 2010). In terms of the economic framing of advisory services, the relations between public, private, and third sectors in the governance of farm advice have deeply changed in recent decades, owing (in part) to widespread privatisation of agricultural advisory services across Europe (Rivera 2000). The public sector is less active directly in the supply of services, characterised by an increasing pluralism. In most EU countries, the state now plays the role of setting regulations about farm advice, which is also framed by the various quality standards of private actors, as well as new challenges regarding the impact of agriculture on human health and the environment. Such a fragmented landscape raises the question of the effectiveness of government policies in coordinating and regulating public and private advisory initiatives (Laurent et al. 2006). Governance is also subject to path-dependency: the rules shaping farm advice are the expression of past and present institutional arrangements (Labarthe 2009). This pleads for a grounded institutional analysis of the governance of farm advice in Europe that considers the various types of drivers and impacts of the innovation process.

The governance of farm advice is also undertaken at multiple levels. The regional and the European levels are now key levels of conception and implementation of policies framing farm
advice, which need to be integrated with the national level. The EIP-AGRI, implemented in many EU countries at a regional level, is a typical example.

The interaction of the actors involved is influenced by institutions (i.e. rules, norms) within knowledge regimes or the community/region. The rules in turn become effective through governance structures. The Institutional Analysis and Development framework (IAD) was developed by Elinor Ostrom (1990). The IAD relates a set of concepts to help in the description and analysis of collective action problems (such as the use of common natural resources) that involve social structures, positions, and rules. Clement (2010) proposed a “politicised” IAD framework (Figure 10) that allows simultaneous consideration of institutions, the politico-economic context and discourses across governance government levels in order to allow the generation of policy recommendations. Thus, it can be seen as a systematic method to collect policy analysis functions similar to analytic technique commonly used in physical and social sciences and understand how institution operate and change over a period of time. See Primer 10: Prager and Prazan’s primer on governance, also for a development of the relation between governance and the public/private/common goods debate).

Figure 10: Revised IAD Framework by Clement (2010), building on Ostrom (2005)

3.4.2 Application to AgriLink

AgriLink will adapt the IAD analytical framework to depict the governance structures and styles of national advisory systems across Europe, with the focus on the back-office of advisory service. Following Figure 10, we will consider that the common resource accessed is the knowledge shared between actors of AKIS, including advisors and farmers. For instance, AgriLink may describe in the different national contexts the action arenas (where the rules and funding schemes of farm advice are discussed, including the implementation of EU-FAS), patterns of interactions, decision and evaluation criteria that shape the rules and conditions of production of and access to knowledge for these different actors. AgriLink will thus analyse the governance models that frame the rules, funding schemes and networks within the innovation environment of advisors and farmers (figure 11).
AgriLink will assess through an in-depth analysis of seven countries, the diversity of governance structures on farm advice and their effects within knowledge regimes (WP4). We will analyse the rules that shape both the front-office and the back-office dimension of service. The front-office dimension is crucial to determine the conditions of farmers' access to knowledge. The conditions of accreditation and qualification of advisors (independence, good practices, etc.) and the funding schemes vary from one country to another. It will play a part on the service relationships between farmers and advisors, with key notions such as trust, social networks, etc. The back-office dimension is central to the questions of knowledge updating and of the assessment of the quality of the evidence available to practitioners. AgriLink will pay specific attention to the back-office advice, with key items such as the development of shared knowledge platforms, multi-actor innovation networks and advisors' training schemes. AgriLink will assess how different structures of governance play on the linkages between actors within a community or region. It will also assess how the European regulation on farm advisory systems (EU-FAS) play on the governance of advisory systems in various EU countries.

This framework will enable to integrate the issue of decentralisation of AKIS and advisory systems into our analysis. There are controversies about the effects of such a complexification of the advisory systems, between enhanced creativity and fragmentation (Leeuwis 2000, Garforth et al. 2003). Recent research suggests that governance structures comprising many agencies and levels of governance yields higher environmental outputs in a complex environment (Newig and Fritsch 2009). At the same time, this type of multi-level and multiple-actor governance structures would create significant coordination challenges. These challenges are all the more important in a context of new relation and balances of power between public, private and third sector actors. AgriLink will focus in particular on how the coordination challenges and inter-organizational communication are addressed in different governance models and identify elements that allow coordination to take place and have the desired effects within knowledge regimes.
4 AgriLink transdisciplinarity: Co-designing service innovation and debating transitions scenarios

In AgriLink WP2, we will be assessing the services provided by the Regional Farm Advisory Services (R-FAS). The R-FAS comprises the full range of organisations providing advice to farms in a given region, and their connection to wider AKIS organisations. In WP3, we are explicitly aiming to intervene in service provision. In WP4 we will assess how the regulations from the EU-FAS influence advisory service provision (the EU-FAS are the advisory services formally supported by the EU through national governments). In WP5, we will integrate data from WP2-3-4 to provide an integrated assessment of the role of advisory services, in a transdisciplinary perspective. This assessment will also feed some participatory workshop to discuss about sustainable transitions of advisory systems. As such, WP3 and WP5 are explicitly transdisciplinary in nature, involving multiple scientific disciplines as well as non-academic and non-formalised knowledge (e.g. ‘tacit’ knowledge from farmers or other practitioners).

4.1 Intervening in service provision – organisation learning

AgriLink’s intervention in service provision will be implemented in a participatory approach with advisors, farmers and other AKIS actors, to support the co-design of service innovations (WP3). Intervention is undertaken with the explicit purpose of altering the way that farmers, researchers, advisors and other relevant actors exchange information. Changing the way that advisory services perform can be conceptualised as a process of organisational learning. Organisations can be regarded as systems comprised of the actors involved, their social relations, and their mutual dependency. By nature, organisations have established rules and norms for behaviour; they also have shared knowledge of existing practices, and the products or services they produce/provide. Organisational knowledge is knowledge that is shared by multiple individuals and is more than the sum of each individual’s knowledge. Change in organisations thus involves learning. To achieve change in an organisation, that organisation must be able to develop new knowledge and learn; however, innovation is not limited to a single action but is instead a process (Lundvall 1992, Russo-Spena and Mele 2012, Vargo et al. 2015) that is concerned with how the actors influence each other. To create something new involves breaking up established routines and conventions in organisations. Organisational learning is about being able to break established routines, produce new knowledge, and establish new routines. The topic of an organisation’s efforts to systematically improve and learn, and to continuously do so, is noted as organisational learning.

An organisation’s ability to generate new knowledge is based on the existing stock of accumulated knowledge and the method of generating new knowledge. This stock and method will typically exist as routines. Convention theory addresses the implicit “agreements” about what is to be done – what each person does meets the expectations of the others on whom he or she depends’ (Storper and Salais 1997, p.16). This agreement is a convention; it is not a formal or formulated agreement and, in sociological terms, this agreement is more like rules. The theory of conventions may be applied in both the macro- and micro-levels; macro about ‘long variations, in terms of historical duration or cultural gaps’ and micro about ‘short variations which consist of differences between activities within a single economy, or changes in conventions in an organization, during interaction and so on’ (Eymard-Duvernay 2002, p. 69). Convention theory may not be so obvious a part of organisational learning, but it can be applied here too. For further information see Primer 13: Nguyen’s primer on Knowledge and organisational learning for innovation.

4.1.1 Design of interventions

In order to develop new approaches to advisory service provision, AgriLink will also draw on the theory of Design Thinking. It gives a protocol for solving problems and discovering new
opportunities supported by different tools/techniques. The core of the process is the understanding of the problem, exploring solutions and development or resolving the problem.

Design thinking is a method for practical, creative resolution of problems. It is a form of solution-based thinking with the intent of producing a constructive future result. Design thinking is especially useful when addressing "wicked" (complex socio-environmental) problems, which are ill-defined or tricky. With ill-defined problems, both the problem and the solution are unknown at the outset of the problem-solving exercise.

The five steps of Design Thinking (figure 12):

- Empathise: gain an empathic understanding of the problem through observing, engaging and empathizing with people to understand their experiences and motivations.
- Define: analyse observations and define the problem in a human centred manner
- Ideate: generating ideas
- Prototype: production of an inexpensive, scaled down version of the product useful to investigate the problem solution
- Test: of the complete product using the best solutions identified during the prototyping phase. Results of the test can be used to redefine one or more problems and result in an iterative process.

![Figure 12: Design Thinking Process](image)

The Living Laboratory process will also involve reflexivity – active reflection on the part of researchers and practitioners, to critically look at their own practices, their views and their ways of doing things. Reflexive monitoring is a strong approach in achieving this by offering tools to stimulate reflexivity in co-creation processes whilst also collecting relevant data on the proceedings that will later be analysed vis-à-vis the results from the other Living Labs.

4.1.2 Application to AgriLink

In AgriLink, our ambition is to stimulate a system-innovation in the European AKIS, through organisational learning and beyond. This means that elements of design thinking and reflexive monitoring are being used and put into practice. This means understanding the social system, describing the design process systematically, contextualizing interventions and recognizing influences of stakeholders.
In relation to Figure 11, the focus is on the interplay between the farmers’ microAKIS and the innovation environment. Organisational learning is particularly relevant for advisory service organisations and knowledge environments because the organisation of the advisory group is important both for the development of advisory products and for the implementation of new knowledge into practises for farmers. It will be important to identify the rules and norms of behaviour associated with current practices (of all participants i.e. farmers, advisors, researchers) to reflect on how these can be altered. Participants will assess these rules to explain how organisations (or firms) work with innovation or why they are not doing so. It is also relevant to analyse how organisations can improve their ability to learn and innovate. Organisational learning can help in considering how farmers and advisors integrate new tangible and intangible tools to change their practice and how they are able to develop new practices. It also can support the analysis of the interplay between front and back office work and how the whole organization support changes in advisory work (and by the way in advisory services, but by paying attention to the way such services are performed and not only how they are designed or can be made available to farmers). It can be relevant to develop the WP3 methodology if WP3 is seen as a place to identify how enabling environments are created (e.g. in Living Labs).

Design thinking can guide an active process of developing and testing new approaches. Monitoring activities are an integral part of the change initiative; it may be appropriate to appoint a designated reflexive monitor, or to actively engage the living laboratory participants in periods of reflection (at intervals during the project).

4.2 The Multi-Level Perspective as an Integrating Framework

AgriLink’s multi-level framework enables collection of data at different levels, in a coherent way. It will allow production of original data and knowledge about the contribution of advisory services to innovation dynamics. To better understand the contribution of advisory services to sustainable transitions, we plan to revise our Conceptual Framework on an ongoing basis throughout the project. In that respect, we will use transdisciplinary methods and tools provided by the multi-level perspective (MLP) to discuss relations between the different levels where advice influences innovation dynamics. Transdisciplinarity is all the more important for AgriLink as it acknowledges that the ‘best fit’ of advice is context dependant. There is thus a need to integrate actors in the discussion of transitions scenarios.

4.2.1 Key concept about the MLP framework

The multi-level perspective (MLP) has developed an extensive literature within innovation and technology studies over the past decade (for reviews see Genus and Coles 2008, Markard and Truffer 2008, Smith et al. 2010). The appeal of the MLP is in the conceptual link made between micro-level innovation processes and large-scale socio-technical systems (Smith et al. 2010).

The MLP distinguishes three levels: micro-level (socio-technical) niches, meso-level (socio-technical) regimes and macro-level (socio-technical) landscape (figure 13). Innovation processes are analysed as the interplay between these three levels. Niches are the breeding ground for novelties\(^8\) to develop and made to work in practice. Socio-technical regimes are considered relatively stable, ‘locked-in’ to particular trajectories, tending to change incrementally. Landscapes describe external factors that put pressure on regimes for change and create ‘windows of opportunity’ for niches to connect and transform regimes. For example, Sutherland et al. (2015) argue that landscape level pressures, in the form of

\(^8\) A novelty could be considered an ‘innovation’, but is not termed this way in the MLP. Instead, innovation refers to processes. Although by definition, novelties can refer to technologies, ideas or new methods, most MLP research focuses on technologies.
European regulations, created ‘windows of opportunity’ for the mainstreaming of renewable energy production on farms in Germany, the Czech Republic and the UK in the 2000s.

In the MLP, ‘niches’ are conceptualised as sources of radical innovation, owing to favourable ‘socio-technical landscape’ pressures (broad societal, technological or ecological developments), that exert influence on the dominant socio-technical regime. Niches flourish in protected spaces, typically at the margins of regime influence, and are often introduced by actors peripheral to the mainstream sector. These actors have similarities to the ‘innovators’ identified in the innovation/diffusion literature, in that they are not typically integrated into mainstream groups and develop the innovation at a cost. Potential radical innovations can exist for considerable time as niches before a ‘window of opportunity’ opens. Even then, the niche may not become mainstream (e.g. if it is insufficiently developed to take advantage of the opportunity when it arises, or if landscape factors change).

An analysis utilising the MLP typically follow the development of a particular technology over time, describing its evolution from innovation or ‘novelty’ to mainstream use (Konrad et al. 2008). Most studies using the MLP focus on historical analyses (Genus and Coles 2008), which make it possible to define the regime in relation to the technologies under consideration (e.g. Geels and Kemp 2007, Geels and Schot, 2010). The size of the regime therefore depends on the topic of analysis: for example, Elzen et al. (2011) considers the regime surrounding housing of pigs in the Netherlands, whereas Geels (2005) assesses the replacement of horses by automobiles in North America (Geels 2005). As a result, it can be difficult to distinguish between radical transition and the incremental changes of established regimes, depending on the scale at which the analysis is undertaken (Darnhofer et al. 2015, Genus and Coles 2008).

In the MLP, the transfer or diffusion of innovations is conceptualised in terms of ‘scaling’. The principle behind traditional ‘dissemination’ approaches is that innovations that are effective in one place or region can be copied elsewhere and work there as well. Recent work in innovation studies, however, indicates that this process rarely is so simple. Particularly in agriculture, with a broad variety of farming practices, a novelty needs further adaptation to be made to work in another location. Technologies and practices that work in a specific ecological, sociocultural or geographical area, do not automatically work, and may even have negative effects, in other areas. The MLP therefore refers to scaling, rather than dissemination of innovations: scaling up (increasing the size, speed or numbers of an innovation) and
‘scaling out’ (geographical spread of innovation up-take) (e.g. Anderson 2012, Millar and Connell 2010).

“Anchoring” is a concept that has been recently developed to better understand the scaling of innovations (i.e. how niches develop and influence mainstream regime practices).

Anchoring is the process in which a novelty becomes newly connected, connected in a new way, or connected more firmly to a niche or a regime. The further the process of anchoring progresses, meaning that more new connections supporting the novelty develop, the larger the chances are that anchoring will eventually develop into durable links. (Elzen et al. 2012, p.3)

Building on a distinction between three constituent components of a regime, notably technical, network and institutional components (Geels 2004), the authors distinguish three forms of anchoring: technological anchoring, network anchoring and institutional anchoring (Elzen et al. 2012, p.4-6). Technological anchoring takes place when the technical characteristics of a novelty (e.g. new technical concepts) are refined by the actors involved and therefore become more specific. Network anchoring means that the network of actors that support the novelty enrols new producers, users or developers. Institutional anchoring relates to the rules, regulations and norms that surround the novelty and its use (e.g. the niche becomes regulated and therefore formally recognised by regime actors).

Several FP7 projects have utilised the MLP to various degrees, particularly FP7 IN-SIGHT, FP7 FarmPath and FP7 Solinsa. In these cases, the focus was on understanding and supporting the development of innovations. Analysis in FarmPath demonstrated that the MLP is particularly well suited to assessing technological innovations, which are easily defined. It requires further adaptation for use in assessing ‘softer’ innovations such as new collaborations or ways of doing things. The emphasis on technology within the MLP also leads to an inherent ‘market bias’ – novelties are conceptualised as become mainstream when they become competitive in established markets. For sustainability transitions, where public goods are at stake, novelties may never achieve market penetration (see Sutherland et al. 2015b). For further information on the Multi-Level perspective see Primer 19: Elzen’s primer on the MLP: Anchoring and Scaling.

4.2.2 Developing the MLP for ‘knowledge regimes’ in AgriLink

In the AgriLink Description of Work, we specified that we would adapt the MLP for use in understanding the role of advisory services in farm innovation. There are three options for utilising the MLP in AgriLink. The first is to further develop the role of knowledge in multilevel transition processes. Within the MLP construct, the conceptualisation of knowledge and information flows is not well-developed, although knowledge is routinely identified as a resource (e.g. Geels 2004, in a seminal paper, identifies knowledge as a key element of sectoral systems, along with labour, tools, natural resources, capital etc). Several authors have now developed concepts of knowledge and learning within the MLP (e.g. Li et al. 2017 and Haley 2015). Most notably, Ingram (2017) specifically utilised the MLP to assess the role of Agricultural Knowledge Systems9 in sustainability transitions in agriculture. She argued that the existing AKS is reinforced by entrenched organisations, is typically locked into its practices, and focuses on ‘first order learning’ (transfer of technological information from science to practice). In contrast, the knowledge systems associated with niches tend to be more flexible, and are developed in specific relation to the niche: niche actors develop specialised knowledge, embedded in niche networks, leading to ‘second order learning’, where knowledge is co-developed. Mobilising knowledge is particularly important to niche development and anchoring or mainstreaming (i.e. not only the knowledge of the innovation, but influencing public opinions and markets through knowledge of alternative products, benefits etc).

9 Her choice to use the term AKS instead of AKIS is not defended in her paper.
The second option is to consider AKIS a regime, characterised primarily by the R-FAS structure. This is not an approach that has been taken before (e.g. Ingram’s approach defined the AKS as part of the agriculture regime, not as the regime itself). In this approach, the ‘niches’ would be the new approaches for advice provision (or potentially information access) evident in the analysis of farmer’s microAKIS. Analysis would focus on the processes by which new approaches to advice emerge, and how they influence or become integrated into R-FAS structures. The development of the R-FAS would be conceptualised in relation to the EU-FAS as part of the landscape. The policy and institutional landscape would include EU regulations and markets for agricultural advice.

The third option is to use the MLP framework in a transdisciplinary perspective, to support the construction of scenario of potential transitions pathways of advisory systems towards a more sustainable development. To explore the third option and to assess potential future transition pathways, Elzen et al. (2004) developed a scenario methodology that builds on the MLP. Such ‘socio-technical scenarios’ feature the interplay between the three MLP levels. Doing so, they not only describe what may happen in the future but also why this happens. This focus on the ‘why’ questions, leads to a richer source of input for governance and policy than traditional scenario methods. This is an approach that can be utilised for the development of scenarios in WP5.

The ambition of AgriLink’s WP5 is to try to combine the second and third options. The second option will be explored based on an integrative assessment of the findings of the different WPs of the project (WP2-WP3-WP4). The idea is to integrate the key findings of the project to propose a revise version of the conceptual framework. A joint effort with WP1 and other WP leaders should lead towards academic publications about the diversity of advisory systems across Europe, and practical applications about their consequences (best fit or not) for innovation dynamics in a multi-level perspective.
5. AgriLink Main Research Questions, Methods and Concepts

AgriLink aims at answering to six main research questions:

- Question 1. What roles do advisory services play in the cycles of farmers’ decision making?
- Question 2: What is the relationship between different types of farmer and different types of advisory service in the decision making process?
- Question 3. How does the transformation of advisory services influence farmers’ decision making and uptake of innovation?
- Question 4. How can transdisciplinarity contribute to innovation in advisory services?
- Question 5. How do the differing national and regional governance structures and funding schemes of farm advice influence farmers’ and advisors’ access to knowledge?
- Question 6. How can transdisciplinarity contribute to sustainable transitions of advisory systems in a multi-level perspective?

The table below develops this research questions, and explains how they are related to the objectives of the various WPs. The table also gives an overview of the methodologies that will be implemented to answer each questions. It also highlights the key concepts relevant to each question, and the available primers that give more insights on the theoretical debates related to these questions.

<table>
<thead>
<tr>
<th>Relevant WP and Associated Objectives</th>
<th>Research questions</th>
<th>Method</th>
<th>Important Concepts and Primers</th>
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<tbody>
<tr>
<td>WP2</td>
<td>Question 1. What roles do advisory services play in the cycles of farmers’ decision making?</td>
<td>Personal network analysis (interviews with farmers to assess microAKIS) in focus regions (40-50 farmers per region). On-line survey for advisory organisations in focus regions (30-35 organisations per region)</td>
<td>Concepts</td>
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<tr>
<td>WP2</td>
<td>What is the role of farm advice in “triggering” events: how do advisory services influence farmers’ awareness of sustainability issues and innovation?</td>
<td></td>
<td>MicroAKIS, AKIS, Focus regions, R-FAS, Business models, Back office/front office, Triggering change model</td>
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these processes, accounting for the range of advisory services available in 26 focus regions.

To develop this knowledge, WP2 will target the following specific objectives:

- To describe and depict European farmers’ micro-AKIS, which supports their decision-making processes on the development and implementation of eight selected Innovation Areas;
- To analyse in-depth the knowledge and information flows supporting farmers’ decision-making processes on innovations, the role of advisors in gathering and mobilising new knowledge on innovations (advisory back-office) and the ways they interact with farmers (advisory front-office);
- To deliver a European level typology of farmers' micro-AKIS related to eight selected Innovation Areas, accounting for the influence of regional geographical diversity, heterogeneity of farmer profiles, along with diversity in farming styles, structures, and systems, and the specifics of regional FAS (R-FAS);
- What is the role for farm advice in supporting farmers in “assessing innovation”: how do advisory services support farmers in assessing the positive and negative effects of innovations? This relates to the back-office activities of farm advice for producing knowledge about payoffs. It also relates to new activities of knowledge brokering and assisting farmers in finding reliable and relevant source of knowledge in fragmented AKIS, and in the digital age.
- What is the role of farm advice in supporting farmers in implementing innovation: how do advisory services support farmers in the acquisition of learning-by-doing type of knowledge? This relates to classical front-office function of farm advice, with one-on-one consulting, or coaching, but also group facilitation, use of Decision Support Tools, etc.

**WP2**

- To describe and map the R-FAS, respecting the diversity of advisory business models, and their back-

**Question 2: What is the relationship between different types of farmer and different types of advisory services?**

**Analysis of above**

**Primers**

- AKIS
- Best and Good Practice as Normative
- Big data
- Different theories of knowledge and learning
- Geographic dimension of innovation and farmer decisions
- How farmers assemble knowledge for innovation
- Land tenure and AKIS
- LINSAs
- Social networks
- Triggering Change in farmer decision-making

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<tr>
<th>Primers</th>
<th>Key concepts</th>
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<tr>
<td>AKIS</td>
<td>KIBS</td>
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<tr>
<td>Best and Good Practice as Normative</td>
<td>Adopters/non-adopters/droppers</td>
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<td>Big data</td>
<td>Innovation areas</td>
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<td>office activities (e.g. how they are involved in the R&amp;D infrastructure, their training methods and practices, and how and with whom they network);</td>
<td>service in the decision making process?</td>
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<tr>
<td>• How do farm characteristics relate to the role of advice in decision making? This will encompass farmers’ profiles (their development models and values) and farm characteristics (location, equipment). AgriLink sample comprises farmers who adopted innovation, but also who did not adopt innovation (either because they could not, or because they chose not to).</td>
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<tr>
<td>• How is the nature of the innovation areas (social, technological…) reflected in the contribution of different types of advice and provider to decision making?</td>
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<td>• What is the role of the regional context (rural vs. urban, history of R-FAS…)?</td>
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<tr>
<td>• How do new business models of advisory suppliers (including models associated to digitization of agriculture) interact in different stages of farmers’ decision making cycles? Are they creating new opportunities and new functions? For instance bringing new triggers in the agricultural scene? Or speed up farmers’ assessment of innovation through new</td>
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<td></td>
<td>R-FAS</td>
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<td>Business models</td>
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<td>Primers</td>
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<td></td>
<td>Habermas and AKIS</td>
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<td></td>
<td>Innovation and knowledge as resources (evolutionary economics)/exploration-exploitation of knowledge</td>
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<td></td>
<td>Knowledge brokering, network learning, transition from ‘advisor’ to ‘facilitator’</td>
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<td></td>
<td>Knowledge and organisational learning for innovation</td>
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<td>Organisational learning</td>
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<td>Ostrom’s perspective on knowledge</td>
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<td>STS and science communication</td>
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<td>WP2</td>
<td>Question 3. How does the transformation of advisory services influence farmers’ decision making and uptake of innovation?</td>
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<tr>
<td>• To identify best fit practices’ and examples of well-functioning agricultural advisory services regarding their capacity to guide/support the farmers decision-making processes on developing and implementing innovations enhancing farm sustainability both at the individual and collective level (operational groups, agricultural/rural networks, trade unions, cooperatives, irrigation associations among others), and their ability to store, mobilise and share practical knowledge with a long run perspective.</td>
<td>How do the new configurations of R-FAS (generally depicted as more fragmented and pluralistic) play on the relation between farmers and advice? Do they allow for more creativity, triggers, and a diversity of knowledge and information channels for farmers? How do these new trends influence farmers' access to information and knowledge, and on equity of information access?</td>
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<tr>
<th>WP3</th>
<th>Question 4. How can transdisciplinarity contribute to innovation in advisory services?</th>
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<tbody>
<tr>
<td>The overall objective of WP3 is to engage a range of practitioners (including farmers, researchers,</td>
<td>In each lab, new innovation support services will be designed and tested to address specific local</td>
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<tr>
<th>Concepts</th>
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<tr>
<td>• R-FAS</td>
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<td>• EU-FAS</td>
<td>• EU-FAS</td>
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<tr>
<td>• Sustainability</td>
<td>• Sustainability</td>
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<tr>
<td>• Innovation</td>
<td>• Innovation</td>
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<tr>
<td>• AKIS</td>
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<th>Primers</th>
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<tr>
<td>• Conceptualising change in advisor practices</td>
<td>• Conceptualising change in advisor practices</td>
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<tr>
<td>• Influence of advisory services (R-FAS/AKIS) on the innovation uptake farmer decision</td>
<td>• Influence of advisory services (R-FAS/AKIS) on the innovation uptake farmer decision</td>
</tr>
<tr>
<td>• Knowledge-intensive business services and related literatures; relationship between innovation and advisory services.</td>
<td>• Knowledge-intensive business services and related literatures; relationship between innovation and advisory services.</td>
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<tr>
<td>• Systems and complexity</td>
<td>• Systems and complexity</td>
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<tr>
<td>• What we know already about FAS structures and practice.</td>
<td>• What we know already about FAS structures and practice.</td>
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<tr>
<td>• What should the role of advisors be</td>
<td>• What should the role of advisors be</td>
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advisors and other actors) in co-creation and testing of new and improved innovation support services, within existing innovation initiatives. Such new and improved advisory services target a better connection between practice and research, improved engagement with farmers' decision-making to realise more impact on innovation and sustainability at farm level and commitment to a learning attitude towards change. Such new advisory services require moving away from ‘business as usual’ approaches and experimenting with new tools and skills.

The overall objective of WP3 will be pursued via four specific objectives:
- Develop, test and validate a variety of new or improved innovation support services in six Living Labs across Europe;
- Recommendations on how to utilise these new services across the EU, supporting the implementation of EIP-AGRI;
- Development and deployment of a web-based engagement strategy for practitioners to exchange knowledge and experiences on innovation support services;
- Tested approaches for co-creation of Innovation Support

| • How can new participatory approaches such as Living Labs contribute to service innovation and learning not only for Lab participants, but also for broader audiences? |
| • What learning processes take place – within the lab and at a broader scale? What new practices, new understandings of the core challenges and ways to support innovation are emerging? |
| challenges. In an iterative process of exploration, design, testing in practice and evaluation, elements of the service will be worked out. Farmers will be encouraged to test new ideas in practice, targeting changed strategic or operational measures on their farms. Options for new services identified in WP2 will be explored. AgriLink’s role: facilitation of the co-creation process; helping the stakeholders in reflexive assessment of what is happening, what works well and what works poorly, also trying to understand why; bringing in scientific knowledge; serve as a sounding board in decision on tools and new approaches and guiding the development and tests. |

**Primers**
- Reflexive monitoring
- Sustainability
- Co-design

- Reflecting on our methods/action research
- Organisational learning
- Science and Technology Studies
### WP4

WP4 investigates the governance models of farm advisory systems at national and European levels. The aim is to understand the effects of various levels of decentralisation of governance on the effectiveness and coordination of advisory systems for i) supporting farmers’ access to information and services; ii) enhancing linkages between advisory organisations and other AKIS actors. WP4 provides an institutional and comparative analysis, combining quantitative and qualitative approaches. A specific task is to assess how European instruments, and more specifically the EU regulations on Farm Advisory System (EU-FAS), affect the governance of farm advisory systems.

#### Question 5. How do the differing national and regional governance structures and funding schemes of farm advice influence farmers’ and advisors’ access to knowledge?

- How do these structure and schemes support (or not) farmers' micro-AKIS?
- How does the governance structure impact the back-office of advisory services, through platforms, training schemes, and networks of relations between advisors, researchers and farmers?
- Do these structures allow for the accumulation and distribution of knowledge about the positive and negative effects of innovation for farmers, and for society at large?
- Who are the new key players of brokering and linkages within AKIS?
- What is the impact of new EU-level policies on governance structure (EU-FAS and EIP-AGRI)

#### The approach will be based on

i) a review of existing material (academic papers, policy reports, databases) on the assessment of farm advisory systems in Europe (including monitoring of the implementation of the EU-FAS regulation in 17 EU countries);

ii) inputs from WP2 about Regional Farm Advisory Systems (R-FAS) and farmers’ access to services;

iii) an institutional comparative analysis of the governance structures of seven European countries. The institutional analysis will be implemented through interviews with policy makers, industry representatives, knowledge providers, service organisations, NGOs, farmers' organisation, etc. The analysis will be

#### Concepts
- Governance
- R-FAS
- EU-FAS
- Front office/Back office
- MicroAKIS
- Brokering

#### Primers
- Evaluation of farm advice
- Governance
- KIBS
- Brokering
<table>
<thead>
<tr>
<th>WP5</th>
<th>The specific objectives of WP5 are:</th>
<th>Question 6. How can transdisciplinarity contribute to sustainable transitions of advisory systems in a multi-level perspective?</th>
<th>Sustainability Transitions Scenarios Operationalise the STSc method to make it suited for an exploration of the role of advisory services in agriculture. Application of the STSc method in various European regions to explore possible transitions pathways. Analyse the various STSc workshops in terms of process as well as outcomes to draw lessons on both the method (how to use STSc effectively in various types of situations) as well as on strengthening the role of advisors in making agriculture more sustainable.</th>
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<td></td>
<td>• Research protocol for multi-level integrated assessment (micro, meso, macro) of all project results.</td>
<td>• How can transdisciplinary methodologies such as the Sustainable Transition Scenarios contribute to the production of knowledge on the 'best fit' of advisory systems regarding the diversity or rural and agricultural contexts?</td>
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<td></td>
<td>• Integration and analysis of all project findings coming from all other WPs.</td>
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<td>• Exploration of future transition pathways via the operationalisation and use of the “Socio-Technical Scenario” method in interactive workshops with stakeholders.</td>
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<td></td>
<td>• Lessons for targeted stakeholders (advisors, farming stakeholders, policy makers) on improving the ‘farming advice system’.</td>
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Concepts:
- Transdisciplinarity
- Multilevel perspective
- Sustainability
- Scenarios

Primers:
- Innovation and Sustainability?
- Multi-level perspective
- Sustainability Transition Scenarios
References


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Appendix A: Theory Primers

To develop the AgriLink conceptual framework, consortium members produced an initial set of “primers” on relevant topics. These topics were identified initially at the kick-off meeting. The primers are expected to develop over the course of AgriLink: new primers will be added, and existing primers will be further developed.

The purpose of the primers is to provide AgriLink consortium members with an introduction to each topic, which outlines the key points and identifies options for further reading. The primers have also served to demonstrate the wide range of expertise in the consortium, and to highlight the specific research interests of consortium members. Primers are intended to act as a foundation for academic journal articles, and an early opportunity for collaboration between consortium members.

At present, the primers have primarily been authored by academic partners; we expect stakeholder partners to become more engaged as empirical data is collected and integrated into the framework.

<table>
<thead>
<tr>
<th>Theory/Topic</th>
<th>Authors</th>
<th>Included in Appendix</th>
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<td>Lee-Ann Sutherland, Pierre Labarthe</td>
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<tr>
<td>2</td>
<td>“Binding” and “not binding” good practices – necessity to differentiate</td>
<td>Catherine Laurent</td>
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<td>3</td>
<td>Communicative action and agricultural innovation systems</td>
<td>Freddy van Hulst</td>
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<td>4</td>
<td>Conceptualising change in advisory practice</td>
<td>Marianne Cerf</td>
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<td>5</td>
<td>Digitalization of agriculture and big data</td>
<td>Cristina Micheloni</td>
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<td>Katrin Prager, Jaroslav Prazan</td>
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<td>How farmers assemble knowledge for innovation</td>
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<td>11</td>
<td>Influence of advisory services (FAS/AKIS) on the innovation up-take farmer decision</td>
<td>Livia Costa-Madureira</td>
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<td>12</td>
<td>Innovation and knowledge as resources (evolutionary economics) / exploration-exploitation of knowledge</td>
<td>Pierre Labarthe and Geneviève Nguyen</td>
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<td></td>
<td>Knowledge and organisational learning for innovation.</td>
<td>Geneviève Nguyen</td>
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<td>Carla Susana Marques, Pierre Labarthe</td>
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<td>15</td>
<td>Knowledge brokering, network learning, transition from 'advisor' to 'facilitator'</td>
<td>Sandra Šūmane and Talis Tisenkopfs</td>
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<td>16</td>
<td>(Theories of) knowledge, knowing and learning</td>
<td>Chris Blackmore</td>
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<td>17</td>
<td>Land tenure and AKIS</td>
<td>Alberto Lafarga, Lee-Ann Sutherland</td>
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<tr>
<td>18</td>
<td>Learning and Innovation Networks for Sustainable Agriculture - LINSA</td>
<td>Ilona Kunda</td>
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<tr>
<td>19</td>
<td>Multi-level perspective – general; plus how the niche connects to the regime, diffusion of innovations within the regime</td>
<td>Boelie Elzen</td>
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<td>20</td>
<td>Organisational learning</td>
<td>Egil Strate, Chris Blackmore</td>
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<td>Ostrom’s perspective on knowledge</td>
<td>Jaroslav Prazan</td>
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<td>22</td>
<td>Reflecting on our methods/action research (Design thinking)</td>
<td>Herman Schoorlemmer, Chris Blackmore</td>
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<td>23</td>
<td>Social networks</td>
<td>Lee-Ann Sutherland, Livia Costa-Madureira</td>
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<td>24</td>
<td>Science and Technology Studies</td>
<td>Anda Admasone-Fiskovica</td>
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<td>25</td>
<td>Sustainable Development</td>
<td>Boelie Elzen, with Bram Bos and Rob Burton</td>
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<td>Systems and complexity</td>
<td>Andy Lane</td>
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<td>27</td>
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<td>Lee-Ann Sutherland</td>
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<td>28</td>
<td>What we know already about FAS structures and practice</td>
<td>Pierre Labarthe</td>
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<td>29</td>
<td>What should the role of advisors be</td>
<td>Cristina Micheloni, Marianne Cerf</td>
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</table>
1) Agricultural Knowledge and Innovation/Information Systems
Authors: Lee-Ann Sutherland, Pierre Labarthe

1.0 General Overview of the Theory or Approach

1.1 Summary of the Theory, Approach or Topic
An agricultural knowledge system refers to the collection of agricultural information providers, the flows of information between them, and the institutions regulating these relations. It traditionally referred to farmers, support systems, educators, researchers and advisors, but has been broadened to include other actors (e.g. input suppliers, retailers). The term has evolved from Agricultural Knowledge and Information System to Agricultural Knowledge and Innovation System with limited critique. Both are frameworks or constructs for identifying the different actors and their roles in innovation and knowledge exchange within the agricultural sector, rather than a theory or approach. Academics who use the term AKIS typically integrate it with another theory when undertaking empirical research, to increase its explanatory power.

1.2 Major authors and their disciplines
The AKIS construct was developed by academics specifically interested in agricultural knowledge and communication. It is rooted in extension studies, science communication, interdisciplinary research and a range of social science disciplines (Röling and Engel 1991, Hall et al. 2006). The term is widely used in European policy documents, in the agricultural extension literature, and by international institutions (OECD, World Bank)

Within the AgriLink consortium, the concept of AKIS has been assessed in relation to commercialisation and privatisation (Prager et al., 2016, Sutherland et al., 2013; Labarthe and Laurent, 2013) and learning and innovation networks (Tisenkopfs et al., 2015).

1.3 Key references


1.4 Brief history of how the theory has developed and been applied
This concept of ‘agricultural knowledge and information systems’ (AKIS) advanced extension thinking from the 1950s and 1960s. This early work had emphasised linear knowledge flows from research to extension to farmers. The AKIS concept promoted the idea that farmers exchange and produce knowledge in conjunction with a number of sources, which include research, agricultural advisors, and education/training and support services (Röling, 1988;
Röling and Wagemakers, 1998). Over the past two decades, the AKIS concept has been appropriated to address European policy concerns about innovation, and re-termed ‘agricultural knowledge and innovation systems’, reflecting an ideological shift towards innovation (Dockès et al., 2011). AKIS in reference to information systems has tended to emphasise ‘traditional’ participants in knowledge development (researchers, advisors, extensionists, educators) (Kania, 2015), whereas AKIS in reference to innovation includes a broader range of individuals and organisations (e.g. farmer organisations, charities, up and downstream supply chain members). In the current AKIS conceptualisation, refers to novelty: in products, processes or organisation (OECD, 2010).

The AKIS construct is differentiated from AIS (Agricultural Innovation System) by Klerkx et al (2012) and Dockes et al (2011), amongst others. The AKIS and AIS approaches developed in parallel, with AKIS developed through application in agricultural extension, and AIS by researchers (Rivera et al 2006 in Klerkx et al., 2012). The AIS approach draws attention to the evolving nature of innovation systems, and the role of institutional actors (e.g market). There are a variety of conceptual approaches to AIS (Klerkx et al. 2012 identify: infrastructural, process, and functionalist perspectives). The process approach is connected to the multi-level perspective, also being explored in AgriLink.

A lot of the recent literature on AKIS draws attention to privatisation and commercialisation (see Section 1.2). There is also a research focus on network, interactive innovation and knowledge flows. Although the AIS approach appears more theoretically nuanced, the term AKIS is more commonly used in policy documents (e.g. SWG AKIS) etc.

AKIS was deemed more useful for the PRO AKIS FP7 project, which conducted an inventory of AKIS across Europe, but as AIS follows processes of specific innovations, it may be better for AgriLink (particularly WP2).

1.5 Basic concepts

![Diagram](Source: Dockes et al, 2011 (who adapted it from Rivera et al., 2005))
AKIS: Multiple SCAR SWG reports (e.g. 2012, probably 2016) use the Röling and Engel (1991) definition of AKIS: “a set of agricultural organizations and/or persons, and the links and interactions between them, engaged in the generation, transformation, transmission, storage, retrieval, integration, diffusion and utilization of knowledge and information, with the purpose of working synergistically to support decision making, problem solving and innovation in agriculture” (Röling and Engel, 1991). Dockès et al (2011) note that although this definition is still in place, usage has evolved to include innovation i.e. Agricultural Knowledge and Innovation Systems.

AIS: Dockès et al. (2011) distinguish AIS – Agricultural Innovation Systems – from AKIS. They define AIS as “a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect the way different agents interact, share, access, exchange and use knowledge”, based on (Leeuwis and Ban, 2004). As such, the AIS is more process oriented, focuses on what is changing, rather than the specific members of the system.

Innovation: SWG AKIS reports draw on OECD definitions of innovation: “An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations. Innovation activities are all scientific, technological, organisational, financial and commercial steps which actually, or are intended to, lead to the implementation of innovations. These activities themselves need not to be novel, but are necessary for the implementation of innovations”.

2.0 Application to the analysing the role of farm advisory services in innovation

2.1 Relevance to AgriLink Objectives

<table>
<thead>
<tr>
<th>[tick relevant]</th>
<th>AgriLink Objectives</th>
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<tr>
<td>☒</td>
<td>Develop a theoretical framework utilising a multi-level perspective to integrate sociological and economic theories with inputs from psychology and learning studies; and assess the functions played by advisory</td>
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organisations in innovation dynamics at multiple levels (micro-, meso-, macro-levels) [WP1];

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<td>X</td>
<td>Assess the diversity of farmers’ use of knowledge and services from both formal and informal sources (micro-AKIS), and how they translate this into changes on their own farms [WP2];</td>
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<td>Identify thoroughly the roles of the R-FAS (regional FAS) in innovation development, evaluation, adoption and dissemination in various EU rural and agricultural contexts [WP2];</td>
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<td>Test how various forms of (national and regional) governance and funding schemes of farm advice i) support (or not) farmers’ micro-AKIS, ii) sustain the relation between research, advice, farmers and facilitate knowledge assemblage iii) enable evaluation of the (positive and negative) effects of innovation for sustainable development of agriculture [WP4];</td>
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<td>Assess the effectiveness of formal support to agricultural advisory organisations forming the R-FAS by combining quantitative and qualitative methods, with a focus on the EU-FAS policy instrument (the first and second version of the regulation) and by relating them to other findings of AgriLink. [WP4].</td>
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At the applied level, the objectives of AgriLink are to:

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<td>X</td>
<td>Develop recommendations to enhance farm advisory systems from a multi-level perspective, from the viewpoint of farmers’ access to knowledge and services (micro-AKIS) up to the question of governance, also recommending supports to encourage advisors to utilise specific tools, methods to better link science and practice, encourage life-long learning and interactivity between advisors [WP5];</td>
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<td>Build socio-technical transition scenarios for improving the performance of advisory systems and achieving more sustainable systems - through interactive sessions with policy makers and advisory organisations; explore the practical relevance of AgriLink’s recommendations in this process [WP5];</td>
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<td>Guarantee the quality of practitioners’ involvement throughout the project to support the identification of best fit practices for various types of farm advisory services (use of new technologies, methods, tools) in different European contexts, and for the governance of their public supports [WP6].</td>
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2.2 How this can be applied/developed in AgriLink

Agricultural knowledge systems are central to AgriLink – identifying and defining the organisations involved in knowledge production and exchange in the agricultural sector is a major activity. The term AKIS will inevitably be utilised in project reports. It appears
beneficial to go beyond the functionalism of AKIS and into process-oriented approaches to AIS, in order to assess the evolution of the relationships between AKIS actors and how innovations emerge, evolve and are taken up. Alternatively, it may be better to keep AKIS as a term, and integrate it with other theories to form the overall framework, rather than venturing into AIS.

AIS raises the questions

- How have knowledge structures come to be in their current form? (i.e. what processes are involved)
- How are the functions of farm advisory services influenced by the institutional settings of advisory systems?

2.3 Research questions relevant to AgriLink

What are the main sources of informal and formal knowledge about innovations for farmers?

1. How do farmers make decisions in their daily farming activities? Who influences them most in their decision-making? Differentiate between main 'types' of farmers, e.g. innovators, followers, laggards
2. What is the specific role/functions of advisory services in farmer decision-making on their farming practices? (consulting/facilitation/brokering/knowledge processing…)
3. What is the role of the prevailing (regional/national, EU) AKIS on farmers’ decisions to change their practices and what is the role of farming advisory services therein?
4. How are the functions of farm advisory services influenced by the institutional settings of advisory systems (who are the providers? What are their business models? Their relations?) at regional level or within innovation areas?
5. How can advisors enhance knowledge flows and accumulation and boost the innovativeness of farms?
6. What are the factors facilitating and hindering farmer-advisor-researcher collaboration?
7. How do governance structures of (regional or national) farm advisory systems in Europe empower (or not) multi-functional advisory services, and facilitate an accumulation and open access to knowledge?
8. What is the impact of advice/advisory services on the sustainability of agricultural practices?

2.4 Methodological implications

AKIS does not engender particular methods. The identity and function of AKIS actors can be ascertained by qualitative interviewing and document review. Klerkx et al. (2012, p. 471) identify these options for undertaking AIS research: institutional analysis, social network analysis, innovation journeys or histories, game-theory modelling, benchmark analysis, innovation systems analysis, functions of innovation systems approach.

2.5 Strengths and weaknesses/Sensitivities regarding use

The term AKIS is well recognised amongst policy makers and academics. It allows for a systematic identification of the major actors in agricultural knowledge provision. It appears under-theorised – quite functionalist by default. Although the academics involved recognise
that there is no single ideal AKIS, the mantra seems to be that identifying and addressing disconnections within the system are what is necessary to 'fix' and AKIS (e.g. Knierim et al., 2016). AIS appears to be more promising academically, but also relies on systems thinking and the integration of other theories to give it analytical power.

2.6 Potential operational problems

Use of the term AKIS is straightforward, but implies functionalism. With AIS, it may be difficult to know when to stop, in terms of identifying information sources (i.e. what is in and outside of the scope of the AKIS, given the vast array of information access options).

Optional Section 3: Practical example

The PRO AKIS FP7 project (www.proakis.eu) undertook an inventory of AKIS across Europe. The web-site contains numerous examples of AKIS structures.

Optional Section 4: Recommended further reading


References (to documents referenced in this template only)


2) “Binding” and “not binding” good practices – necessity to differentiate
Author: Catherine Laurent

1.0 General Overview of the Theory or Approach

1.1 Summary of the Theory, Approach or Topic
The notion of “practice” is widely used to analyse farm related activities and disseminate knowledge regarding these activities.

There are two different uses of the notion of “good practices”.

1) Non prescriptive approach. Identification of “good practices” can aim at sharing experience and know-how (production, advice) when observations have shown good results of certain practices. It is acknowledge that such information may only help decision making, and that what is a “good” practice may vary according to the objectives of the action, the context, etc.

2) Prescriptive approaches. Description of “good practices” is provided to various stakeholders in order to set the norms of their activity. These norms can be used for various purposes (regulation, subsidies release, etc.). It is acknowledge that a “good practice” is a framework for decision making, and that it is the responsibility of the concerned stakeholder to adopt it.

1.2 Major authors and their disciplines
1) The concept of “practice” has a long history in anthropology and social sciences (Turner 1994). Practices studies are grounded approaches "in taking up a point of view on the action, withdrawing from it in order to observe it from above and from a distance, he [the researcher] constitutes practical activity as an object of observation and analysis, a representation." Bourdieu 1977 p.2

Farming System research and extension papers have shown that 1) for similar agricultural productions practices may be diverse and value driven and 2) that good performances could be obtained by a variety of practices (e.g. works presented in IFSA, research of Inra-SAD, research of rural sociology Group of Wageningen...).

Basically, these approaches were opposed to the idea that there is one and only “one best way” to produce.

2) This concept has been captured by some approaches who are willing to impose a certain way of production. Hence the development of prescriptive approaches. For instance, the pesticide industry is describing “good practices” for the use of each crop protection product that is sold in the EU. These are “binding good practices”, if the farmer does not follow them, the law will make him responsible for any accident that will occur. In that case, the fact that the prescribed “good practice” is not relevant or feasible does not matter (e.g. prescription of personal protective equipment in hot environment; if a farmer does not wear it because it is impossible (hit stress), he will be considered as responsible for his intoxication).

1.3 Key references


1.4 Brief history of how the theory has developed and been applied
See above.

2.0 Application to the analysing the role of farm advisory services in innovation

2.1 Relevance to AgriLink Objectives

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At the applied level, the objectives of AgriLink are to:

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| X               | Build socio-technical transition scenarios for improving the performance of advisory systems and achieving more sustainable systems - through interactive sessions with policy makers and advisory organisations; explore the practical relevance of AgriLink’s recommendations in this process [WP5]; |
Test and validate innovative advisory tools and services to better connect research and practice [WP3];

Develop new learning and interaction methods for fruitful exchanges between farmers, researchers and advisors, with a focus on advisors’ needs for new skills and new roles [WP3];

Guarantee the quality of practitioners’ involvement throughout the project to support the identification of best fit practices for various types of farm advisory services (use of new technologies, methods, tools) in different European contexts, and for the governance of their public supports [WP6].

2.2 How this can be applied/developed in AgriLink

Personal position, to be discussed:

For research. We need to be cautious about the diversity of practices and the reasons why they are diverse (various constraints met by farmers, contexts...).

For dissemination of our research results (including the many short notes to be released). We need to be explicit in each document that the notion of “good practices” is used to share experience and not as a binding approach.

2.3 Research questions relevant to AgriLink [see the draft conceptual framework for further options]

I feel that one important dimension of the innovation studies should be the analysis of the adverse effects of innovations, and the analysis of how this knowledge on adverse effects is made available to stakeholders.

If we consider that there is one best way to produce, to deliver advice, then there is only one optimal development path. An authoritarian policy regime (and its researchers) may decide what is THE “good practice”.

If we consider that innovations are not win / win games, but may entail benefits and costs, winners and losers, then innovation adoption needs to be based on an assessment of these different aspects.

A growing number of farmers distrust technical messages coming from the industry and some advisory services because they were not informed of adverse effects of certain measures or prescriptions (eg. pesticide use and farmers' health). In this situation, we can make the hypothesis that a total lack of information on adverse effects of the innovation will have a negative impact on innovation adoption.

2.4 Methodological implications

- To favour typologies of the diversity of practices rather than the assumption of “representative agent practices”. To be cautious regarding any normative interpretation of results on “good” practices.
- However, we should not reject the heuristic value of identification and exchanges around the notion of practices.

References (to documents referenced in this template only)

3) Communicative action and agricultural innovation systems

Author: Freddy van Hulst

1.0 General Overview of the Theory or Approach

1.1 Summary of the Theory, Approach or Topic

This primer summarises how some ideas from Habermas’ social theory of Communicative Action can be and have been applied to agricultural extension and innovation. There are two key ideas that are potentially relevant for informing an analysis of Agricultural Knowledge and Innovation Systems (AKIS) in Europe:

1. Habermas’ distinction between instrumental rationality (the calculation of the best means to a given end, oriented towards control) and communicative rationality (the interaction between social actors seeking to reach a shared understanding of situations and plans, oriented towards communication).

This resonates with the two extremes between which agricultural extension approaches can theoretically move: from ‘Transfer of Technology’ approaches that rely on predetermined objectives that are realised through a blueprint top-down process - treating people as objects, ranging to ‘Facilitation of processes’ approaches that rely on open-ended, emerging process of co-learning, negotiation and interaction in subject-subject relationships.

2. Habermas’ ideal speech situation is a description of how a process of deliberation and discourse between stakeholders can lead to an agreement on definitions, problems and on the rules of the game. This concept can be used as a counterfactual for analysing the strengths and weaknesses of interactions in existing AKIS processes.

1.2 Major authors and their disciplines

The theory of Reasoned Action is a high-level social theory, and in that domain and in the (applied) philosophy of science there is a wide body of literature. Applied to agriculture and AKIS, the main author to draw on Habermas is Niels Röling who published a lot on agricultural extension and innovation both in developed and developing countries (e.g. N. Röling et al., 2012; Niels Röling, 2009a, 2009b).

Interestingly, as Table 1 shows, there are many parallel distinctions to draw in other (scientific) discourses that contrasts ‘normal’ and ‘post-normal’ approaches, e.g. in social learning (Ison, Röling, & Watson, 2007).

An author who is more critical of drawing on Habermas for agricultural extension is Leeuwis (Leeuwis & Van den Ban, 2004)10, who prefers Giddens’ structuration theory to provide a theoretical lens to capture the interactional and strategic coalitions etc. in multi-stakeholder processes that characterise today’s AKIS.

1.3 Key references


1.4 Brief history of how the theory has developed and been applied

The theory can be placed in the academic tradition of what is referred to as ‘the Frankfurt school of critical theory’ or simply ‘Critical Theory’.

It has been applied as a theoretical underpinning of AKIS by Roling to criticize the conventional realist-positivist approaches in extension that are characterised by instrumental rationality. In the ‘old’ but still common paradigm, innovation is the result of a linear process of ‘applying’ of scientific findings to practice, around an uncontroversial objective: an increased production.

As a contrast, the idea of an AKIS explicitly draws on a constructivist epistemology, acknowledging a diversity of objectives, including social and environmental sustainability. The underlying rationality must therefore be communicative, aiming at reaching a shared understanding and collective agency.

1.5 Basic concepts

**Instrumental rationality**

“Instrumental rationality concerns changing things by instrumental intervention which is informed by predictions based on generalizations. The goal is control.” (N. Röling, 1996)

**Strategic rationality**

“The anticipation of others' response to your moves and of other actors who are also busy making calculated moves, requires strategic rationality. The goal here is to win. [...] Economics is founded on the assumption that people try to maximize their benefit in their dealings with others” (N. Röling, 1996).

**Communicative rationality**

“Communicative rationality is based on the fact that people can agree to cooperate to solve a common problem on the basis of discussion. The goal is consensus, where consensus is defined as agreement on action” (N. Röling, 1996).

The objective of communicative action is reaching a shared understanding as a newly constructed reality: “The concept of communicative action refers to the interaction of at least two subjects capable of speech and action who establish interpersonal relations (whether by verbal or extra-verbal means). The actors seek to reach an understanding about the action situation ad their plans of action in order to coordinate their actions by way of agreement” (Habermas, 1984, p. 86).

**Ideal Speech situation**
Habermas speaks of discourse as a case of communicative action. It is a technical term for a reflective speech act through which participants of discourse strive for a rationally motivated consensus (Finlayson, 2005, p. 41). Habermas further argues that participants in the ‘discursive arena’ must adhere to some rules to create ‘the ideal speech situation’ (Habermas, 1990). These are not formal rules, but function as ‘pragmatic presuppositions’ that are implicit in discourse (Finlayson, 2005). The ideal speech situation is met if:

1. Every subject with the competence to speak and act is allowed to take part in a discourse.
2. a) Everyone is allowed to question any assertion whatever.
   b) Everyone is allowed to introduce any assertion whatever into the discourse.
   c) Everyone is allowed to express his attitudes, desires and needs.
3. No speaker may be prevented, by internal or external coercion, from exercising his rights as laid down in (1) and (2) (Habermas, 1990).

**Application to agricultural innovation**

The table below gives an indicative overview of how this distinction between Habermas’ three rationalities can inform an analysis of innovation and extension networks. It is loosely based on (Ison et al., 2007; Niels Röling, 2009b, p. 55). This table can be extended to include: role of extension professional, legitimation of an extension intervention etc.

Table 1 Distinction between ‘instrumental’, ‘strategic’ and ‘communicative’ features of agricultural innovation

<table>
<thead>
<tr>
<th>Discourses</th>
<th>Use instruments of power</th>
<th>Assume rational choice</th>
<th>Rely on emergence from interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forms of rationality</td>
<td>Instrumental</td>
<td>Strategic</td>
<td>Communicative</td>
</tr>
<tr>
<td>Coordination mechanisms</td>
<td>Hierarchy</td>
<td>Market</td>
<td>Network</td>
</tr>
<tr>
<td>Innovation model</td>
<td>End of pipe outcome of technology transfer and diffusion</td>
<td>Induced by changes in relative factor prices; market-propelled outcome of farmers on the treadmill</td>
<td>Emergent property of multi-stakeholder interaction (e.g. social learning; innovation systems (Hall, Janssen, Pehu, &amp; Rajalahti, 2007)</td>
</tr>
<tr>
<td>Purpose</td>
<td>Control</td>
<td>Win, gain advantage</td>
<td>Equity, resolve resource dilemmas</td>
</tr>
<tr>
<td>Intervention mechanisms</td>
<td>Regulation, coercion, engineering</td>
<td>Laissez faire, fiscal policy, deregulation</td>
<td>Process facilitation</td>
</tr>
<tr>
<td>Criteria for success</td>
<td>Realisation of formal goals</td>
<td>Satisfaction of individual needs</td>
<td>Common meanings, concerted action, institutional change</td>
</tr>
<tr>
<td>Conditions for failure</td>
<td>Lack of information, no legitimation</td>
<td>Market failure</td>
<td>Inequality in power relations</td>
</tr>
</tbody>
</table>

Source: Based on Ison et al., 2007 and Röling 2009b p55.
2.0 Application to the analysing the role of farm advisory services in innovation

2.1 Relevance to AgriLink Objectives

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At the applied level, the objectives of AgriLink are to:

| X               | Develop recommendations to enhance farm advisory systems from a multi-level perspective, from the viewpoint of farmers’ access to knowledge and services (micro-AKIS) up to the question of governance, also recommending supports to encourage advisors to utilise specific tools, methods to better link science and practice, encourage life-long learning and interactivity between advisors [WP5]; |
|                 | Build socio-technical transition scenarios for improving the performance of advisory systems and achieving more sustainable systems - through interactive sessions with policy makers and advisory organisations; explore the practical relevance of AgriLink’s recommendations in this process [WP5]; |
|                 | Test and validate innovative advisory tools and services to better connect research and practice [WP3]; |
|                 | Develop new learning and interaction methods for fruitful exchanges between farmers, researchers and advisors, with a focus on advisors’ needs for new skills and new roles [WP3]; |
Guarantee the quality of practitioners’ involvement throughout the project to support the identification of best fit practices for various types of farm advisory services (use of new technologies, methods, tools) in different European contexts, and for the governance of their public supports [WP6].

2.2 How this can be applied/developed in AgriLink

In general terms, it would be interesting to find which type of rationalities are predominantly driving AKIS at different scales, including EU level, country level, micro-AKIS. Are they aimed at convincing farmers to adopt certain practices? Are they aimed at answering demand for knowledge/services from farmers? Are they oriented towards facilitating group processes?

At a more practical level, the elements as listed in Table 1 could be added to a stakeholder analysis. One could ask stakeholders involved in a (micro-) AKIS how they see their role (e.g. as a consultant, a facilitator, and expert) which can be linked to a particular model of extension and a related underlying rationality.

Similarly it is interesting to ask stakeholders what they see as the legitimation of their involvement in the AKIS (e.g. there is a politically accepted decision, there is scientific evidence, an active demand or a shared idea of a problem). Again, this can be linked with a particular model of extension and a related underlying rationality.

Another application is the ideal speech situation described below. This can be used as a counterfactual ideal to assess what is hindering/facilitating interaction processes.

2.3 Research questions relevant to AgriLink

- At each level of agricultural extension (EU, country, micro-AKSI) what is an appropriate mix of extension approaches focussing on facilitation (aimed at reaching shared understanding through Communicative Action), persuasion (aimed at convincing through Instrumental Action), or negotiation (aiming at anticipating on ideas/problems through Strategic Action)
- Is Habermas’ Ideal Speech situation a useful idea to analyse and critique AKIS and the stakeholders’ participation, representation, power and influence?
- To what extent are instrumental and communicative extension approaches respectively, institutionalised in the institutions/bureaucracy supporting agricultural innovation?

2.4 Methodological implications

Unclear. One possible avenue is to use the above angles to inform a stakeholder analysis.

2.5 Strengths and weaknesses/Sensitivities regarding use

2.6 Potential operational problems

A potential problem is that although in theory it is easy to differentiate between the three rationalities, in practice there will most likely be a mix of several approaches. Therefore it may be confusing to try to apply it to a real situation. Nevertheless, in general terms it should be possible to compare AKIS in different regions/countries.

The ‘instrumental’ way of thinking is deeply entrenched in many ways of thinking and also in institutions, so discussing features of ‘communicative’ thinking can be a confusing exercise.
Optional Section 4: Recommended further reading

Easy to read inaugural lecture:


References


4) Conceptualizing change in advisory practice
Author: Marianne Cerf

1.0 General Overview of the Theory or Approach

1.1 Summary of the Theory, Approach or Topic

Change in advisory practice can either be addressed at the level of the relation between a farmer and or at the level of the advisor collective (e.g. those sharing some professional norms) or at the level of the organization (in line with new business models) or even at the policy level (how are some advisory practices institutionalized). Up to now, I have not seen any approach or theory which embrace these different levels in a unique framework. While organizational learning and activity theories and more generally practice-based approaches can offer some theoretical backgrounds if one conceptualize change from a learning driven perspective, evolutionary economics and innovation studies can also offer some theoretical backgrounds from a more efficiency driven perspective may be. Below, I will not develop all the different theories and approaches also I try to give a flavour of each at first. I will mainly develop activity approaches, but even in this area it is difficult as there are different lanes. Finally, I do not refer to formal or informal training and theories related to them and to skill development, also this can be a way to conceptualize change in advisory practice, e.g. change is supported by training advisors. Referring to activity theories, organizational learning or to innovation studies do not mean that training is not an issue, but it is only one among other resources which can support change in advisory practice.

1.2 Major authors and their disciplines

Organizational learning: Argyris and Schön (in the 80’s) and Gerardi and Niccolini (in the 90’s). The later have developed a scientific community OLK which recently merge with the OKLC community (http://www2.warwick.ac.uk/fac/soc/wbs/conf/olkc/). Learning issues are key to conceptualize change and different learning loops (first, second and third order) are considered to discuss how change occurs in practice within and between organizations. Mainly management scientists but also some economists and some sociologists who recognize themselves as belonging to the “organization studies” community (European Group of Organization Studies for example, EGOS Conference). See also primer from Chris and Engle? Situated learning issues are related to this field (Lave and Wenger with the notion of Communities of Practice)

Social learning and system thinking: see theory primer from Chris (theories of learning and knowledge) and form Andy (complexity and systems)

Activity theories: There are quite different theories. Some are related to situated action (Schuman, 1987) and cognition (Hutchins, 1990), some to the pragmatism (Dewey, James) while others are grounded in the Russian tradition (referring to Vitgosky and Leontiev work, see for example Engeström, 1988 ; Clot, 2000) or in the francophone ergonomic approach (Leplat and Cuny 1977 ; Rabardel, 1995). please also comment on the scope of the theory or approach (i.e. is it specific to a few authors, or is there a wide body of literature on it, and if so, in what disciplines). Change is not necessarily a key issues in some of these approaches. Engeström speaks of expansive learning cycles of systems of activities, which are related to contradictions within the elements of the system (4 different levels of contradictions). Clot also conceptualize change as the result of contradictions between 4 different components of a job: the historical component (how the job evolve in the past of the organization), the prescriptive component (what is currently “to be done” as defined by the organization), the collective component (what the professionals collectively define as what has to be done, the collective norm so to say), and the personal component (what the individual consider as the right way to perform the job). At individual level, this is revealed by tensions between what is done, what
the individual would have like to do, consider s/he should do, s/he could do. Here mainly psychologists, ergonomists, education scientists. Cultural and Historical Activity Theory (CHAT) as a community, but also the francophone ergonomic society. Change is mainly conceptualize as developmental processes (e.g. finding ways to overcome (individually but also collectively and eventually at the level of the organization) the contradictions which will result in the development of a new practice (activity).

Innovation Studies: Unclear for me at this stage the extent to which practice is a relevant concept for those referring to innovation as a driver of change whether it be technological or more organizational and institutional innovation.

1.3 Key references
Still to be identified (overview papers). Mainly books!!

1.4 Brief history of how the theory has developed and been applied
Organizational learning : see Primer 20 (Strate and Blackmore)
Activity theories: They were first developed to give account of how individual and collective human action in and on its environment.

Cultural and Historical Activity Theory, have developed to address organizational and technological innovation issues and then to address inter-organizational or more networking processes then those which were addressed in a first version of the Engeström triangle representing the activity system through various mediations between a subject –individual or collective- and a object (to be understood as a purpose and a motive rather than as a physical object). Mediation through tools (language and other cultural tools, material tools) and through the collective of work, the division of work and the rules of work within the organization. Such a framework is “used” for developmental intervention (Virkkunen). Such interventions have been carried out in various organizations and inter-organizational settings and some took place in the agricultural sector (Seppännen in organic farming, Perreira-Queyrol in the pig sector, Väninen in the horticulture sector, Prost in the wheat breeding inter-organizational setting for example). It has been applied to service delivery but not necessarily (as far as I know) to agricultural advisory organizations.

French ergonomists have specifically developed the activity approach in order to point out the difference between the task and the activity. Metaphorically, we can say that, it the task (given by the manager in an organization) is the music partition, the activity is the interpretation of the partition and such interpretation is always required and new due to the specific circumstances (internal to the individual, or external to him or her) while activity is performed. They then distinguished between productive activity and constructive activity as two face of the same coin (Rabardel and Samurçay) to point out that while performing a given activity in order to reach a productive goal (such as providing a service for example), individuals develop their own skills, tools (e.g. learn, change their tools to make them more relevant to their own activity) but also to point out that constructive can be “destructive” (e.g. individual are not able to perform their activity in a manner which they feel comfortable with, and develop strategies to cope nevertheless with what the situation requires, resulting in stress, lack of abilities, etc.). Change therefore means adapting the working conditions to reduced destructive effects and to support adequately the advisor activity (e.g. which will not be in contradiction with the goal, the motive of the activity, will support the advisor in being efficient and will not affect his well-being and health) on one hand, and also to create enabling environments (e.g environments which support constructive activity). Few studies in the agricultural sector (see some of Cerf et al. work) address whether to change advisory work in order to support farmers in their transition towards agro-ecological practice and see Chantre et al. (2015) or Coquil (2014) who
analyse how farmers achieve changes from conventional to more environmental-friendly practices).

Pragmatic approaches put forward the role of experience and inquiry in the coupling between the human and his/her environment, while situated approaches mainly point situation awareness. They are critical about approaches which consider human from an information processing system (such as in substantive or procedural decision making or problem solving approaches) and critical about the role played by plans in human action. Practice emerges from the coupling between the human and its environment so to say (but I am not so sure that the term “practice” is actually core in their work.) As I am less familiar to such approaches, I am less at ease to say anything about their evolution. They are applied in a wide range of work whether to analyse coordination in action (Boltasnski and Thevenot for example) or to analyse how individuals cope with innovative technologies, or develop their experience (Mayen). Such approach has been used to analyse advisory practice (at least see Guillot, 2015).

2.0 Application to the analysing the role of farm advisory services in innovation

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### 2.2 How this can be applied/developed in AgriLink

If I consider activity theories, I think that they can help in considering how farmers and advisors integrate new tangible and intangible tools to change their practice and how they are able to develop new practices.

It also can support the analysis of the interplay between front and back office work and how the whole organization support changes in advisory work (and by the way in advisory services, but by paying attention to the way such services are performed and not only how they are designed or can be made available to farmers).

It can help to better characterize how co-creation of knowledge and innovation happens without micro-AKIS.

It can be relevant to develop the WP3 methodology if WP3 is seen as a place to identify how enabling environments are created (living labs ?).

### 2.3 Research questions relevant to AgriLink

- How to support constructive processes and avoid destructive ones within advisor activity while creating advisory environments which are meant to increase relations among researchers, farmers and advisors (and other players?)
- How to create enabling environments within advisory organizations to support a collective of advisors in developing services in line with the diversity of farmers’ access and use of services?

### 2.4 Methodological implications

- types of methods typically associated with the theory or approach : quite intense data collection through observation of work activity or methods of inquiry which enable the interviewee to recall what s.he really did in a given situation. Qualitative data collection and analysis. Need to reflect on what are the key work situation (e.g. those which can give information for a larger set of work situations).
- implications for specific workpackages (e.g. sampling, data collection, research questions)
May be to be used to develop a follow-up of some of the task of WP3. May be relevant in some WP2 task when in-depth analysis is seek for?

2.5 Strengths and weaknesses/Sensitivities regarding use

Activity theories are practice-based approach and pay attention to the way people really perform the work rather than paying attention to what ought to be done. It also conceptualize change not only in relation to performance but also pays attention to sense making, to welfare. It pays attention to the interactions between individuals, professional collective and organizations in a change process. It has been applied already to advisory work in agriculture and other fields.

As it is a practice-based approach, it means in-depth inquiry rather than interviews out of work context. It might be difficult to use for people who are not familiar with it. It might be difficult to use it if little attention is paid to knowing and learning (knowledge as a process) and more attention is paid to knowledge as an asset, a stock..

2.6 Potential operational problems

(e.g. theories may be ‘vague’ and difficult to operationalise, they may require labour-intensive data collection, may require data that are hard to get, etc.)

See above questions about time consuming methods and difficulties to get used to the conceptual framework.
5) Digitalization of agriculture and big data

Author: Cristina Micheloni

1.0 General Overview of the Approach

1.1 Summary of the Approach

In general, “big data” is quite an issue in various sectors, but it has not received the same level of attention within agriculture as some other areas (e.g. genomics). On the other hand, increasingly more data are now available in the agricultural sector that could be used in a much more systematic way than has been done hitherto. However, different than for other sectors, there are many different data holders like remote sensing data, digital soil maps, data of various authorities in the agricultural and environmental field, farmers’ data (for example, sensors on modern tractors and harvesters) etc. that hardly communicate with each other.

In all fields of application, the use of ontologies and controlled vocabularies to describe metadata is state of the art. Standardised data formats are used or are under development. These formats are applied to stored and published data sets. The best choices to publish the structured data are international repositories. In case of less structured data sets the assignment of Digital Object Identifiers (DOIs) is one of the standard procedures. Often, systems to publish DOI data sets are operated institutionally. The current situation shows that a lot of activities are running but they are mostly not aligned. The compilation of used ontologies, controlled vocabularies, running repositories, provided access interfaces and data publication policies is the first step to overcome this issue. As the next task, the harmonisation of data formats and access interfaces should be started.

As with other areas in life sciences, the recent advent of inexpensive high-throughput technologies promises to revolutionise agriculture. It is now possible to measure almost anything imaginable and in only few hours we can collect vast amounts of data using all kinds of different approaches. We can fly drones over large crop fields loaded with a multitude of cameras, install sophisticated sensors to monitor livestock behaviour, access publicly available satellite images and monitor current crop prices; all from the comfort of a desk in an office that can and probably will be remotely located. The challenge, however, remains: how can we make sense of the data? Realising the value of the data collected and how this can be translated into applicable knowledge is at the heart of the Big Data revolution.

Most of the devices that are now available to growers, agronomists and scientists have been developed in a bottom-up fashion focused on specific issues first and only looking into the data they generate after the initial prototypes are already available to the users.

Service provider perspective (commercial and academic)

Data-driven added-value services in the agricultural sectors is emerging as an opportunity for the development of businesses and spin offs. Many of these opportunities are focused on specific areas of expertise such as image capturing services, crop modelling, irrigation scheduling, etc. In most of these examples the focus is on decision-making support and best-practice advice. One of the major challenges for service providers is the access to affordable high-quality reliable data. This point is particularly relevant to the costing of the services and the impact this has on the adoption of novel approaches by the end users (i.e. agronomists and farmers). The development and maturation of new technologies greatly depends on a dynamic and resilient service sector. In many examples the research community will be the early customers of this sector which in turn is driven by access to public funding in the form of research grants.

End user perspective
End users in relation to big data form a very diverse set. Two are companies (developing equipment and tools for use on farms) and the farmers themselves who could make use of data-driven tools to optimise on-farm solutions.

Communication between and within layers of industry, from data generators to end users, is extremely important and necessary to maintain a focus on big data in order to keep industry involved through funding and interest in future developments. Industry can be seen in several layers: on the one hand, companies (in collaboration with the scientific community) need to develop new equipment. On the other hand, farmers need easy-to-interpret daily management tools which are consistent, reliable and which are a good investment. Farmers don’t need background information on how the data are collected and analysed, but rather tools that provide solutions which can be used in their everyday routine.

In-between are advisers, who on one side can make use of big data for their own update and skills improvement and on the other can mediate the use of big data and digital services for farmers.

1.3 Key references (3 to 5 maximum)
See below.

1.4 Brief history of how the theory has developed and been applied
Big data is not a theory but a state of art: they became available in the last 5 years in agriculture sourced for several purposes and by several means: climatic data for pest and disease management; production data for certification schemes; geographic data and management data for precision farming and for CAP schemes…

In last years the awareness of such a huge availability led to the attempt to use them, facing in one side the problem of data compatibility and interoperability (very low) and, on the other hand, the request of infrastructures in rural areas in order to make use of the opportunity as well as the need for farmers training and informations that often the “usual” farm advisers do not have.

1.5 Basic concepts
1. a huge amount of any kind of data is already available at farm level but still unexploited for better/more efficient farm management.
2. causes of such unexploitation are a) low interoperability; b) infrastructural limitations; c) lack of farmers skills/informations; d) inadequate support from usual advisory services and lack of different brokers (as well as costs).
3. on c) and d) AGRILINK can analyse cases and identify areas for improvement/action
4. infrastructural features and degree of information/service provided can impact on the digital divide between rural areas and, consequently, on innovation potential.

Basically new skills and knowledge should come into the farming systems and it is not likely to be provided by the “usual” channels. The situation varies greatly among regions and it affects the potential for innovation.
2.0 Application to the analysing the role of farm advisory services in innovation

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<td>Guarantee the quality of practitioners’ involvement throughout the project to support the identification of best fit practices for various types of farm advisory services (use of new technologies, methods, tools) in different European contexts, and for the governance of their public supports [WP6].</td>
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**2.2 How this can be applied/developed in AgriLink (2-5 paragraphs)**

- we can include some cases in WP2
- at least a living lab on the topic in WP3
- specifically address the question in the survey and questionnaire of WP2

**2.3 Research questions relevant to AgriLink [see the draft conceptual framework for further options]**

- Who can be the innovation broker in this topic? What is its business model?
- How to bridge infrastructural differences?
- How to ensure that available data is translated into really useful and affordable tools to be used on a day-to-day basis for farmers.
- How to integrate independent datasets across different scales (especially climate data) e.g. to really inform what crops are grown at farm level.
- How to ensure that data-driven tools that seek to optimise farm management in the context of climate change do not have contrary trade-off effects elsewhere.

**2.6 Potential operational problems**

Technology and its use evolves very fast, there is the risk to work on situations that in 2 years time do not exist any-longer and we risk to give recommendations out of time.
References

Big Data in Smart Farming – A review, Sjaak Wolfert, Lan Ge, Cor Verdouw, Marc-Jeroen Bogaardt, Agricultural Systems 153 (2017) 69–80; http://dx.doi.org/10.1016/j.agsy.2017.01.023

7) Geography of innovation and farmers' adoption behaviour
Author: Danielle Galliano

1.0 General Overview of the Theory or Approach

1.1 Summary of the Theory, Approach or Topic: The contributions of the geography of innovation.

The geography of innovation is an interdisciplinary scientific field - at the intersection of the innovation economy and regional science - which studies the spatial dimension of innovation and the related dynamics of technological, institutional and geographical change. In this context, numerous studies have shown the role of geographical proximity and the importance of spatial externalities in the process of information and knowledge transfer, and in the diffusion of innovations ((Audretsch et Feldman, 2004, Boshma and Frenken 2011 Cooke et al. 2011, Camagni Capello 2013, Capello 2014). They show that location plays a strategic role in actors' and organizations' capacity to capture and absorb external knowledge. Although this spatial dimension has been modified by the digital revolution, many authors show that geographical proximity and territorial resources related processes remain fundamental factors in innovation and, in particular, in processes of transition towards sustainable development (circular economy, the role of place-based factors etc.). This is particularly true for innovation processes in rural areas, characterized by low flows of information and knowledge that can hamper the processes of change and innovation (Esparcia 2014, Galliano et al., 2012, 2017).

1.3 Key references


2.0 Application to the analysing the role of farm advisory services in innovation

2.1 How this can be applied/developed in AgriLink: Characteristics of the spatial environment of farming operations and its role in innovation and agro-ecological transition processes

The processes of technical or organizational innovation and of adoption of practices can be linked to different processes of knowledge dissemination and interaction between actors in which the spatial dimension plays an important role. DiMaggio and Powell (1983) point to a
phenomenon of "institutional isomorphism" which refers to a convergence and homogenization of actors' behaviors in the same sector or territory. They highlight that this homogenization of behaviors stems from three mechanisms. The first is a coercive mechanism ("coercive isomorphism") which refers to the existence of rules, norms, regulations that affect actors belonging to the same sector. The second mechanism is the "mimetic processes", particularly active at local level. Uncertainty and risk are conducive to behavioral imitation among farmers, particularly in terms of adoption of innovative practices. The third is a normative mechanism (normative pressures) related to regulation and standards (Di Maggio and Powell, 1983).

In line with this, and beyond the coercive and regulatory aspects, various studies show the importance of these normative mechanisms linked to informal institutions (associations, training, specialized press, etc.) and of mimetic mechanisms, which refer to processes of imitation or contagion between actors (Vicente and Suire, 2007, Lapple and Kelley, 2015, Lewis et al. 2011). Consulting organizations are, in this context, a particularly important driving force in the knowledge dissemination process, particularly in terms of knowledge sharing among agricultural stakeholders. These processes are particularly active within the same sector (the sharing of knowledge and experience on specific farming practices, etc.) and within the same territory (geographical proximity). The two dimensions reinforce each other.

In the empirical literature on agriculture, the study conducted by Lapple and Kelley (2015) and based on a local sample of Irish breeders, shows that spatial proximity is conducive to farmers making similar adoption choices, and more specifically that interactions between farmers and the frequency of use of agricultural consulting or training services are strongly correlated with the adoption of organic farming. These neighborhood effects are confirmed by different studies involving direct variables such as social capital, network analysis, etc. (Wollni et Andersson, 2014 ; Lewis et al 2011, Wei et al., 2016, Crespo et al. 2014 ) or indirect variables, through their effects on farmers' perception. Thus, these studies emphasize the important effect of farmers' perceptions on the difficulties (or ease) associated with the adoption of an innovation and its expected benefits (Greiner et Gregg, 2011 ; Zeweld et al 2017) or the sharing of the value added (Tregear et al., 2007 ; Crespo et al. 2014).

The question of spatial externalities refers more broadly to the effects of networks and of the spatial conditions of innovation diffusion. Regarding networks, research has emphasized the importance of personal networks and key actors involved in the governance of innovation projects in rural areas (Esparcia, 2014). It has also shown the importance of institutional mechanisms to complement personal networks and their contribution to a project (Doloreux et al., 2011). These studies stress the key role of sectoral and cross-sectoral links between actors in the agro-food chain as well as the key role played by local public authorities during the different stages of innovation projects, particularly in rural areas (Esparcia, 2014, Galliano, Gonçalves et Triboulet, 2017). The analysis of networks and interactions among public and private actors throughout the various stages is often essential to understanding the adoption process of eco-innovation. This implies that research must consider the geographical dimension of the learning process, the successive choices made by actors, and its influence on the progressive construction of the specific material or non-material assets that support the eco-innovation process (Galliano et al. 2017). As a consequence, our analysis must clearly examine the relational and geographical dynamics of these processes.

Mention must be made, finally, of the biophysical environment and its pedo-climatic conditions, which must be taken into account insofar as they play an important role in how available natural resources are used and in the choices of adoption of practices (Ostrom, 1990 ; Hagedorn, 2008 ; Allen et Lueck, 2003 ). Because of their complex interactions with ecosystems, farms are much more sensitive to uncertainties related to the functioning of these ecosystems and to natural events (Hagedorn, 2008, Renting et al., 2009, Darnhofer, 2014). The local biophysical environment is an important control variable in the analysis of the environmental profile of farming operations and of their transition processes.
2.1 Research questions relevant to AgriLink:

- What is the role of spatial proximity in farmers' uptake of innovations?
- Quels sont les réseaux d'acteurs mobilisés par les farmers et leur localisation?
- What networks of actors do farmers utilize and their location?
- What role does geographical proximity play in knowledge transfer and appropriation?
- Does the nature of knowledge (tacit, codified, etc) affect the way in which knowledge is appropriated. More specifically, does spatial proximity facilitate the sharing of experience and the transfer of tacit knowledge (vs codified)?
- What role do the adoption and use of IT play in the transfer of knowledge and the adoption of specific innovation by farmers?
- What role does the location of the different types of advisors play in farmers' uptake of innovations?
- It raises a more general research question: is the location of the sources of information (and advice) always a key factor in farmers' decision making processes?

2.3 Methodological implications

In order to better understand the effectiveness of adoption processes and the role of the different type of advisors, it is important to take into account the spatial dimension of the processes of knowledge dissemination and of the ways in which farmers use resources. It will be appropriate to examine and assess:

- the role of knowledge sharing via localized networks of actors,
- the mimetic phenomenon in the adoption process (my neighbor has adopted such or such a practice, so I do it too),
- the role of advisors in the linking and coordinating of farmers on a territory, in experience and knowledge sharing between farmers.

For micro-AKIS, this topic of geographical proximity raises the question of identifying, in surveys, the sources of information and service and their location.

In AgriLink WP2, we will be interviewing farmers who have adopted specific innovations on:

- The location of the actors in the personal and professional networks used
- The location of the physical, cognitive and relational resources used by farmers to innovate.
- Distinguish the sources of information and services mobilized according to the stage of the innovation process: emergence, realization, stabilization - and their location (what kind of resources are mobilized locally or extra locally? especially via ICTs? etc...)

2.2 Relevance to AgriLink Objectives

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| ✔ | Develop a theoretical framework utilising a multi-level perspective to integrate sociological and economic theories with inputs from psychology and learning studies; and assess the functions played by advisory organisations in innovation dynamics at multiple levels (micro-, meso-, macro-levels) [WP1]; |
| ✔ | Assess the diversity of farmers’ use of knowledge and services from both formal and informal sources (micro-AKIS), and how they translate this into changes on their own farms [WP2]; |
| ✔ | Develop and utilise cutting edge research methods to assess new advisory service models and their innovation potential [WP2]; |
| ✔ | Identify thoroughly the roles of the R-FAS (regional FAS) in innovation development, evaluation, adoption and dissemination in various EU rural and agricultural contexts [WP2]; |
| ✔ | Test how various forms of (national and regional) governance and funding schemes of farm advice i) support (or not) farmers’ micro-AKIS, ii) sustain the relation between research, advice, farmers and facilitate knowledge assemblage iii) enable evaluation of the (positive and negative) effects of innovation for sustainable development of agriculture [WP4]; |
| ✔ | Assess the effectiveness of formal support to agricultural advisory organisations forming the R-FAS by combining quantitative and qualitative methods, with a focus on the EU-FAS policy instrument (the first and second version of the regulation) and by relating them to other findings of AgriLink. [WP4]. |

At the applied level, the objectives of AgriLink are to:

| ✔ | Develop recommendations to enhance farm advisory systems from a multi-level perspective, from the viewpoint of farmers’ access to knowledge and services (micro-AKIS) up to the question of governance, also recommending supports to encourage advisors to utilise specific tools, methods to better link science and practice, encourage life-long learning and interactivity between advisors [WP5]; |
| ✔ | Build socio-technical transition scenarios for improving the performance of advisory systems and achieving more sustainable systems - through interactive sessions with policy makers and advisory organisations; explore the practical relevance of AgriLink’s recommendations in this process [WP5]; |
| ✔ | Test and validate innovative advisory tools and services to better connect research and practice [WP3]; |
| ✔ | Develop new learning and interaction methods for fruitful exchanges between farmers, researchers and advisors, with a focus on advisors’ needs for new skills and new roles [WP3]; |
| ✔ | Guarantee the quality of practitioners’ involvement throughout the project to support the identification of best fit practices for various types of farm advisory services (use of new technologies, methods, tools) in different European contexts, and for the governance of their public supports [WP6]. |

### 2.3 References


8) Governance
Authors: Katrin Prager, Jaroslav Prazan

1.0 General Overview of the Theory or Approach
1.1 Summary of the Theory, Approach or Topic
Governance as a topic or concept is covered in many different disciplines, ranging from public policy, political sciences, administrative sciences, to environmental sciences, human geography and sociology, institutional economics and behavioural economics. This primer considers mainly literature relating to the field of environmental and common pool resources governance. Knowledge can be viewed as a public good or a common pool resource. We therefore posit that in particular Ostrom’s work on institutions and social-ecological systems has relevance.

1.2 Major authors and their disciplines
- Governance is understood as “the totality of interactions, in which government, other public bodies, private sector and civil society participate, aiming at solving societal problems or creating societal opportunities” (Meuleman, 2008, p11). Another broad definition adds the normative dimension: Governance is “a collection of normative insights into the organization of influence, steering, power, checks and balances in human societies” (In’t Veld, 2011, p9).
- Major authors are difficult to identify due to the spread of governance work across disciplines and topic areas.
- In institutional economics, governance is closely linked to institutions (formal and informal rules that determine actors behaviour), because governance is conceptualised as the necessary structures to make rules effective (the “forms, modes and practices of organisation to put rules into practice”)
- Major contributions have been made by Elinor Ostrom through her Institutional Analysis and Development (IAD) framework (Ostrom, 1990; Ostrom, 2005). This has been applied empirically in many case studies and adaptations made.
- Further developments include a proposition for a “ politicised” IAD framework (Clement, 2010), to simultaneously consider institutions, the politico-economic context and discourses across governance and government levels in order to allow the generation of policy recommendations (the conventional IAD approach concentrates on describing and analysing a situation).
- Further developments are the combination of the IAD with a social-ecological systems (SES) framework (McGinnis, 2010), and a diagnostic approach to unpacking the SES framework into multiple levels (Ostrom and Cox, 2010).
- A key asset of the IAD framework is its ability to link multiple governance levels. Issues of scale are inherent in governance concepts (termed multi-level governance) (Moss and Newig, 2010)
- Ostrom’s concept of IAD/SES could be applied as a tool for assessment of the advisory system performance, where knowledge/information on sustainability is subject of transaction, while taking into account the whole system of interactions involved (if using SES). But the framework should be adapted to the specificities of the agricultural knowledge system.
Polycentric governance (Marshall, 2009), decentralised governance (Birner and Wittmer, 2004; Clement, 2010) and adaptive (or reflexive governance) (Folke et al., 2005; Rouillard et al.; Voss et al., 2006) is often cited as a requirement for effective governance, but at the same time as challenging.

The way in which a system or a resource is governed is expected to have impacts on the outcomes and the effectiveness of governance, for example community-based governance (Marshall, 2008) and participatory governance (Newig and Fritsch, 2009) are important in the management of natural resources.

Meuleman distinguishes three governance styles: market, network and hierarchy. These styles are ideal types and, in real situations, there are mixtures of styles. Nevertheless, each style is internally consistent and has distinct internal logic: “The central value of hierarchical governance is authority; therefore the output must be authoritative and legitimate. Empathy and trust are central in network governance, and therefore results are expected to be based on consensus. Market governance is based on competition and price, which makes it logical that the best results are the most competitive and cheapest products. This internal logic seems so attractive that many public managers and politicians adopted one of the styles as their belief system or doctrine” (Meuleman, 2010, p51). Similarly Oliveira (2017) privatization governance, self-governing institutions, and state-led governance (meaning the same as governance styles by Meuleman). The conclusion to the question which governance is the best for example for ground water use, was that the multilevel (i.e. combined) governance as the most useful for examples from India and USA. The study stated that no one single governance type/style is the best for all conditions or even states. It could be assumed that similar rule could apply to knowledge governance.

The literature on IAD and SAS is quite extensive and used across the globe.

1.3 Key references


1.4 Brief history of how the theory has developed and been applied

Elinor Ostrom worked from 1970s on case studies dealing with common pool resources (CPR) threatened by exhaustion (concentrating on self-governance or network governance in combination with other governance types). The concept of CPR evolved as a response to insufficiency of working with only two concepts: pure public and private goods (Samuelson 1954, Ostrom 2010) and limits of corresponding state and market governance. CPR including knowledge (especially knowledge on CPR or sustainability issues) carries out features of public goods where one of the challenges is the equality of access to this resource (or its provision). Elinor Ostrom and her team analysed a large number of case studies on CPR, carried out several experiments (assessing the outcome of communication and cooperation of actors) and modelling exercises, in order to identify factors of success and failure of relevant system characteristics and produced a list of ‘design principles’, which synthesize core factors that affect the probability of long term survival of an institution developed by the users of a
resource (Ostrom 2010). Later they asked questions how to develop the theories further to increase understanding and predicting when those actors involved in CPR dilemmas will be able to self-organise and how various aspects of the broad context affect their strategies and success (Ostrom 2010).

The experience from these case studies led to development of Institutional Analysis and Development framework (IAD) helping to organise diverse efforts to study common-pool resources and providing language for describing relationships at multiple levels and scales. Her work challenged a presumption that either the market (privatisation – private governance) or government (public domain and its governance) can do better job, than local actors protecting and managing the resources, who were conceptualised primarily as voters or consumers (Ostrom 2010, Olivera 2017).

This reflects the thinking in public policy which was characterised by a dichotomy of governance structures: market and hierarchical governance (i.e. governance structure of a firm). Another benefit of using IAD/SES is that several group of factors are dealt together in a systematic way, trying to avoid one sided point of view, and asking the question “what institutions could resolve the social dilemma”.

Another outcome of these studies was a concept of polycentric governance (Ostrom 2010). Further studies led to enrichment of previous IAD with missing factors (e.g. governance, resource units) and extending it to a systems assessment. The concept is called Socio-ecological systems and was used also for assessment of institutions and policies. Ostrom (2010) started to study the learning process (especially social learning leading to better decisions, to solve social dilemmas about norms and cooperation). Both concepts can be used to assess how the CPR/ public goods (knowledge) are produced, spread (distributed), and used in a systematic way. The SES provides a systems approach.

Ostrom’s work on knowledge relates to its public goods/CPR characteristics (and therefore relevance of IAD/SES approach in this case). In her literature Ostrom speaks about information/knowledge as source and specifically as a CPR (Hess, Ostrom 2001) or about “global knowledge pool”. The approach has been applied in the assessment of systems producing CPR/public goods (in this paper also knowledge as CPR) and as a tool for policy assessment, but the literature focusing on knowledge/advisory services with this approach is rather limited. The approach provides clear structure to the analysis of suitability of governance regimes, the role of property rights and regimes, the ways how key stakeholders are participating on the resource provision. Because the AKIS is a system of high complexity the approach has potential to help dealing with numerous factors, interdependencies and the whole dynamic quite effectively.

1.5 Basic concepts

IAD and SES concepts

IAD and SES provide a framework for a systematic study and supports understanding complex social dilemmas and confusions regarding management of common pool resources or public goods (e.g. knowledge, fish in the sea). The framework is compatible with using different theories for example public goods/common –pool resources theory, collective action theory, game theory, transaction costs theory – because in itself it is only a framework for labelling and describing the components of a system without explaining or theorising about the links between the components.

Knowledge carries characteristics of public goods (long term difficulty to exclude others from using the pool of knowledge, and low extraction, because if used by one there is no decrease of using for others), CPR (the resource could be commonly used) and partly also club goods (short term exclusion is possible – innovation used only by small group). As a private goods it is more related to providing access to the knowledge. CPR and club goods are by neoclassical
economist regarded as public goods (dilemma in exclusion of free riders who use the goods without contribution). Thus the knowledge could be seen lying somewhere between pure public goods, CPR and club goods. This diversity of characteristics of this good creates complex institutional and governance situations which could be source of confusion (deduced from graph on goods characteristics in Hess, Ostrom 2010).

IAD (Ostrom 2010):
The IAD supports the study of complex systems which are composed of cluster of variables which could be unpacked several times according to actual interest. The core of the framework is an action situation which is influenced by several external factors. The key clusters of variables are:

1. Biophysical conditions, which may be simplified in some analyses to be one of the four types of goods defined.
2. Attributes of a community, which may include the history of prior interactions, internal homogeneity or heterogeneity of key attributes, and the knowledge and social capital of those who may participate or be affected by others.
3. Rules-in-use, which specify common understanding of those involved related to who must, must not, or may take which actions affecting others subject to sanctions. The rules-in-use may evolve over time as those involved in one action situation interact with others in a variety of settings.

Due to the characteristics of the good (in our case: knowledge) the IAD could be adapted and used for the performance assessment of advisory system and for the assessment of institutions generated by actors involved in the system (e.g. the AKIS) or its subsystems. IAD concept is flexible enough to study different property regimes (e.g. when the resource is government property, private property, community property or owned by no one and also counts with diversity of property rights (not only right to sell the property) which could occur when public goods or CPR are managed and/or produced (Ostrom 2010).

Aspects of ‘good governance’ are discussed in a number of policy documents (OECD, 2006) and are associated with the following aspects: transparency, legitimacy, participation in decision making, horizontal and vertical integration, learning mechanisms, and communication and conflict management.

Diagram [if available]
The IAD and subsequently the SES describe how to describe and analyse (diagnose) a governance system.
**Figure 1:** Revised IAD Framework by Clement (2010), building on Ostrom (2005). Added variables appear in grey shaded boxes. These variables impact both the action situation – notably in the way they position actors – and the actors, as they shape values, norms and preferences.

**Figure 2:** Revised SES framework combining the IAD and SES frameworks (McGinnis, 2010)

Figure 2 shows the features of the SES framework, including its multi-tiered quality. The (five) primary entities are the first level of the framework. These are each associated with a set of attributes, which can, in turn, be decomposed into a set of sub-attributes to form the second level of the framework (Figure 3).
2.0 Application to the analysing the role of farm advisory services in innovation

2.1 Relevance to AgriLink Objectives

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| Science and practice, encourage life-long learning and interactivity between advisors [WP5]| Build socio-technical transition scenarios for improving the performance of advisory systems and achieving more sustainable systems - through interactive sessions with policy makers and advisory organisations; explore the practical relevance of AgriLink’s recommendations in this process [WP5]; |
| Test and validate innovative advisory tools and services to better connect research and practice [WP3]; |
| Develop new learning and interaction methods for fruitful exchanges between farmers, researchers and advisors, with a focus on advisors’ needs for new skills and new roles [WP3]; |
| YES Guarantee the quality of practitioners’ involvement throughout the project to support the identification of best fit practices for various types of farm advisory services (use of new technologies, methods, tools) in different European contexts, and for the governance of their public supports [WP6]. |

### 2.2 How this can be applied/developed in AgriLink

The Social-ecological system (SES) could serve after some modifications as a framework for assessment of the AKIS while asking questions like: “What are enabling and blocking factors influencing the support of farmers' decision making in sustainability issues?” The assessment of SES would cover investigation how actors reflect production characteristics including particular area of studied innovations, characteristics of actors (from direction of interest to power in the arena), social settings (e.g. trust), property regimes in farming and in knowledge and knowledge access (e.g. role of IT in establishing of private properties where previously the knowledge was a common and vice versa\(^\text{11}\)), governance styles/regimes (state, private, common or self-governance) and their appropriateness, policies and their role, and others factors (to be specified).

For carrying out the case studies (WP2) the approach could provide consistent guidance for studying of all key actors role in farmers’ decision making (e.g. studying relationship between farmers and advisors, organisations which generate knowledge, exchange of knowledge/experience between farmers).

Also WP4 could benefit from this approach, which can help in studying governance regimes on all levels (EU, national, regional), also in assessment of their effectiveness and explanation of the reasons of their appropriateness and potential space for institutional change. The theoretical background would help in understanding the role of state, private and self-governance styles (network). The experience and theories behind the CPR management is particularly suitable for studying commonly managed knowledge transfer (self-governance), based on networks, knowledge sharing, any level of cooperation of different stakeholders (e.g. farmers and their representatives, advisors, researchers).

### 2.3 Research questions relevant to AgriLink

The first level research questions (derived from the proposal directly):

1. What are the roles of a wide range of advisory organizations (and other actors) play in farmers’ decision-making?

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\(^{11}\) Hess, Ostrom (2001)
2. What changes are necessary in order to enhance contribution of advisory organizations to learning and innovation in sustainable farming?

**Second level research questions:**

1.a What are mechanisms and dynamics of farmers decision making on sustainability issues in farming?

1.b What are factors influencing farmers decision making on sustainability issues and what is the role of advisory services in this process?

1.c What are the factors influencing the effectiveness of advisory organisation in providing advice to farmers deciding on sustainable issues? (factors/variables are listed in the SES literature and should be adapted, e.g. governance, policies, actors characteristics….)

2.a Under which context are particular governance regimes suitable?

2.b What combination of governance regime should contribute to increase of effectiveness of advisory organisations?

2.c How the context specific (e.g. social context) institutional change should look like in order to enhance effectiveness of advisory organisation in advice provision on sustainability issues?

The research questions could be elaborated to **third level** in order to focus on sufficient details.

For example for 2.c.a it could be: “What and how technological change can help to institutional change in favour of advisory services effectiveness?” (e.g. IT)

**2.4 Methodological implications**

Methods from institutional analysis and policy analysis are commonly applied while taking into account systems approach and interaction of social and physical world. Methodology can help to assess effectiveness of governance, to assess the role of policies in advice provision, to define proposals for institutional change in advisory systems, while taking into account frequently overlooked factors such as social capital or property rights. Research methods could be desk-based review of documents to understand individual and collective actors’ roles in the system and in the governance of the system combined with qualitative research (e.g. based on interviews) to get in-depth insights into how the system is governed, what are the power relations, influences, processes, outputs and outcomes etc. The most frequent format is in deep case study approach.

Case study survey (WP 2) can use the framework to reflect the complexity of the studied subject. Also study of governance (WP 4) could be guided by this approach (e.g. the SES gives to governance place and its relations to the other parts of the system studied). It would help to ensure that all components in the system (e.g. history/ legacy of previous arrangements, individual working relationships, etc.) are considered that might have an influence on its performance. Finally work-package assessing the advisory systems and defining the conclusions/suggestions for change could also benefit (WP 5), because the SES provides for example framework for a design of criteria of the system assessment. It means assessment of its all subsystems, for example policies and governance, flow of information and advice as outputs of the system, actors and their relationship, “production and processing” of information, and complex action situation in which all transactions happen.
2.5 Strengths and weaknesses/Sensitivities regarding use

**Strengths:**
The framework provides an excellent structure for assessment of complex situations while taking into account thematic areas including several disciplines in systematic and systems approach.

The framework/approach gives good ground for studying cooperative efforts in advisory service (e.g. agreement of farmers or farming organisations on common approach in “production” and dissemination of knowledge, sharing experience and knowledge between farmers).

Approach provides common theoretical framework for assessment of roles of institutional environment, social settings (e.g. social capital) in the transactions of knowledge, and also actor assessment, property rights regimes and their role in effectivity of different governance styles and to the action situation in which different actors participate on the transaction (i.e. creation and transfer of knowledge). The approach offers a possibility to assess suitability of current governance styles or types to particular stages and factors of the knowledge transfer (e.g. appropriateness of private or state governance) given social settings and particular institutional arrangements in particular country/region.

As it is approach not used in AKIS research widely, its use can bring new insights to the topic.

**Weakness:**
The use of the approach is quite demanding especially for those who are new in that approach.

2.6 Potential operational problems

The distinction between institutions and governance structures is not straightforward

When there is ambition to go deep in the topic, the data collection and especially drawing the reliable conclusions are quite demanding tasks. It is because the framework reflects complex situations in quite systematic way and needs to be used in a creative way, because the right use of the framework is context specific (Ostrom 2010).

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10) How farmers assemble knowledge for innovation
Authors: Lee-Ann Sutherland, Catherine Laurent, Marianne Cerf

1.0 General Overview of the Theory or Approach
1.1 Summary of the Theory, Approach or Topic
This approach looks at assemblages: heterogeneous collections of elements (material and immaterial, sentient and non-sentient) that are constantly evolving. It was developed in part to counter systems thinking (i.e. the assemblage approach argues that many things can be considered systems, could be more usefully considered assemblages, because the term ‘system’ implies that everything in the system is - or should be - working together towards a common purpose). Assemblage theory emphasises that the different elements have different functions and purposes, and as a result, configurations are constantly changing. Assemblage theory also focuses on how assemblies came into being, to better understand how they are currently functioning and evolving.

1.2 Major authors and their disciplines
Assemblage theory brings together ideas from Gilles Deleuze (a French philosopher) and Felix Guattari (French psychotherapist and philosopher) with more recent thinking about actor networks (e.g. actor-network theory) and the role of material objects in shaping action. The approach has been developed and applied by a range of academics in recent years, particularly in human geography but also in sociology. A review of the literature demonstrated that assemblage concepts are also appearing in archaeology literature and medicine. There are therefore a variety of theorisations and applications of assemblage thinking. In this primer, we focus on the approach of Manuel De Landa (a social theorist not allied with a particular discipline), who draws on Deleuze but also connects to work by French sociologist Pierre Bourdieu.

1.3 Key references

1.4 Brief history of how the theory has developed and been applied
Assemblage theory is rooted in post-Actor-Network approaches, emphasising the diverse elements (human, non-human, organic, technical, natural) constituting the social (Anderson and McFarlane, 2011). The appeal of ‘assemblage’ thinking is that it identifies entities as heterogeneous and evolving, embodying the ongoing coexistence of diverse power arrangements (Allen, 2011). As such, it also emphasises the contextual specificity and history of change processes and ongoing ‘territorialisation’ and ‘de-territorialisation’ processes: components of the assemblage (e.g. land, particular practices) can be added to or removed from the ‘territory’ or definition of the assemblage through establishment of rules and routines.
Critically, these components can be assembled into new or different assemblages (e.g. evident in the integration of farming practices into tourist experiences). Assemblage have been used to look at new land configurations in the global South (sometimes termed ‘land grabbing’ – for examples of assemblage theory application Le Billon and Sommerville, 2017; Sassen, 2013). Assemblage theory has had some application to agriculture in the global North, but offers considerable potential (Woods, 2016). Some work has been done looking at the evolution of land use and commodity production in New Zealand (e.g. Woods, 2016; Le Heron et al, 2013).

Conceptualising farms and farming systems as assemblages emphasises the ongoing processes of territorialisation and identity formation, involving human and non-human actants and engagement in multiple ‘fields’. Crucially, assemblage theory draws attention to the materiality of these transition processes. Assemblage theory reflects the material and post-human turns in social research and the call for more complex understanding of the messy interplay of things and ideas or body and mind.

To date, assemblage theory has not been used to consider AKIS.

1.5 Basic concepts
Delanda terms his approach ‘neo-assemblage theory’, and uses some complicated terminology. He identifies the basic principles as:

- The whole is not reducible to the sum of its parts or ‘elements’ (i.e. the parts have functions beyond that of the ‘whole’ being considered)
- Those elements (e.g. people, objects, natural resources) are heterogeneous
- Those elements can play material and/or expressive roles (a material role is physical – e.g. resource availability and functions; expressive roles are communicative e.g. expressing identity or expectations)
- The properties of the assemblage emerge from the interactions between the elements (not the characteristics of the parts)
- ‘Relations of exteriority’ – a component part of an assemblage can be detached and plugged into a different assemblage. Elements can be in more than one assemblage at a time.
- Territorialisation – the process of stabilising the identity of the assemblage by increasing internal homogeneity or sharpness of boundaries (e.g. defining what is in the assemblage)
- Deterritorialisation - destabilizing and working to change or transform the assemblage (changing what is in an assemblage, what it does, or making use of different capabilities)
- Coding - consolidates the effects of territorialisation and further stabilizes the identity of an assemblage = ‘doubly articulated’ (e.g. through establishing formal rules about membership, purpose). ‘De-coding’ is thus the weakening of these rules and norms.
- Space of possibilities – assemblages have access to the capacity of their elements, even those capacities which are presently within not in use in the assemblage.

History is also important in assemblage theory – assemblages do not emerge out of nothing but from preceding assemblages and their actions. To understand an assemblage, you need to understand how it came together (rather than looking at the properties of its current elements).

2.0 Application to the analysing the role of farm advisory services in innovation
### 2.1 Relevance to AgriLink Objectives

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At the applied level, the objectives of AgriLink are to:

| X               | Develop recommendations to enhance farm advisory systems from a multi-level perspective, from the viewpoint of farmers’ access to knowledge and services (micro-AKIS) up to the question of governance, also recommending supports to encourage advisors to utilise specific tools, methods to better link science and practice, encourage life-long learning and interactivity between advisors [WP5]; |
|                 | Build socio-technical transition scenarios for improving the performance of advisory systems and achieving more sustainable systems - through interactive sessions with policy makers and advisory organisations; explore the practical relevance of AgriLink’s recommendations in this process [WP5]; |
|                 | Test and validate innovative advisory tools and services to better connect research and practice [WP3]; |
|                 | Develop new learning and interaction methods for fruitful exchanges between farmers, researchers and advisors, with a focus on advisors’ needs for new skills and new roles [WP3]; |
|                 | Guarantee the quality of practitioners’ involvement throughout the project to support the identification of best fit practices for various types of farm advisory services (use of new technologies, methods, tools) in different European contexts, and for the governance of their public supports [WP6]. |
2.2 How this can be applied/developed in AgriLink

The use of assemblage theory to better understand agricultural knowledge and innovation is an important contribution that AgriLink can make to advance thinking on farmer innovation and knowledge exchange.

Assemblage theory should enable us to go beyond the ‘systems’ thinking of ‘agricultural knowledge systems’, to consider new actors, and the role of technologies (particularly digital) in mediating knowledge flows. The term ‘agricultural knowledge and innovation system’ (AKIS) implies that there is a defined system of actors who produce and communicate knowledge to farmers. It also implies that these actors are component parts of the system i.e. that their roles are solely within the AKIS. This is clearly not the case – actors within AKIS are also parts of other systems or assemblages, which place demands on their time and resources.

In AgriLink, we want to look at new actors (e.g. accounting firms, input suppliers) and their role in microAKIS – assemblage theory enables us to include these other actors. It also focuses on the processes – how these firms have come to be involved the microAKIS, as well as the resources they are able to mobilise to do so. Assemblage should be particularly helpful for looking at the role of digital technologies in mobilising microAKIS – access to the internet and mobile phones, for example, reduces the geographic distance between information providers and farmers. Assemblage can also help us look at the R-FAS, and critically examine the extent to which it is a ‘system’.

2.3 Research questions relevant to AgriLink [see the draft conceptual framework for further options]

General assemblage questions

a) what components play a material role in microAKIS?
b) what components play an expressive role in microAKIS?
c) what are the territorialisation processes of the R-FAS?
d) what are the deterritorialisation processes influencing the R-FAS?
e) What are the coding processes of the R-FAS? What are the decoding processes of the R-FAS?
g) what other assemblages are the components of the microAKIS active in?
h) what historical processes have led to the farmer’s microAKIS, the R-FAS, and how the intersect?
i) what is the space of possibilities for R-FAS and micro AKIS components?
j) what other assemblages are linked?

2.4 Methodological implications

Assemblage theory does not have established methods, but published papers rely on document review and qualitative interviews.

2.5 Strengths and weaknesses/Sensitivities regarding use

Assemblage theory is good for understanding the complexity of entities, and going beyond systems thinking. It usefully integrates the role of material objects in enabling and constraining particular trajectories, and draws attention to the historical basis for current configurations. However, the concepts are subjective (difficult to operationalise), which can make for analysis
which is descriptive rather than analytical. Power relations are not well conceptualised. See Allen (2011) for further critique.

2.6 Potential operational problems
The complexity of the terms may make it difficult to use in a multi-actor project like AgriLink. Including material objects and history in the dataset may make the data collection quite extensive.

Optional Section 3: Practical example
Mike Wood’s (2016) plenary paper provides a good example of the evolution of the New Zealand dairy system and how it adapted to integrate into Chinese markets.

Optional Section 4: Recommended further reading

References (to documents referenced in this template only)
Le Heron, E., Le Heron, R., Lewis, N., 2013. Wine economy as open assemblage: Thinking beyond sector and region. New Zealand Geographer 69, 221-234.
13) Knowledge and organisational learning for innovation
Geneviève Nguyen

1.0 General Overview of the Approach
1.1 Summary of the Approach
The paradigm shift towards sustainable agriculture over the last 30 years has led to questioning the linear and top-down innovation model based on the transfer to farmers of new techniques developed by researchers. The search for new innovation approaches requires overcoming the path dependency problem induced by the post-war model of intensive farming. From a knowledge-based perspective, the specialization of farming systems and the production of standardized technical references (explicit knowledge) and their top-down transfer towards farmers via technical advisors led to a progressive loss of tacit knowledge, whose interactions with explicit knowledge constitute a critical factor of innovation. Tacit knowledge is a form knowledge acquired by farmers themselves through a learning-by-doing process based on farmers’ capacity to observe, make sense of change in their environment and adapt to their specific context. The creation and assemblage of new knowledge for innovation relies upon a complex organisational learning process. This latter generally involves different learning patterns, learned capabilities and institutional arrangements capable of fostering interactions between the different forms of knowledge in order to bring individuals and the associated organisation from a “know-what” level to a “know-how” level.

1.2 Major authors and their disciplines
The way a firm use information to build meaning, create knowledge and make decisions has always been a major concern for researchers in economics, management sciences and psychology. The body of research on this issue being amazingly rich, the idea here is not to offer a systematic literature review but to point out some approaches on knowledge and organisational learning, which can provide interesting inputs for the Agrilink framework.

We are in debt in particular to the works of Polanyi (1966, 2009) who first provided an analysis of the nature of knowledge and distinguished tacit from explicit knowledge. Cyert and March (1963), Nelson and Winter (1982), Aoki (1986), Teece et al. (1990) offered a dynamic framework of the firm as a knowledge-based system in which different types of knowledge are organized and assembled to build the firm’s dynamic capabilities. Their analyses are complementary to those of Argyris and Schon (1978), Kolb (1984), Nonaka and Tadeuchi (1995), Spender (1996), who provided a more in depth analysis of ways of learning, and more precisely of the organisational learning process and of its role in the firm’s innovation process.

1.3 Key references


1.4 Brief history of how the theory has developed and been applied
If the theories cited above on knowledge and organizational learning have long been widely applied to the analysis of the industrial firms, they have only been recently mobilized by only a few researchers to analyze agrofood innovation systems and changes in farmers’ attitudes and practices (Cerf et al., 2000; Girard and Navarette, 2005; Gross et al., 2010; Rivaud and Mathé, 2011; Wolf and Zilberman, 2012; Touzard et al., 2014).

1.5 Basic concepts
In a world of uncertainty, complexity and change, the capacity of a firm to construct and organize knowledge is indeed a major factor of competitiveness and sustainability. There are two types of knowledge, explicit and tacit. Explicit knowledge is defined as knowledge, which can be codified and easily transferred and shared within an organization. Conversely, tacit knowledge is acquired only through learning-by-doing and practical experiences. Tacit knowledge cannot theoretically be codified. It is by nature personal and contextual.

A firm is not the sum of knowledge individually generated by the different stakeholders. A firm, as an organisation (structure and governance), is a complex system in which different types of knowledge hold by its members (individual knowledge) are articulated and structured in shared rules/routines/norms/beliefs (collective knowledge) and organisational learning processes. Four types of knowledge can thus be distinguished according to whether they are tacit/explicit and individual/collective. Explicit collective knowledge, such as shared written rules and norms, facilitates coordination within the firm and ensures its stability in time. Tacit collective knowledge, such as routines, shared beliefs and implicit norms, is the foundation of communities-of-practice and what is commonly qualified as the firm’s DNA.

The way these different types of knowledge are acquired, organized, stored and articulated with each other, through the organisational learning process, determines the firm’s dynamic capabilities. However, it is tacit knowledge, which favours in the first stage the firm’s learning and innovative capabilities. Learning involves indeed at a first stage the detection and correction of errors (single-loop learning) and in a second stage the conversion of tacit knowledge into explicit knowledge, and the modification of the firm’s routines (double-loop learning). In other words, through organisational learning, a firm observes changes in its environment (acquisition of data and information), interprets and makes sense of these latter, creates new knowledge then makes strategic management decisions.

Certain firms, according to the way they are structured and governed (refer to Mintzberg’s and Aoki’s organisational forms, to the notions of networks and communities-of-practice, etc.), are more capable of fostering the development of tacit knowledge (individual and collective) and the organisational learning process. Allowing for the entry of new members/leaders holding strategic knowledge, developing deliberation and legitimation processes, creating trust and common culture, building efficient procedures to solve conflicts among members are examples of factors facilitating learning within an organisation. Finally, it is important to point out a firm’s organisational learning process can not be analysed without taking account the economic, social, environmental and institutional environment in which the firm is embedded.

2.0 Application to the analysing the role of farm advisory services in innovation
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2.2 How this can be applied/developed in AgriLink

Theories of knowledge and of organisational learning provide help to understand the nature and the role of knowledge in developing an organisation’s innovative capacity. A farm, as well
as a farm advisory system can be viewed as a learning organisation, which has to react and adapt to changes in its environment (economic, institutional, social, natural) by mobilizing its repository of knowledge, correcting it and creating new knowledge. The information flows coming from the organisation's external environment is thus perceived, interpreted, assimilated, converted and processed into action. In this analytical approach, the innovation process is no longer viewed as a linear top-down model, but rather as a complex process, which involves different types of actors (farmers, advisors, other actors), different types of knowledge and different types of learning organisations and patterns.

Such an approach thus acknowledges the diversity of innovation systems and of situated learning organisations. It allows to embrace the diversity of micro-Akis situations and of innovation areas studied. Since it considers that not only successful trials but also errors are parts of learning, and that organisations are more or less efficient in setting up the organisational learning process, it could be interesting to include in the sample of case studies situations of failure.

2.3 Research questions relevant to AgriLink

- What are the types of knowledge used by farmers in their daily routines? What are those used when they have to make strategic decision (practice change, change in the farm organisation, investment decision, etc.)? How do these knowledge translated into their decision making process?
- What are the sources of these different types of knowledge?
- To what extent other actors (neighbouring farmers, advisors, etc.) participate to their "learning process"? How?
- What are the different types of knowledge mobilized in the advisory organisation studied? How do they flow and are organized? How do these different types of knowledge translated into the farmer’s decisions?
- Can one associate particular patterns of organisational learning with particular types of learning organisation?
- What are the factors favouring organisational learning?

2.4 Methodological implications

Theories on knowledge and organizational learning were generally developed based on inductive research, and more precisely, on the observation and study of real-life cases of firms. Their application in empirical studies combines both inductive and hypothetico-deductive approaches, depending on the goals set and also on the methodologies mastered within the different disciplines (economics, management sciences, psychology). Because organisational learning process is complex and contextual, researchers in management sciences or in psychology often use the case study approach to gain an in depth understanding of the phenomena. They do desk and field research, collect desk information on the firm, interview different stakeholders in order to draw a detailed picture of the farm’s organisation and functioning. In contrast, the test of a particular hypothesis on a causal relationship relies most often upon a modelling exercise and econometric analysis. More recently, new approaches have been mobilized, such as network analysis and discourse analysis. They provide interesting insights about the knowledge sharing process within networks of firms and communities-of-practice of farmers.

2.5 Strengths and weaknesses
See 2.2 for some of the strengths of the theories discussed above.

The main weakness of research on knowledge and organisational learning lies in the multiplicity of the approaches and the lack of a unified framework across disciplines and across levels of analysis (micro / meso / macro). Some other weaknesses can be pointed out:

- The theories remain vague on some aspects of knowledge and of organisational learning, in particular those related to the conversion of one type of knowledge into another, and to the interaction among individuals in an organisational setting.

- In the agricultural context, some major notions need to be clarified, such as routines and the frontiers of the firm. It is not clear whether the approach is perfectly relevant in the case of a farm managed and run by a single farmer-worker. In this case, the analysis has to include other actors involved in the learning process (advisory system).

2.6 Potential operational problems

Some aspects of the theories may be ‘vague’ and difficult to operationalise, such as the nature of knowledge and the interaction mechanisms involved in the organisational learning process. Studies in psychology and management sciences may provide useful advices on how to organise and structure the field data collection: questions to ask to interviewees and how to ask them. Case study approach developed in management sciences may also help but it can require labour-intensive data collection.

References


14) Knowledge-intensive business services
Authors: Carla Susana Marques, Pierre Labarthe

1.0 General Overview of the Theory or Approach

1.1 Summary of the Theory, Approach or Topic
Knowledge Intensive business services as a topic or concept is covered in many different disciplines, ranging from business and economics, strategy, operation research and management studies, geography and environmental studies, engineering and information and library science. The main theoretical and empirical advances relevant for the analysis of agricultural advisory services are the following:

- Definitions of KIBS as services activities which main input and output is knowledge,
- Empirically grounded typologies of KIBS organisations,
- Models to analyse the relations between supply and demand for KIBS,
- Concepts to describe the specific innovation dynamics of advisory services,
- Qualitative frameworks and methods to assess the performance rationale of advisory organisations.

1.2 Major authors and their disciplines
The literature on Knowledge Intensive Business Services is a relatively new field of research that has spread remarkably in the past 20 years. Knowledge Intensive Business Services research has flourished in 1994, mainly in Europe and USA. The earlier published paper found in WoS was written by Simone (Strambach, 1994), from University of Stuttgart, Germany, and it was published in Tijdschrift Voor Economische en Sociale Geografie, a journal published by Wiley-Blackwell (USA), which web of science categories are economics and geography. Most of researches about KIBS are embedded in economics or management sciences. A strong emphasis of these researches is on the specificities of innovation dynamics within KIBS. It is embedded in a broader research track that work on the specificities of services in economics (Gadrey 2000, Hill 1999, Gallouj and Weinstein 1997) and management sciences (Vargo et Lusch 2008).

Miles et al. (1995), focus on highlighting the contributions of KIBS to innovation; provide the agenda for coherent analyses of KIBS innovation processes; and, draw recommendations for a consideration of KIBS in policy-making. R&D becomes increasingly the basis of new techniques, and networks of innovators become increasingly the basis of accumulation of the knowledge that results in innovation. They provided a typology of KIBS organisations.

Den Hertog (2000) makes an analysis of the role played by KIBS in innovation. It presents a four-dimensional model of (services) innovation that point to the significance of such non-technological factors in innovation as new service concepts, client interfaces and service delivery system. The various roles of service firms in innovation processes are mapped out by identifying five basic service innovation patterns. KIBS are seen to function as facilitator, carrier or source of innovation, and through their almost symbiotic relationship with client firms, some KIBS function as co-producers of innovation. In addition to discrete and tangible forms of knowledge exchange, process-oriented and intangible forms of knowledge flows are crucial in such relationships.

Muller and Zenker (2001)’s work focus on innovation interactions between manufacturing small- and medium-sized enterprises (SMEs) and KIBS, the empirical analyses grasps KIBS position in five regional contexts. The paper gives an overview of the role and function of KIBS.
in innovation systems and their knowledge production, transformation and diffusion activities. The analysis leads to the conclusion that innovation activities link SMEs and KIBS through the process of knowledge generation and diffusion.

Bettencourt et al. (2002) developed a co-production management model. The co-production model illustrates the importance of considering clients as "partial employees" of the service provider firms and applying traditional employee management practices to developing effective client partnerships. The paper also proposes a definition of KIBS.

The focus of the study of Hipp and Grupp (2005) was to support the conceptual findings and to identify potential improvements on innovation within KIBS. They introduce a new typology with a view to obtaining a better understanding of innovation in services. Special attention is directed towards the inclusion of KIBS that are of particular importance for innovation processes.

Miles (2005) examined KIBS in the European Union, highlighting key similarities and differences in their development across Member States. KIBS are one of the fastest growing areas of the European economy, and are increasingly important contributors to the performance of the sectors who are their clients. KIBS are continuing to grow at rapid rates, and are experiencing qualitative change. The growth is associated with outsourcing, the internationalization of services, and the growth in demand for certain forms of knowledge. Many KIBS sectors are becoming more concentrated (though most KIBS sectors feature a higher share of small firms than does the economy as a whole).

Simmie and Strambach (2006) develop a theoretical position for understanding the role of services in innovation in post-industrial societies. The paper suggests a systematic theoretical approach to understanding the currently under-theorized role of services in general and KIBS in particular in innovation. It also points to the importance of the geography of specialized services. The paper argues that the role of KIBS in innovation may be understood theoretically in terms of evolutionary and institutional economics. Urban economies are path dependent interactive learning systems that develop individually through time. They are increasingly characterized by networked production systems in which KIBS play a key role in the transfer of bespoke knowledge between actors both within and from outside individual cities. As a result, KIBS make a significant and place specific contribution to innovation in the cities where they are located.

Amara et al. (2009) developed indicators to capture forms or types of innovation in KIBS and proposed a conceptual framework inspired by the knowledge-based theory using different categories of knowledge assets as explanatory variables.

According to Zhu and Guan (2013), some hot topics were focused on for a long time, such as customer orientation and telecommunication, and others were changeable with years, market or information process over the period 2004-2005, globalization and collaboration over the period 2006-2007, then the focus were to innovation process and service innovation model over the period 2008-2009, and shifted into internet and network effects over the period 2010-2011. The study of Braga and Marques (2016) analyse the research situation, and found the research focus of the field of innovation, knowledge and collaboration between KIBS and other firms brings recognized benefits to the latter as well as for the whole economy.

1.3 Key references


1.5 Basic concepts

Knowledge-intensive business services (KIBS) over the last 20 years become an important field of both theoretical (e.g., Bettiol et al., 2012; Chae, 2012; Gimzauskiene and Staliuniene, 2010; Murray et al., 2009) and empirical study (e.g., Miozzo and Grimshaw, 2005; Carmona-Lavado et al., 2013; Miozzo and Grimshaw, 2005; Palacios-Marques et al., 2011; Santos-Vijande et al., 2013a; Yam et al., 2011). Santos-Vijande et al. (2013a) argue that as the dynamism of the KIBS sector has an impact on the whole economy, it is also necessary to understand the most advisable management practices in KIBS to foster innovation activities across the whole economy and improved performance (e.g., Abreu et al., 2010; Hu et al., 2013; Mas-Verdú et al., 2011; Miles et al., 2000; Shi et al., 2014; Viljamaa et al., 2010; Wood, 2005).

1.5.1 Defining KIBS

Although the term “knowledge-intensive business services” has been used since the early nineties, only recently it has become a major theme of investigation and empirical research (Mas-Verdú et al., 2011). Despite this relatively recent concern of the academia in studying KIBS, the literature has already provided many definitions of KIBS firms that, in many cases, do not differ significantly, but rather display different nuances. The different definitions of KIBS found in the literature can be explained by the purpose of the studies, in which a definition serves a specific target.

Bettencourt et al. (2002, p.100), describe KIBS firms as those aiming to generate value-added service activities, and that these activities consist in “the accumulation, creation, or dissemination of knowledge for the purpose of developing a customised service or product solution to satisfy the client’s needs”. The knowledge that serves as the basis for their business can, according to Miozzo and Grimshaw, 2005, be social and institutional knowledge (e.g., accountancy, management consultancy) or technical knowledge (computer R&D, engineering services).

According to Borodako et al., 2014, most definitions in the literature stress the following key aspects of KIBS: they are offered by private business to other business (e.g., den Hertog, 2000); they are based on knowledge or expertise – mostly highly advanced and related to a specific field; and the consumption of the service usually improves the client company’s intellectual capital. When focusing on the role of KIBS services in client innovation, three different aspects can be perceived: KIBS act as (1) facilitators (if it supports a client firm in its innovation process); (2) carriers (if it plays a role in transferring existing innovations from one firm or industry to the client firm or industry); or (3) sources of innovation (if it plays a major role in initiating and developing innovations in client firms, mostly in close interaction with the client firm) (Hauknes, 1998).
A strong characteristic of KIBS firms, given the nature of their business and the importance of knowledge on the society, is the impact they have on the economic tissue. (Wong and He, 2005), with this respect, refer that KIBS firms are “group of services which are very actively integrated into innovation systems by joint knowledge development with their clients, and which consequently create considerable positive externalities and possibly accelerate knowledge intensification across the economy”.

In the academia, KIBS literature has addressed the concept from several different perspectives. The topic of KIBS can be interpreted in different ways and types of study. Table 1 provides some examples of how the literature has dealt with KIBS concept.

Table 1 KIBS: some concepts from the Literature

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<tr>
<th>Reference</th>
<th>Definitions of KIBS</th>
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</thead>
<tbody>
<tr>
<td>Miles et al. (1995)</td>
<td>KIBS are services involving economic activities which are intended to result in the creation, accumulation or dissemination of knowledge.</td>
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<tr>
<td>Gallouj et al. (200)</td>
<td>KIBS are services firms which main input and output is knowledge</td>
</tr>
<tr>
<td>Muller and Zenker (2001)</td>
<td>KIBS do not only “transmit” knowledge, in fact they play a crucial role in terms of “knowledge re-engineering”. KIBS has potentially as receptors, interfaces and “catalysators” in terms of knowledge-creation and diffusion. KIBS can be described as services offered by firms, usually to other firms, incorporating ‘a high intellectual value-added’.</td>
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<tr>
<td>Wong and He (2005, p. 27)</td>
<td>“KIBS firms’ innovation efforts extend far beyond their internal organisation to the service relationship and directly into the domain of service clients by providing competence enhancing knowledge services to their clients”.</td>
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<tr>
<td>Bettiol et al. (2011)</td>
<td>The KIBS sector constitutes a service subsector that includes establishments whose primary activities are mainly concerned with providing knowledge-intensive inputs to the business processes of other organisations, including private and public sector clients</td>
</tr>
<tr>
<td>Santos-Vijande et al. (2013)</td>
<td>KIBS are private companies or organizations which have a high degree of professional knowledge</td>
</tr>
<tr>
<td>Corrocher and Cusmano (2014)</td>
<td>KIBS are key players in innovation systems, particularly in advanced regions where manufacturing competitiveness largely depends on knowledge contents provided by highly specialized suppliers.</td>
</tr>
<tr>
<td>Shi et al. (2014)</td>
<td>KIBS are becoming a major force in promoting innovation and that effect is highly related to the average level of human capital.</td>
</tr>
<tr>
<td>Doloreux and Laperriere (2014)</td>
<td>The KIBS firm has developed a core portfolio of services, methods or solutions and achieves growth through the penetration of new markets and/or client groups that demonstrate similar needs.</td>
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</tbody>
</table>

Overall, two key elements should be stressed in the definition of KIBS: the importance of the relation between clients and providers during the process of service production; and the fact that KIBS providers can be represented as knowledge processors. These two points have strong implications on how KIBS can be analysed.

1.5.2 Typology of KIBS
Many authors (e.g., Borodako et al., 2014; Fernandes and Ferreira, 2013; Hakanen, 2014; Huang and Ji, 2013; Muller and Zenker, 2001) refer to the concept presented by (Miles et al., 1995), who have distinguished KIBS as traditional professional KIBS (P-KIBS) and new technology-based services (T-KIBS). P-KIBS help their clients to navigate or negotiate complex systems such as social, physical, psychological, and biological systems (for example, marketing or consultancy services). T-KIBS are services that rely heavily on professional knowledge (e.g., IT services, communication, and computer services), thus, their employment structures are heavily weighted toward engineers and scientists.

In light with this consideration, (Wong and He, 2005) include three major KIBS sectors in their study: IT and related services, business and management consulting, and engineering and technical services. Based on (Borodako et al., 2014), the third type of division is made according to the relationship of the KIBS to the (client) company and the market. Here, three groups of KIBS are identified: market KIBS (key services: market research; advertising; and research and experimental development in social sciences and humanities); enterprise KIBS (IT and programming services; legal services; accounting and tax advisory services; management advisory and PR services; temporary employment agencies; and other recruitment services); and technical KIBS (multilevel KIBS – connecting both the above groups of market and enterprise services: architectural activities; technical testing and analysis; research and experimental development in natural sciences and engineering; engineering activities).

1.5.3 Relations between supply and demand for KIBS

There is an agreement that a specificity of KIBS is the importance of the relations between clients and providers. These relations are not marketing relations only. They are part of the very process of producing the service. Moreover, there are strong asymmetries of knowledge to the detriment of the clients: it is very hard for them to assess beforehand the outcomes of purchasing services.

As a result, “KIBS markets” are regulated by very specific rules and institutions, where trust and peer networks play a key role. The question of access to services is not a question of prices only, it depends also on the belonging of clients to specific networks or social groups, where some values are shared.

As a consequence, it is not possible to describe the relations between supply and demand for a purely rational homo economicus. Various clients will have potentially different needs, networks and conditions to access and use of services. Some authors have built models to integrate this idea by adopting a Lancasterian conception of service markets (Windrum and Tomlison 1999, Windrum and Garcia-Goni 2008, Gallouj 2004). This enables to account i) for the fact that the product of services are complex products that can be described through vectors of variables and ii) for the fact that clients could have various needs regarding these variables.

1.5.4 KIBS and innovation

Most of researches about KIBS have focused on the question of innovation. Some authors have argued that studies that tried to apply typologies designed for industry (the “assimilation” approach) have failed to grasp the innovation dynamics in services (Gallouj 2010). They plead for the need to develop typologies specific to services and KIBS (“differentiation” approach) or even to analyse the effect of KIBS on innovation in industries rather than the opposite (“inversion” approach).

Such an idea has led to many fruitful debates and empirical studies about innovation in services, with typologies proposed in many sectors, including KIBS. One key result is to show the importance of “non technological” innovation in KIBS. This includes innovation in the types
of relations between clients and providers. Organisational and social innovations play a key role in the dynamics of innovation within KIBS sector.

1.5.5 Measuring the performance of KIBS and understanding their rationale

There have also been many debates about how to measure the performance of services. Many authors have advocate for the fact that traditional indicators (such as labor productivity) fail to grasp the performance of services.

This is true at different scale.

At a macro scale, there have been some debates about Baumol’s idea of the cost disease od services (Baumol 1982), i.e. the fact that service growth is trapped by the low productivity of the sector and rising salary cost, which prevent prices to decrease. Other authors have argued that such an idea result from a poor measurement of services productivity. Many authors (even accountants, cf. Hill 1979) have stemmed that it is very hard to measure the product of services, and thus to assess their productivity. Therefore, they plead for more complex and comprehensive measurements of the product and performance of services.

At the meso scale, this has led to the development and test of various analytical grid, inspired by the work of Boltanski et Thévenot (2008), where the performance of services is assessed according to various register: technical, relational, innovative, civic, and financial (Gallouj et al. 1999). Such an idea has been applied to various sectors: health, post, trade, etc.

2.0 Application to the analysing the role of farm advisory services in innovation

2.1 Relevance to AgriLink Objectives

<table>
<thead>
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<tr>
<td>x</td>
<td>Develop a theoretical framework utilising a multi-level perspective to integrate sociological and economic theories with inputs from psychology and learning studies; and assess the functions played by advisory organisations in innovation dynamics at multiple levels (micro-, meso-, macro-levels) [WP1];</td>
</tr>
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<td>x</td>
<td>Assess the diversity of farmers’ use of knowledge and services from both formal and informal sources (micro-AKIS), and how they translate this into changes on their own farms [WP2];</td>
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<td>Develop and utilise cutting edge research methods to assess new advisory service models and their innovation potential [WP2];</td>
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<td>Identify thoroughly the roles of the R-FAS (regional FAS) in innovation development, evaluation, adoption and dissemination in various EU rural and agricultural contexts [WP2];</td>
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<td>Test how various forms of (national and regional) governance and funding schemes of farm advice i) support (or not) farmers’ micro-AKIS, ii) sustain the relation between research, advice, farmers and facilitate knowledge assemblage iii) enable evaluation of the (positive and negative) effects of innovation for sustainable development of agriculture [WP4];</td>
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At the applied level, the objectives of AgriLink are to:

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<td><strong>X</strong></td>
<td>Develop recommendations to enhance farm advisory systems from a multi-level perspective, from the viewpoint of farmers’ access to knowledge and services (micro-AKIS) up to the question of governance, also recommending supports to encourage advisors to utilise specific tools, methods to better link science and practice, encourage life-long learning and interactivity between advisors [WP5];</td>
</tr>
<tr>
<td><strong>X</strong></td>
<td>Build socio-technical transition scenarios for improving the performance of advisory systems and achieving more sustainable systems - through interactive sessions with policy makers and advisory organisations; explore the practical relevance of AgriLink’s recommendations in this process [WP5];</td>
</tr>
<tr>
<td><strong>X</strong></td>
<td>Test and validate innovative advisory tools and services to better connect research and practice [WP3];</td>
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<td>Develop new learning and interaction methods for fruitful exchanges between farmers, researchers and advisors, with a focus on advisors’ needs for new skills and new roles [WP3];</td>
</tr>
<tr>
<td><strong>X</strong></td>
<td>Guarantee the quality of practitioners’ involvement throughout the project to support the identification of best fit practices for various types of farm advisory services (use of new technologies, methods, tools) in different European contexts, and for the governance of their public supports [WP6].</td>
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2.2 How this can be applied/developed in AgriLink

2.2.1 Using KIBS concepts to better understand the diversity of KIBS suppliers and of their business models

An important issue for the analysis of KIBS is to be able to describe the complex landscapes of advisory systems at national or regional levels, in a context of growing pluralism of suppliers (Birner et al. 2009).

Using typologies derived from KIBS could help having more accurate typologies; by specifying the nature of service delivered (by differenciating P-KIBS and T-KIBS for instance). There are already some attempts in this direction (Dhiab et al. 2014).

Moreover, some authors propose multicriteria analytical frameworks to describe the performance rationale of KIBS providers. It makes it possible to analyse what is the conception of performance for different registers: relational, technical, financial, innovative, and civic (see table below). The combination of these different performance rationale gives an idea of the business models of the suppliers, and of its organisation (e.g. distribution of resources between front- and back-office activities).
Some of these indicators can be also used in more quantitative studies to describe the diversity of advisory organisations, and the quality of the services that they provide (see for instance Prager et al. 2016, Knierim et al. 2017). One example of such analysis is provided below.
2.2.2 KIBS and microAKIS

The concept of service relationship could be used to describe microAKIS.

2.2.3 Using KIBS concepts to better understand the relations between farm advisory services and innovation

Many studies analyse the relevance of KIBS to innovation (e.g., He and Wong, 2009; Santos-Vijande et al., 2013b; Alvarez-Gonzalez and Gonzalez-Morales, 2014; Doloreux and Laperriere, 2014; He and Wong, 2009; Mas-Tur and Soriano, 2014; Santos-Vijande et al., 2013b; Shi et al., 2014) and it is increasingly recognized that KIBS are key to innovation systems (e.g., (Corrocher and Cusmano, 2014; Hu et al., 2013; Mas-Verdú et al., 2011) and are vectors of knowledge transmission (e.g.,(Larsen, 2001; Muller and Zenker, 2001; Skjolsvik et al., 2007).

Over the last 20 years, some authors (e.g., Abecassis-Moedas et al, 2012; Muller & Doloreux, 2009; Simmie & Strambach, 2006) focused their research on understanding the potential implications of KIBS on innovation processes and on the competitiveness of both firms and economies. Pina and Tether (2016) argue that KIBS are increasingly recognized as being among the most dynamic sectors of advanced economies, not only achieving high rates of innovation but also helping their clients to innovate.

According to (Di Maria et al., 2012), the literature so far pointed out that the spatial proximity is necessary for sustaining the interaction between KIBS and the client. Nevertheless, there are few theoretical or empirical analysis focusing on the role of the relationship with the local context (Aslesen and Isaksen, 2007; Doloreux and Shearmur, 2012; Huggins and Johnston, 2012; Koch and Strotmann, 2006; Peiker et al., 2012), which may be vital for KIBS development (Koch and Strotmann, 2006) and facilitating innovation by interfacing between the generic knowledge available in the economy and the tacit knowledge located within firms.

KIBS act as transmitters of knowledge, contributing in different ways to the innovation processes of related organizations (Haukness, 1998; Miles et al., 1995). Several researchers go further and underline the role of KIBS as co-producers of innovation by creating or sharing knowledge with its clients (Bettencourt et al., 2002; den Hertog, 2000; Wong & He, 2005).

According to Flikkema et al. (2007), innovations can be classified as technological when they apply to products/services or processes or as non-technological innovations when referring to organisational and marketing aspects. Johnson et al. (2003) point out that, traditionally, studies of innovation have focused much more on technological rather than non-technological innovation, and service and organisational innovation has been relatively neglected. Technological innovation, as an integral part of innovation activities, was one of the first approaches used in innovation activities.

The production of services is often, according to den Hertog (2000), the result of a joint effort of the service provider and client. In this co-production process, the quality of the resulting service product largely depends on the quality of interactions and communication between the service provider and client. This author suggests that analyses of the role of KIBS in innovation processes bring into focus the ways in which knowledge is produced and used in the economy, as well as the role of KIBS in these processes. The cited author further argues that, in addition to discrete and tangible forms of knowledge exchange, process-oriented and intangible forms of knowledge flows are crucial in these relationships.

According to several authors (e.g., den Hertog, 2000; Santos & Spring, 2015), when focusing on the role of KIBS services in client innovation, KIBS are seen to function as facilitator, carrier or source of innovation, and through their, almost symbiotic, relationship with client firms - some KIBS function as co-producers of innovation, not only through the cooperation with their clients but also with higher education institutions (HEI) and other organizations. Often KIBS
act as transmitters of knowledge, contributing in different ways to the innovation processes of associated organizations.

According to Lanza (2005), when firms cooperate, they can share and/or create knowledge. These results in a favourable output for the firms involved, either in the form of technology or new products/services, in other words, some form of innovation.

According to Hipp et al. (2012), service activities are characterised by pronounced cooperation with external agents in the development of innovative activities. KIBS are more likely to introduce organisational innovations within their production systems, and these services tend to require collaboration with external agents in innovation processes to a greater extent than most sectors do. This is particularly true when considering cooperation with clients, customers, competitors or higher education institutions (HEIs).

Networks can assume a large variety of forms. These differences can be seen from contrasting perspectives and can be related to different issues. The first distinction centres on the relationships of firms to other organisations in their value chain, resulting in vertical or horizontal networks (Nalebuff and Brandenburger, 1996). In other ways, firms’ involvement with each other may also be different in terms of the formality of ties. Within this dimension, relationships can be informal agreements or co-operative arrangements. Regarding the types of relationships between actors, Conway (2000) proposes two different forms of networks: (1) informal or social networks are those based on social relations created within businesses; and, (2) formal networks are those that happen between firms as formal organisations. Blundel and Smith (2001) also studied business networking and found four different approaches: (1) industrial districts and spatial clusters; (2) supply chain networks; (3) entrepreneurial networks; and (3) innovation networks.

Space has a particular role to play in co-operative relationships. Networks can be developed between firms that are geographically concentrated or distant from each other. When KIBS and its clients share the same geographical location, face-to-face interaction is easier, so more trust is to be expected. It is also more likely that business relationships, because of more frequent face-to-face interaction, become personal relationships and those weak ties become strong ties.

Some authors have proposed some operational typologies of innovation that could be applied to farm advisory services. One example is the MIKR model by Gallouj et al. They propose to analyse the different operations within the service relationship: material operations, operations related to information management, to knowledge management, and relational operations. Any of these operations could lead to specific service innovations.
References (to documents referenced in this template only)


Pina, K., & Tether, B. S. (2016). Towards understanding variety in knowledge intensive business services by distinguishing their knowledge bases. Research Policy, 45(2), 401-413.


15) Knowledge brokering, network learning, transition from ‘advisor’ to ‘facilitator’
Authors: Sandra Šūmane and Talis Tisenkopfs.

1.0 General Overview of the Theory or Approach
1.1 Summary of the Theory, Approach or Topic
Agricultural innovations, particularly those innovations leading towards more sustainable agriculture, are increasingly seen as emerging in and best advanced by multi-actor learning networks where different stakeholders with their various kinds of knowledge meet, and negotiate and institutionalise new meanings and new farming practices (Šūmane et al., 2017; Moschitz et al., 2015; Wood et al., 2014; Oreszczyn et al., 2010, Knickel et al., 2009). Knowledge or learning networks make explicit the interactive and participatory character of knowledge generation and innovation, with all the stakeholders, including the farmers, being active partners and knowledge co-producers. In order to reach different stakeholders’ mutual understanding and learning, and enhance the generation of innovation, the interactions between and within these groups of actors need to be facilitated. Knowledge brokerage or intermediary activities to reduce knowledge gap is key in enabling multi-actor learning networks and in integrating various knowledge cultures (Tisenkopfs et al., 2015; Kramer et al., 2011). While all actors potentially can become knowledge brokers, it is expected that agricultural advisory take a central mediator role and facilitate connections and knowledge exchange among various stakeholders for joint learning.

1.2 Major authors and their disciplines
The concept of knowledge brokerage has developed in the context of linking research, policy and practice. The processes of knowledge brokerage, learning networks have been studied in many sectors - health, education, environmental science, management sector etc. There is a solid research base and theoretical considerations developed on these concepts and related processes in agriculture. Here, the major authors are Cees Leeuwis, Laurens Klerkx. Knowledge brokerage and learning networks are studied from various perspectives such as innovation, knowledge management, sociology; at different levels from individual to inter-organizational level.

1.3 Key references (3 to 5 maximum, ideally overview papers if these exist)

1.4 Brief history of how the theory has developed and been applied
The process of knowledge brokering in the agricultural sector - generally called agricultural extension - has been studied since the 1950s (Klerkx et al., 2012). Since then, the notion of knowledge brokerage has evolved following the shifts in theoretical perspectives on
agricultural development and innovation. Klerkx et al. (2012) distinguish three phases in the evolution of knowledge brokerage concept and practices.

The linear approach to innovation, dominating between 1950s and 1990s, considered research as a source of knowledge and innovations, and producers as their end-users/adaptors. In line with this, knowledge brokerage was interpreted primarily as knowledge/technology transfer, assumed by agricultural extension, from researchers to farmers.

In 1990s, a more systemic perspective to agricultural innovation emerged, which aims to better address heterogeneity and complexity of farming realities which influence innovations. Participatory research approach emerges in order to “enhance research uptake and impact, by adapting research to specific contexts and creating ownership of the research”. The concept of AKIS (agricultural knowledge and information systems) becomes central in order to mark the recognition of broader knowledge systems in which farmers were embedded. Innovation is still considered as research output, but its implementation being more interactive between researchers and farmers, considering the latter as active collaborators and co-owners of innovation. Knowledge brokerage, accordingly, is more about “enhancing dialogue and direct collaboration between research producers and research users, considering the many factors that influence change and innovation”.

In 2000s, the systemic, interactive perspective of innovation was consolidating. Innovation is increasingly perceived as emerging in multi-actor interactions in networks. These multi-actor networks are considered to involve not only ‘conventional’ participants of AKIS – research, extension, education and farmers, but all the diverse actors who contribute to innovation. In such multi-actor environment or networks, all the actors are co-creators of innovation. The notion of knowledge brokerage has changed. Knowledge brokering involves facilitating interactions, learning and co-creating of innovation among various stakeholders. Actually brokering refers not only to overcoming knowledge gap, but a range of social, ideological, cognitive and other kind of gaps. Therefore the concept of innovation broker and systemic facilitator appears. Innovation broker is not anymore associated with extensionist, it can be whatever actor performing these functions of innovation facilitation.

1.5 Basic concepts

Knowledge and learning networks are networks within which actors share information and create new knowledge, and therefore strengthen their individual and collective capacity to act and innovate.

Knowledge brokerage contains a set of activities and processes aimed at exchanging and translating of individual knowledge stocks into collectively shared knowledge and innovations.

Knowledge brokers are actors who facilitate connections, enable coordination and create opportunities for learning and thereby enable knowledge flows and synergies between different actors and communities (Wenger, 1998)

Knowledge brokerage is organised around boundary objects - entities “shared by several different communities but viewed or used differently by each of them, being both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites” (Star and Griesemer 1989: 393). Boundary objects are tangible or intangible - a trademark, a publication, a code of practice, a website, a strategic paper, an idea etc. – and are of shared interest for participants and therefore create interfaces for their communication, interaction and coherence (ibid). Boundary work and objects can be viewed in three domains: learning, innovation, and sustainability. The dynamic and outcomes of boundary work in innovation networks develop a shared knowledge base, coproduce innovation and help to negotiate sustainability (Tisenkopfs et al 2015).
2.0 Application to the analysing the role of farm advisory services in innovation

2.1 Relevance to AgriLink Objectives

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At the applied level, the objectives of AgriLink are to:

| X               | Develop recommendations to enhance farm advisory systems from a multi-level perspective, from the viewpoint of farmers’ access to knowledge and services (micro-AKIS) up to the question of governance, also recommending supports to encourage advisors to utilise specific tools, methods to better link science and practice, encourage life-long learning and interactivity between advisors [WP5]; |
|                 | Build socio-technical transition scenarios for improving the performance of advisory systems and achieving more sustainable systems - through interactive sessions with policy makers and advisory organisations; explore the practical relevance of AgriLink’s recommendations in this process [WP5]; |
|                 | Test and validate innovative advisory tools and services to better connect research and practice [WP3]; |
| X               | Develop new learning and interaction methods for fruitful exchanges between farmers, researchers and advisors, with a focus on advisors’ needs for new skills and new roles [WP3]; |
|                 | Guarantee the quality of practitioners’ involvement throughout the project to support the identification of best fit practices for various types of farm |
2.2 How this can be applied/developed in AgriLink (2-5 paragraphs)

Learning network approach allows us to capture the complex farmers’ multi-actor learning environment and position agricultural advisory within it.

2.3 Research questions relevant to AgriLink

What knowledge sources, formal and informal, do farmers use and why those (access, reliability, relevance, adaptability…)?

What are relations between these different knowledge sources/knowledge actors and their knowledge contents (are they complementary, conflicting, dominating-subordinated…)?

How knowledge coming from various sources is integrated (by farmer him/herself, are there some collective or multi-actor knowledge platforms, the presence of knowledge brokers, use of boundary objects)?

Who are knowledge brokers? What is their social-demographic portrait, professional backgrounds, skill basis?

If and how advisory help to facilitate knowledge exchange, learning, generation of new knowledge between different knowledge actors?

2.4 Methodological implications

Multi-stakeholder and participatory approach is typically associated as a general methodological framework for knowledge brokerage. Various knowledge brokerage methods have been developed to facilitate interactions and learning in multi-actor setting (see Karner et al., 2011).

(Social) network analysis – qualitative and quantitative – is used to capture and analyse various aspects of knowledge, learning and innovation networks: identify participants, their roles; explore and measure their relations and relational structures; estimate the performance of different actors etc. Knowledge brokers can be identified through different lenses in participatory way as key promoters, nodal personalities, gate keepers, facilitators, ‘window openers’ in innovation networks.

2.5 Strengths and weaknesses/Sensitivities regarding use

Participatory methods – representativeness of all the actors; some actors are more keen and skilled to participate. Good facilitation is needed.

2.6 Potential operational problems

Network analysis – networks in real life settings are very broad, it can be challenging to identify all the relevant actors; some boundaries may need to be set to the networks to be studied.

Sometimes knowledge brokering function is implemented by actors outside the classical advisory or agricultural systems. This can cause also strife within the established authority of knowledge in the existing AKIS.
References (to documents referenced in this template only)


16) (Theories of) Knowledge, knowing and learning

Author: Chris Blackmore

1.0 General Overview of the Approach

1.1 Summary of the Approach

Theories of knowledge, knowing and learning offer and underpin many different approaches to research and other forms of practice. Several generations of these theories can be identified with different focuses and epistemological assumptions (i.e. about the nature of knowledge). Many have gradually been extended to include collective as well as individual learning. Distinctions of knowledge, knowing and learning are much contested so one person’s ‘learning approach’ might not be the same as another’s. A learning process approach in management and cybernetic traditions is in contrast with the more linear idea of applying ‘blueprints’ (Korten, 1980). A similar contrast is evident in approaches to knowledge, between those that take account of interaction such as knowledge exchange and co-creation or co-production of knowledge and the more linear idea of ‘knowledge transfer’. Approaches to knowledge, knowing and learning draw on a range of different traditions and many different theories. All these approaches have important roles to play in the context of AgriLink but care is needed in drawing out their underpinning assumptions to recognise what to draw on when, including in design for learning.

1.2 Major authors and their disciplines

Ideas about knowledge and learning can be traced back to very early philosophers (e.g. Plato and Aristotle, along with psychologists (e.g. Pavlov, Piaget, Vigotsky, Bruner) and biologists (e.g. Darwin). Later disciplines of education (e.g. Freire, Buber, Knowles), neuroscience (e.g. Maturana) cybernetics (e.g. Bateson) computer and information science (e.g. Shannon and Weaver), sociology, political science, science and technology studies (e.g. Jasanoff), behavioural science, human geography, cultural anthropology, management science, genetics along with later philosophers e.g. Dewey, Ruskin, Schon, Polanyi) have all contributed and staked their claims to ideas about how we do or could know and learn.

Major authors of theories of knowing and learning have often drawn their insights from more than one discipline. (e.g. Lave and Wenger’s work on Communities of Practice could be described as both a social theory of learning and a situated learning theory that has ethnographic, management science and sociological roots.) It can therefore make more sense to start with the theories and look at who has contributed rather than the authors (see Table 1 in section 2.2). Which contemporary authors would be identified as ‘major’ varies considerably with the researchers’ perspectives and preferred theories.

1.3 Key references

There are many key references coming from different times and much wisdom to be found in returning to original sources of material. In later years many different syntheses of theories of knowledge and learning have been done. The following have been selected because together they cover a range of particular relevance to AgriLink. Each reference signifies a trajectory of contributions to theories and practices of knowledge, knowing and learning that can easily be traced back to its influences and forward to current times. There are many other possibilities.

1.4 Brief history of how the theory has developed and been applied

Many learning theories have evolved over time, often to become more socially than individually oriented. There has also been a lot of cross-fertilisation of ideas. Researchers have used one particular learning theory or the work of one theorist in their approach or they have drawn insights from several theories and develop their own synthesis of ideas. Theories of knowledge, knowing and learning have been applied in a range of different ways, often linked to making systemic changes. They enable distinctions and connections to be made that researchers have used to explore situations from perspectives of learning and knowing. Also in action research mode they have been used to help understand or facilitate learning, including how to provide the conditions where purposeful learning and knowing can emerge.

Contemporary examples of how learning theories have been applied of relevance to AgriLink:

1. **Learning in European agricultural and rural networks: building a systemic research agenda.** See Hubert B. et al (2012) who developed and tested a systemic approach to research practice through an EU-funded project.


3. **Challenges to science and society in the sustainable management and use of water: investigating the role of social learning.** See Ison, R. Röling, N and Watson, D. (2007) who, following a major three year EU-funded project, make the case for researching social learning in contexts such as water catchments.


5. **Networked learning for agricultural extension.** See Kelly N. et al. (2017) who explored motivations for adopting information and communications technology (ICT)-mediated learning networks in agricultural education and extension and propose a framework. They provide examples from India and Australia.

6. **Rethinking Communication in Innovation Processes: Creating Space for Change in Complex Systems.** See Leeuwis C. and Aarts, N. (2011) who draw on literature about learning and knowledge in arguing that three (simultaneous) processes of network building, supporting social learning and dealing with dynamics of power and conflict deserve particular attention and support by communication professionals. This is an
1.5 Basic concepts

Learning: meanings range from the processes whereby individuals or groups acquire and/or construct knowledge and understanding through study or experience, to different kinds of change in individuals, relationships and in situations e.g. in states of knowing, behaviour and in processes of participation. As Bateson (1972, p. 283) said ‘The word “learning” undoubtedly denotes change of some kind. To say what kind of change is a delicate matter.’

Knowing: can mean being aware and being able to distinguish, recognise or perceive. Knowing is dynamic and relational. Cook and Brown (1999) draw on American Pragmatist philosophers to distinguish between what is possessed and used in action as knowledge and what is part of action as knowing.

Knowledge: can be quite a static concept where knowledge is seen as ‘facts’ or seen as a dynamic concept where production and co-production of knowledge is seen as a continuous process and/or where knowledge is seen as part of a continuum (as in data, information, knowledge, wisdom) . Different forms of knowledge are widely recognised e.g explicit knowledge is treated as though it can be formalized and tacit knowledge as that associated with skills or ‘know-how’. Knowledge associated with individuals is often distinguished from that of groups (Cook and Brown, 1999).

De Laats and Simons also distinguish individual and group learning mapping learning processes against outcomes. These distinctions can be extended to knowledge and knowing (Fig 1).

<table>
<thead>
<tr>
<th>Processes</th>
<th>Outcomes</th>
<th>Individual</th>
<th>Collective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual</td>
<td></td>
<td>Individual learning and or knowing</td>
<td>Individual learning and knowing processes with collective outcomes</td>
</tr>
<tr>
<td>Collective</td>
<td></td>
<td>Learning and knowing in social interaction and development of knowledge</td>
<td>Collective learning and knowing and co-production of knowledge</td>
</tr>
</tbody>
</table>

Fig. 1 Individual and collective learning and processes and outcomes. Source: Adapted from De Laat and Simons (2002).

Note that the term ‘social learning’ can apply to all three of the shaded boxes.

Further concepts are included in Table 1 in Section 2.2.

2.0 Application to the analysing the role of farm advisory services in innovation

2.1 Relevance to AgriLink Objectives

<table>
<thead>
<tr>
<th>[tick relevant]</th>
<th>AgriLink Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td>Develop a theoretical framework utilising a multi-level perspective to integrate sociological and economic theories with inputs from psychology and learning studies; and assess the functions played by advisory services</td>
</tr>
</tbody>
</table>
organisations in innovation dynamics at multiple levels (micro-, meso-, macro-levels) [WP1];

- Assess the diversity of farmers’ use of knowledge and services from both formal and informal sources (micro-AKIS), and how they translate this into changes on their own farms [WP2];

- Develop and utilise cutting edge research methods to assess new advisory service models and their innovation potential [WP2];

- Identify thoroughly the roles of the R-FAS (regional FAS) in innovation development, evaluation, adoption and dissemination in various EU rural and agricultural contexts [WP2];

- Test how various forms of (national and regional) governance and funding schemes of farm advice i) support (or not) farmers’ micro-AKIS, ii) sustain the relation between research, advice, farmers and facilitate knowledge assemblage iii) enable evaluation of the (positive and negative) effects of innovation for sustainable development of agriculture [WP4];

- Assess the effectiveness of formal support to agricultural advisory organisations forming the R-FAS by combining quantitative and qualitative methods, with a focus on the EU-FAS policy instrument (the first and second version of the regulation) and by relating them to other findings of AgriLink. [WP4].

At the applied level, the objectives of AgriLink are to:

- Develop recommendations to enhance farm advisory systems from a multi-level perspective, from the viewpoint of farmers' access to knowledge and services (micro-AKIS) up to the question of governance, also recommending supports to encourage advisors to utilise specific tools, methods to better link science and practice, encourage life-long learning and interactivity between advisors [WP5];

- Build socio-technical transition scenarios for improving the performance of advisory systems and achieving more sustainable systems - through interactive sessions with policy makers and advisory organisations; explore the practical relevance of AgriLink’s recommendations in this process [WP5];

- Test and validate innovative advisory tools and services to better connect research and practice [WP3];

- Develop new learning and interaction methods for fruitful exchanges between farmers, researchers and advisors, with a focus on advisors’ needs for new skills and new roles [WP3];

- Guarantee the quality of practitioners’ involvement throughout the project to support the identification of best fit practices for various types of farm advisory services (use of new technologies, methods, tools) in different European contexts, and for the governance of their public supports [WP6].
2.2 How this can be applied/developed in AgriLink

Table 1 Theories, theorists and their potential relevance to AgriLink

<table>
<thead>
<tr>
<th>Theories or models of learning</th>
<th>Main idea concerning learning</th>
<th>Examples of associated theorists</th>
<th>Questions this theory might raise in an AgriLink context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity theory</td>
<td>Cultural–historical theory that explains how people learn to perform activities. Three generations of this theory can be identified. Started with a focus on artefact-mediated and object-oriented action, moved on to explain collective human activity systems and then interacting human activity systems</td>
<td>Vygotsky (1934,1978), Leont’ev (1981), Engestrom (1999)</td>
<td>How might we learn to modify our activities (e.g. transport, food production) to reduce adverse effects on our environments and each other? How might we learn to innovate in relation to agriculture?</td>
</tr>
<tr>
<td>Actor network theory</td>
<td>Attempts to explain both social and technological evolution partly by providing a conceptual framework to integrate human and non-human factors in social processes suggesting both have agency. One of several traditions that has led to a focus on the role of objects in learning</td>
<td>Latour (1987, 2005), Callon (1986), Law (1986,1999 )</td>
<td>Which mediating objects might enable us to interact to develop innovative approaches?</td>
</tr>
</tbody>
</table>

12 The specific references are only indicative of these theorists’ work. Their contributions have spanned many years and publications.
<table>
<thead>
<tr>
<th>appreciative systems</th>
<th>Focuses on the learning process of appreciation as distinct from action and on developing individual or collective 'appreciative settings' i.e. readinesses to see and value, in order to make reality and value judgments. The appreciative system was described as 'in endless development...in far from consistent...physical, social and personal worlds.' (Vickers, 1987 pp.92-3)</th>
<th>Vickers (1965, 1970, 1987)</th>
<th>How might we appreciate the dynamics of learning and innovation in the context of European agricultures? How might researchers, advisors and farmers develop appreciative settings appropriate for making transitions towards sustainable agriculture?</th>
</tr>
</thead>
<tbody>
<tr>
<td>constructivist</td>
<td>Individuals construct their own knowledge and understanding of the surrounding world through learning.</td>
<td>Bruner (1966, 1973); Papert and Harel (1991); Piaget (1926); Vygotsky (1978)</td>
<td>What processes are needed to enable people to construct relevant knowledge and understanding?</td>
</tr>
<tr>
<td>cybernetic</td>
<td>Focuses on systems, communication, control and regulatory feedback. First-order cybernetics assumes an observer of a system can stand outside a system of interest, the position also adopted in traditional behaviourist theories of learning. Second-order cybernetics includes an observer in a system-of-interest and assumes that individuals are structurally coupled with their environments. Examples of learning theories developed from second-order cybernetics include conversation theory in which 'teachback' forms an important part of learning.</td>
<td>Bateson (1972); Churchman (1971); von Foerster (1981); Maturana and Varela (1987); Pask (1976); Wiener (1948).</td>
<td>How can we communicate about our different worlds? What kinds of intervention might be needed where we have positive feedback effects (e.g. in relation to farmer decision making and climate change)?</td>
</tr>
<tr>
<td>experiential learning</td>
<td>Knowledge is produced through transformation of experience. Kolb and Fry (after Lewin) represented this kind of learning in a cycle around (i) concrete experience, (ii) observation and reflection, (iii) formation of abstract concepts and (iv) testing in new situations. Schön's distinction between 'reflection on action' and 'reflection in action' presents an alternative way of thinking about reflection as part of experiential learning. Mezirow emphasised critical reflection in transformative learning leading to changing meaning structures and perspectives.</td>
<td>Dewey (1933); Freire (1970); Kolb and Fry (1975); Kolb (1984); Lewin (1946); Mezirow (1990); Schön (1983).</td>
<td>Can we learn our way to purposeful action through transformation of our experiences and perspectives? If so, how? What is the role of reflexive monitoring and critical reflection?</td>
</tr>
<tr>
<td>instructivist</td>
<td>Learning takes place as a result of teacher-led instruction. Opposite of constructivism</td>
<td>Skinner (1974), Carroll (1985), Bloom (1956),</td>
<td>How can we recognise both strengths and limitations of instruction in agricultural extension situations?</td>
</tr>
<tr>
<td>knowledge management</td>
<td>Range of theories with different epistemological assumptions and focuses. Linked to organisational learning. Three generations of knowledge management theories and practice are identified by Snowden. First generation focused on knowledge sharing and knowledge transfer, second generation focused on knowledge creation, tacit and explicit knowledge, third generation informed by social constructionism and complex adaptive systems.</td>
<td>Brown and Duguid (1991, 2001); Nonaka, and Takeuchi (1995); Polanyi (1974); Snowden (2002); Stacey (2001).</td>
<td>How can we develop knowing and knowledge that will support purposeful action? How do we create a context in which this kind of knowing and knowledge might be developed or emerge?</td>
</tr>
<tr>
<td>learning and epistemological development</td>
<td>Learners progress through developmental stages in how they view knowledge from dualism to relativism. Learners need to ‘bridge’ the epistemologies of knowing and knowledge which have different roles in action.</td>
<td>Baxter Magdola (1992); Perry (1968); Piaget (1926); Salner (1986); Schön (1995); Cook and Brown (1999).</td>
<td>Does a theory of epistemological development help us to understand how we think, act and interact in relation to our actions relating to AgriLink? If so, how?</td>
</tr>
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</table>
### Learning Systems

<table>
<thead>
<tr>
<th>Description</th>
<th>Reference</th>
<th>Question</th>
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</thead>
<tbody>
<tr>
<td>Considers learning as systems made up of interconnected elements and processes different system levels and structurally coupled with learning environments. Draws on cybernetics. Learning in different systems at different levels leads to ideas of public learning, learning society, institutional learning.</td>
<td>Bawden (1994, 1995, 2000, 2007); Checkland and Casar (1986); Ison et al (2007), Maturana and Varela (1987); Schön (1973); Vickers (1970, 1987); Wenger (2000).</td>
<td>What elements and processes comprise our learning systems? What and whose purposes do and could these systems of interest serve? How can we affect the contexts of our learning systems in order to improve effectiveness, efficiency and ethicality of our actions relating to AgriLink?</td>
</tr>
</tbody>
</table>

### Levels and Orders of Learning

<table>
<thead>
<tr>
<th>Description</th>
<th>Reference</th>
<th>Question</th>
</tr>
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<tbody>
<tr>
<td>Level I - first order learning - routine learning and knowing that takes context as given. Level II - second order learning - not confined, learning about the context of level I learning and knowing about learning and knowing. Level III learning takes another step back to learn about the contexts of level II. Kitchener suggests level III is about epistemic cognition and deals with knowing about the nature of knowledge.</td>
<td>Bateson (1972); Kitchener (1983); Maturana and Varela (1987).</td>
<td>How can we bring about second order change? How can we learn and know how to support knowing and learning better?</td>
</tr>
</tbody>
</table>

### Loops of Learning

<table>
<thead>
<tr>
<th>Description</th>
<th>Reference</th>
<th>Question</th>
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<tbody>
<tr>
<td>Single loop learning involves superficial change that allows 'more of the same' to continue without challenging underlying norms, policies and objectives remain unchanged. Double loop learning challenges norms, policies and objectives and underlying values may change. Triple loop learning is concerned with the context for double loop learning.</td>
<td>Argyris and Schön (1978).</td>
<td>How can we go forward differently and/or do 'more of the same' better?</td>
</tr>
</tbody>
</table>

### Situated Learning

<table>
<thead>
<tr>
<th>Description</th>
<th>Reference</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowing and learning are located in processes of co-participation, i.e. in a situation rather than in heads of individuals.</td>
<td>Brown, Collins and Duigud (1989); Lave and Wenger (1991); Rogoff and Lave (1984); Wenger (1999)</td>
<td>What practices are we involved in with others and how can we improve them?</td>
</tr>
</tbody>
</table>
social learning | Range of ideas from those that explain what and how social interactions contribute to individual learning to those that focus on collective learning to those that include both. | Bandura (1977); Daniels and Walker (1996); De Laat, (2006), Finger and Verlaan (1995); Illeris (2002); Röling (2002); SLIM, (2004c); Wenger 1999); Wildemeersch (1999). | How can we support individual and collective action that will improve our situations?

Source: Adapted from Blackmore (2009). It is adapted from an extract of part of an Appendix in Blackmore (2007), which was developed and adapted from Wenger (1999), Ison et al. (2000), Brockbank and McGill (1998), Illeris (2002) and Blackmore (2005).

2.3 Research questions relevant to AgriLink
See questions in Table 1 in Section 2.2

2.4 Methodological implications
Largely used in qualitative research and in blending methodological traditions. Researchers using these theories will often find that they need to make apparent their own epistemological, ontological and axiological assumptions which some do not find easy. Sampling and data collection in which the researcher’s perspective is hidden (e.g. in surveys) is usually inappropriate for researching and supporting learning and knowing.

Can be used as part of systemic inquiry with iteration and reflexive monitoring (e.g. in WP3). Multiple inquiries can use different theories of knowledge, knowing and learning.

2.5 Strengths and weaknesses
The diverse nature, scope and range of the approaches in which researchers and practitioners use these theories is both a strength and a weakness. Most learning theories include potentially useful concepts and distinctions, particularly in relation to change which is generally a strength.

As we all learn, many assume that they understand what is involved in learning without explicitly drawing on theories. This can lead to limitations and misunderstandings e.g. when assumptions are made that learning always requires teaching or knowledge transfer rather than facilitation and co-production of knowledge.

2.6 Potential operational problems
There are significant differences between first and second order learning and what is involved in each. Both are important but if wanting to innovate second order learning is required and this distinction needs to be made explicit, not assumed. Both learning and learning to learn requires skills and understanding (e.g. in facilitation and evaluation).

In many of our processes we need critical reflection-in-action, not just reflection on action. How we ‘design for learning’ and provide space for this as a project can draw on these theories.
There is a huge range of tools and techniques associated with learning theory and practice, ranging from conceptual frameworks to techniques such as diagramming and methodologies that explicitly deal with learning and change. It is important to recognise that there are many ways in which these tools and techniques can be used and that there is skill involved in knowing what to use when and in which situations.

References


18) Learning and Innovation Networks for Sustainable Agriculture - LINSA
Author: Ilona Kunda, Dr. sc. soc.

1.0 General Overview of the Theory or Approach

1.1 Summary of the Theory, Approach or Topic
The idea of LINSA (Learning and Innovation Networks for Sustainable Agriculture) was proposed in the context of searching for organisational sources of transition from the long-dominant productivist agriculture regime towards a sustainability-oriented one. Since it was argued that formal AKIS institutions were not always best suited to initiate that change, a possible alternative driver was suggested: networks of mutually engaged actors with diverse roles in relation to agriculture yet joined by at least a partial focus on rural/agricultural sustainability. The key processes in such networks are joint (social) learning, innovation and negotiating what sustainability means in the specific practice of the involved actors. While LINSA can manifest fairly divergent kinds of structuring, actor relationships, knowledge and communication system traits, learning processes and relationships to AKIS, they can indeed generate and sustain changes towards more sustainable agriculture.

1.2 Major authors and their disciplines
The broader framework for developing the concept of LINSA was provided by several related sources: socio-technical transition theory, actor-network theory, innovation systems, and social learning theory (and the closely associated concept of Community of Practice). All of the source theories are well developed, with a broad range of authors, disciplines and applications.

The concept of LINSA, drawing from these sources, was developed by the core team of the 7th FP SOLINSA13 (2011 – 2014), who were from the disciplines of agricultural economics, rural sociology and innovation studies. Some of the key papers based on the study were authored by (in alphabet order) G. Brunori, F. Hermans, R. Home, J. Ingram, H. Moschitz, T. Tisenkopfs; the concepts further used by the participants of the original team, e.g. J. Ingram 2016; Šūmane et al, 2017.

The LINSA concept (after the project result dissemination) has been referenced in articles on climate change adaptation networks in Germany (Schmid J., A. Knierim and Knuth U., 2016), organic agriculture cooperative in Spain (I. de los Ríos, M. Riveira, García C., 2016), co-innovation networks in animal welfare (L. van Dijk et al, 2017), and more.

1.3 Key references (3 to 5 maximum, ideally overview papers if these exist)

1.4 Brief history of how the theory has developed and been applied

13 “Agricultural Knowledge Systems in Transition: Towards a more effective and efficient support of Learning and Innovation Networks for Sustainable Agriculture”, nr. 266306, FP7 – KBBE – 2010 - 4
The development of LINSA concept started within the broader issue of EU agricultural policy and AKIS capability to address the need of transition to more sustainable agriculture. Conceptualisations of ongoing processes in European agriculture used transition theory (e.g. F. Geels, J. Schot), theories of innovation networks and systems approaches (e.g. L. Klerkx, C. Leeuwis, N. Aarts), as well as more general sources – network theory, and social learning. Increasingly, the heterogeneity of actors participating in producing and disseminating innovation was coming to a fore, with observed examples of sustainability-oriented innovation often originating on the fringes of formal AKIS.

The concept of LINSA was introduced to analyse the alternative pathways in transition towards sustainable agriculture, LINSA being possible candidates for drivers of transition, be it gradual and incremental or more radical, linked to AKIS in varying degrees, but always concerned with joint learning and innovation, and joint definition of sustainability as related to the innovation at hand.

To determine if and how such networks can represent a new organisational pattern of fostering transition to more sustainable agriculture, a 7th FP funded study was carried out, developing the concept of LINSA through a grounded-theory approach, building the theoretical models from sustained joint reflection and interaction with LINSA.

17 cases representing diverse variations of LINSA as to scope, homogeneity, type of innovation, learning processes etc. were explored. The study concluded that LINSA are a special type of network, having potential to act as drivers for a series of adaptive changes towards more sustainable agriculture. Relationships between LINSA and AKIS formed a substantial strand in exploring the LINSA trajectories, concluding that these relationships may exist in a continuum between almost no linkages to very close integration.

1.5 Basic concepts

LINSA – learning and innovation networks for sustainable agriculture, defined as hybrid multi-actor networks mutually engaged with common goals for sustainable agriculture and rural development, and co-producing new knowledge, simultaneously developing as a network. LINSA manifest a dynamic balance of diversity and commonality, a certain level of governance, innovation practiced and disseminated, and reflexivity with regard to network activities and the meaning of sustainability. Relationships with AKIS may range from almost none to close integration (Moschitz et al. 2014).

Transition partners – a concept used to elucidate a range of new roles of AKIS actors as supporters of social learning and the related dynamic in innovation networks. The core of the new roles and functions is about facilitation, innovation brokering, boundary-crossing (Moschitz et al, 2014).

Boundary work – social learning activities to advance and consolidate learning, innovation and the understanding of sustainability (across diverse groups of actors in the network and to mobilise actors outside of the network) through ever-evolving communication, co-production and negotiation of meaning, framing and reframing, and readjustment of network goals (Tisenkopfs et al 2015).

Reflexive learning – a process by which network participants constantly reassess their innovation objectives and evaluate sustainability performance; can be assisted by researchers provided they have particular skills (Moschitz et al 2014).

2.0 Application to the analysing the role of farm advisory services in innovation
### 2.1 Relevance to AgriLink Objectives

<table>
<thead>
<tr>
<th>[tick relevant]</th>
<th>AgriLink Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>**</td>
<td>Develop a theoretical framework utilising a multi-level perspective to integrate sociological and economic theories with inputs from psychology and learning studies; and assess the functions played by advisory organisations in innovation dynamics at multiple levels (micro-, meso-, macro-levels) [WP1];</td>
</tr>
<tr>
<td>**</td>
<td>Assess the diversity of farmers’ use of knowledge and services from both formal and informal sources (micro-AKIS), and how they translate this into changes on their own farms [WP2];</td>
</tr>
<tr>
<td>*</td>
<td>Develop and utilise cutting edge research methods to assess new advisory service models and their innovation potential [WP2];</td>
</tr>
<tr>
<td>**</td>
<td>Identify thoroughly the roles of the R-FAS (regional FAS) in innovation development, evaluation, adoption and dissemination in various EU rural and agricultural contexts [WP2];</td>
</tr>
<tr>
<td>**</td>
<td>Test how various forms of (national and regional) governance and funding schemes of farm advice i) support (or not) farmers’ micro-AKIS, ii) sustain the relation between research, advice, farmers and facilitate knowledge assemblage iii) enable evaluation of the (positive and negative) effects of innovation for sustainable development of agriculture [WP4];</td>
</tr>
<tr>
<td>*</td>
<td>Assess the effectiveness of formal support to agricultural advisory organisations forming the R-FAS by combining quantitative and qualitative methods, with a focus on the EU-FAS policy instrument (the first and second version of the regulation) and by relating them to other findings of AgriLink. [WP4].</td>
</tr>
<tr>
<td>**</td>
<td>At the applied level, the objectives of AgriLink are to:</td>
</tr>
<tr>
<td>**</td>
<td>Develop recommendations to enhance farm advisory systems from a multi-level perspective, from the viewpoint of farmers’ access to knowledge and services (micro-AKIS) up to the question of governance, also recommending supports to encourage advisors to utilise specific tools, methods to better link science and practice, encourage life-long learning and interactivity between advisors [WP5];</td>
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<td>**</td>
<td>Build socio-technical transition scenarios for improving the performance of advisory systems and achieving more sustainable systems - through interactive sessions with policy makers and advisory organisations; explore the practical relevance of AgriLink’s recommendations in this process [WP5];</td>
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<td>Test and validate innovative advisory tools and services to better connect research and practice [WP3];</td>
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<td>**</td>
<td>Develop new learning and interaction methods for fruitful exchanges between farmers, researchers and advisors, with a focus on advisors’ needs for new skills and new roles [WP3];</td>
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<tr>
<td>*</td>
<td>Guarantee the quality of practitioners’ involvement throughout the project to support the identification of best fit practices for various types of farm advisory services (use of new technologies, methods, tools) in different European contexts, and for the governance of their public supports [WP6].</td>
</tr>
</tbody>
</table>
2.2 How this can be applied/developed in AgriLink

The LINSA concept sharpens researcher awareness of the heterogeneity of multi-actor networks and the range of their relationships with AKIS, and allows building on the lessons learned: on the new roles of AKIS, on the experience of developing the practical tools to facilitate reflexion and co-development of knowledge, evaluation of researcher skills and tools needed/used for an interactive, iterative research process.

Awareness of the dynamic, hybrid nature of the actual links between various agent groups involved in developing an innovation allows asking more nuanced research questions uncovering the underlying dynamics, roles and links, communication patterns and infrastructures, boundary interactions.

2.3 Research questions relevant to AgriLink [see the draft conceptual framework for further options]

In developing the typology of farmers’ micro-AKIS: How are the distinct types of micro-AKIS related to the type and degree of innovation pursued by farmers?

In mapping R- FAS: How the business models applied and back-office activities take into account the existing informal knowledge and information networks around the particular innovation, how do they engender trust and mutuality? What is the power dynamics: what groups of farmers might remain marginalised and why?

Roles of farming advisors: To what extent and how advisors are capable of facilitating joint reflexion which is needed for co-production of knowledge? What are the framings used by farmers with regard to specific practices and how these can be made more inclusive? How do stakeholders frame the goals of their interaction, are the frames adjusted (by advisors) to accommodate the various knowledges?

Assemblage of different types of knowledge: How the farmers’ choices to give preference to specific sources of knowledge are made? What creates/maintains the validity of these sources? What causes tensions (if any) between different sources of knowledge? Are conflicting goals present in pursuing specific practices (by farmers and advisors)?

Opportunities presented in the Digital Revolution: What are the usual, trusted ways that farmers gather, exchange and validate knowledge needed for their practices? Are benefits of the Digital Revolution distributed evenly between stakeholders; what are the gaps?

2.4 Methodological implications

For getting the basic understanding of network functioning, LINSA research uses the usual network analysis tools, which combine qualitative and quantitative data, and may be supplemented by network visualisations. However to obtain in-depth understanding of learning processes and find the tools to help LINSA develop its innovation and its interactions, it is best to adopt an action research approach, using a range of reflexion tools, co-developing the research agenda, acting as facilitators of network learning.

2.5 Strengths and weaknesses/Sensitivities regarding use

Developing a trustful relationship with LINSA participants, and finding a relevant, meaningful role for researchers which contributes to network development requires time and sensitivity to network relationship and communication dynamics.
2.6 Potential operational problems
LINSA may take several forms and sometimes be actually a network of networks, which
does put a strain on operationalisation – determining the boundaries of the phenomenon.
For analytical purposes, it may also be a certain challenge to untangle the formal and
informal overlapping layers of the network exchanges if LINSA is closely integrated with
AKIS.
For large networks, data collection on knowledge processes may be a certain challenge (of
scope).

Optional Section 4: Recommended further reading

Please identify and other references or original sources which would be particularly useful
for AgriLink consortium members interested in learning more.

To get an idea of the tools and approaches to use in interaction with various stakeholders,
the following might be useful:

N. Rump Training course concept for transition partners supporting LINSA, available at

References (to documents referenced in this template only)

J. Ingram (2016) Framing niche-regime linkage as adaptation: An analysis of learning and
innovation networks for sustainable agriculture across Europe. Journal of Rural Studies,
Vol.40, pp. 59 – 75, https://doi.org/10.1016/j.jrurstud.2015.06.003

Moschitz, H., Roep, D., Brunori, G., and Tisenkopfs, T. 2015. Learning and innovation
networks for sustainable agriculture: Processes of co-evolution, joint reflection and facilitation.

Šūmane, S., Kunda, I., Knickel, K., Strauss, A., Tisenkopfs, T., de los Rios. I., Rivera, M.,
Chebach, T., and Ashkenazy, A. (2017) Local and farmers' knowledge matters! How
integrating informal and formal knowledge enhances sustainable and resilient agriculture.

and innovation in agriculture and rural development: The use of the concepts of boundary
13-33.
19) MLP – Anchoring and scaling
Author: Boelie Elzen

1.0 General Overview of the Theory or Approach
1.1 Summary of the Theory, Approach or Topic
MLP distinguishes three levels: micro-level of (socio-technical) niches, meso-level of (socio-technical) regimes and macro-level of (socio-technical) landscape. Innovation processes are analysed as the interplay between these three levels. Niches are the breeding ground for novelties to learn on how novelties can be made to work in practice. Regimes describe an incumbent socio-technical system within which innovation tends to be of an incremental nature. Landscapes describe exogenous factors that put pressure on regimes for change and create ‘windows of opportunity’ for niches to link up to and transform regimes.

Scaling of innovations addresses the issue that has traditionally been conceptualised as transfer, dissemination, diffusion or adoption. Unlike these other concepts, scaling acknowledges that a novelty undergoes continuous change during this process and that it is not only a matter of adapting the novelty to an existing regime, but also of adapting an existing regime to a novelty. The latter has important implications for governance and policy, stressing it is important to create a ‘conducive environment’.

The concept of anchoring has been developed to analyse the linking of niches with regimes. Three forms of anchoring are distinguished that derive from the three constituent components of a regime, notably technical, network and institutional components. These are technological anchoring, network anchoring and institutional anchoring. To realise scaling, all three forms of anchoring need to take place.

1.2 Major authors and their disciplines
The MLP was initially developed by Rip and Kemp and later elaborated extensively by Geels (2005). Whereas traditional innovation studies mainly addressed processes of incremental innovations, the MLP enabled the understanding of radical innovations, also called system innovations or transitions. The MLP was subsequently ‘translated’ into strategic approaches to stimulate transitions towards sustainability, such as ‘strategic niche management’ (Schot and Geels 2008) and ‘transition management’ (Loorbach 2007). The topic of ‘scaling’ has many fathers, who sometimes distinguish between scaling up and scaling out. Scaling up relates to the process of ‘increase’ (e.g. in terms of numbers, speed, size), whereas scaling out describes a process of ‘expansion’, e.g. geographical spread of a particular technology. Wigboldus et al. (2016) take these together, using the single term ‘scaling’. The concept of anchoring was developed by Elzen at al. (2012) to address an understudied aspect of the MLP, notably the linking between niches and regimes. To assess potential future transition pathways, Elzen et al. have developed a scenario methodology that builds on the MLP.

1.3 Key references


### 1.4 Brief history of how the theory has developed and been applied

MLP was initially applied in a wide number of cases as an analytical perspective to analyse transition processes. It has been used by a wide variety of scholars. Subsequently it was developed into strategic tools to stimulate sustainability transitions and these are widely used by a variety of stakeholder networks in the Netherlands. The concepts of scaling and anchoring are used by an increasing range of scholars to study how niches can link up to regimes and actually start a transition process.

### 1.5 Basic concepts

In the MLP dynamic, system innovations develop as follows (cf. figure ##). A novelty emerges in a local practice and becomes part of a niche when a network of actors is formed that share certain expectations about the future success of the novelty, and are willing to fund and work on further development. Niches may emerge and develop partly in response to pressure and serious problems in an existing regime which can be either internal to the regime itself (such as animal welfare in industrial animal production) or come from the socio-technical landscape (e.g. the pressure to curb CO2 emissions which affects more than just the animal production sector). The further success of niche formation is on the one hand linked to processes within the niche (micro-level) and on the other hand to developments at the level of the existing regime (meso-level) and the socio-technical landscape (macro-level). Supported by actors willing to invest in the new concept (industries, R&D organisations, government) and initially protected from competition at the market place (e.g. through subsidies), the novelty is improved within the niche, broader networks are formed around it, and more is learned about directions for improvement and functions it may fulfil.
Scaling of innovations addresses the issue that has traditionally been conceptualised as transfer, dissemination, diffusion or adoption. The typical idea behind these concepts is that what has been demonstrated in one place can be copied elsewhere and work there as well. Recent work in innovation studies, however, is that this rarely works as simple as that. Especially in agriculture, with a broad variety of farming practices, a novelty needs further adaptation to be made to work in another location. Technologies and practices that work in a specific ecological, sociocultural or geographical area, do not automatically work, and may even have negative effects, in other areas. This may produce undesirable effects such as emission of pollutants and greenhouse gases, poorer animal welfare, deteriorating labour conditions, degradation of soil quality, etc. Finally, and not least important, in terms of policy adoption thinking focusses attention on the farm level while it neglects the importance of creating a conducive environment (e.g. by changing consumption behaviour, changing values of various stakeholders, changing markets and value chains, etc.).

To acknowledge this, scaling processes are conceptualised as an “integral part of a systemic approach to innovation, to anticipate on the possible consequences of scaling efforts” (Wigboldus et al. 2016, 1). Various authors make a distinction between scaling up and scaling out (e.g. Anderson 2012; Millar and Connell 2010). Scaling up relates to the process of ‘increase’ (e.g. in terms of numbers, speed, size), whereas scaling out describes a process of ‘expansion’, e.g. geographical spread of a particular technology. Wigboldus et al. (2016) take these together, using the single term ‘scaling’.

Various innovation and scaling approaches and related policies and interventions can be distinguished, depending on situation specificities (Fig. 1). In the first approach (push), the value of the technology or practice (e.g. higher yielding crop variety) to be scaled up is taken for granted and the focus is on uptake and adoption. The second approach (pull) begins by defining a vision that innovation and associated scaling processes need to make a contribution
to. The focus of activity is to reorient system values towards this vision, i.e. some players such as policymakers within the regime may assist niches to make changes and disrupt the regime (Kivimaa and Kern 2016; Mitchell et al. 2015)."

Fig. 2. Distinguishing different types of scaling initiatives in a simplified MLP view (Wigboldus et al. 2016, 10).

Historical studies largely provide examples of ‘pushed scaling’ whereas this also seems to be the main emphasis in current innovation attempts. However, ‘pulled scaling’ (support scaling by changing regime and niche conditions) may in many cases a more appropriate and effective approach.

To study the uptake of innovations, the concept of anchoring, which was developed in the context of system innovation programmes in the Netherlands (Loeber 2003, Grin & Van Staveren 2007). In a study of the uptake of radical energy novelties in glasshouse horticulture, the concept was defined more specifically as follows:

“Anchoring is the process in which a novelty becomes newly connected, connected in a new way, or connected more firmly to a niche or a regime. The further the process of anchoring progresses, meaning that more new connections supporting the novelty develop, the larger the chances are that anchoring will eventually develop into durable links.” (Elzen et al., 2012, p.3)

Building on a distinction between three constituent components of a regime, notably technical, network and institutional components (Geels, 2004), the authors distinguish three forms of anchoring. These are technological anchoring, network anchoring and institutional anchoring (Elzen et al., 2012, p.4-6). Technological anchoring takes place when the technical characteristics of a novelty (e.g. new technical concepts) become defined by the actors involved and, hence, become more specific to them. Network anchoring means that the network of actors that support the novelty changes, e.g. by enrolling new producers, users or developers. Institutional anchoring relates to the institutional characteristics of the novelty, i.e. the new rules that govern its further development and uptake. Institutional anchoring implies that developments within a niche or regime become translated into adapted or new rules that govern, at least temporarily, the activities of both niche and regime actors. Various other authors have also addressed the study of niche-regime interaction, e.g. Ingram (2017) who focuses on knowledge rather than innovation and who explores the extent to which niche knowledge systems confront and, or enhance the regime’s AKS.

To assess potential future transition pathways, Elzen et al. () have developed a scenario methodology that builds on the MLP. Such ‘socio-technical scenarios’ feature the interplay between the three MLP levels. Doing so, they not only describe what may happen in the future
but also why this happens. Because of this focus on the why questions such scenarios provide a much richer source of input for governance and policy than traditional scenario methods.

2.0 Application to the analysing the role of farm advisory services in innovation

2.1 Relevance to AgriLink Objectives

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<td>Develop a theoretical framework utilising a multi-level perspective to integrate sociological and economic theories with inputs from psychology and learning studies; and assess the functions played by advisory organisations in innovation dynamics at multiple levels (micro-, meso-, macro-levels) [WP1];</td>
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<td>Assess the diversity of farmers’ use of knowledge and services from both formal and informal sources (micro-AKIS), and how they translate this into changes on their own farms [WP2];</td>
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<td>Test how various forms of (national and regional) governance and funding schemes of farm advice i) support (or not) farmers’ micro-AKIS, ii) sustain the relation between research, advice, farmers and facilitate knowledge assemblage iii) enable evaluation of the (positive and negative) effects of innovation for sustainable development of agriculture [WP4];</td>
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At the applied level, the objectives of AgriLink are to:

| ✓               | Develop recommendations to enhance farm advisory systems from a multi-level perspective, from the viewpoint of farmers’ access to knowledge and services (micro-AKIS) up to the question of governance, also recommending supports to encourage advisors to utilise specific tools, methods to better link science and practice, encourage life-long learning and interactivity between advisors [WP5]; |
| ✓               | Build socio-technical transition scenarios for improving the performance of advisory systems and achieving more sustainable systems - through interactive sessions with policy makers and advisory organisations; explore the practical relevance of AgriLink’s recommendations in this process [WP5]; |
|                | Test and validate innovative advisory tools and services to better connect research and practice [WP3]; |
2.2 How this can be applied/developed in AgriLink

The multi-level perspective analyses on-farm development as being embedded within a wider agro-food system. It focuses attention on the fact that making agriculture more sustainable is not only a matter of making on-farm practices more sustainable but also a matter of making the wider system more sustainable and conducive to the necessary changes at the farm level. The implication for farming advise is that this also needs to be embedded in knowledge on the wider system and that the content of the advice should address both the farm and this wider system.

The concept of anchoring makes an important distinction between three different dimensions in the multi-level dynamic, notably networks, institutions and technology. This distinction needs to be reflected in the analysis of AgriLink cases and also in recommendations for improving the farming advisory system.

The socio-technical scenario methodology is of direct relevance for the envisaged scenario building task in WP5.

2.3 Research questions relevant to AgriLink [see the draft conceptual framework for further options]

- To what extent are advisors aware of the various distinctions suggested by the MLP, including: niche vs. regime developments; technical, network and institutional issues; pull vs. push strategies?
- What is the relative role of ‘push’ scaling and ‘pull’ scaling in various advisory practices.
- What are the main barriers for farmers to follow advice given by advisors. What is the respective role of technical, network and/or institutional factors in these.

2.4 Methodological implications

- In both analysis and advice, make a clear distinction between niche-situations (where the emphasis should be on learning and articulation) and regime situations (where the emphasis should be on scaling).
- In both analysis and advice, acknowledge the importance of the distinction between technical, network and institutional factors.
- In advice, make a distinction between push and pull strategies and potential synergies between them.

2.5 Strengths and weaknesses/Sensitivities regarding use

The MLP has been widely used and has proven to be a very robust framework to analyse retrospective innovation processes.
MLP has been less proven in ‘ongoing’ innovation processes and various conceptual tools to do so have only been recently developed and used. MLP claims to be able to zoom in (to the micro-level of individual actors) and zoom out (to the system level of agriculture at large) but the analytical toolbox to do so still needs to be largely developed.

2.6 Potential operational problems

MLP provides a number of ‘guiding heuristics’ but few clear analytical concepts and guidance on how to operationalise them. Still a lot of ‘learning by doing’ is needed.

Optional Section 3: Practical example

The anchoring ‘approach’ has been used in a Dutch programme for sustainable animal production. In this programme, various ‘integrally sustainable’ new animal production systems were developed in an interactive process with stakeholders for a dozen species of animals. Using the anchoring approach from the very beginning has led to considerable successes for the practice uptake of some of these newly developed systems, although some other were also failures (Bos and Elzen 2016).

Optional Section 4: Recommended further reading


References (to documents referenced in this template only)


Elzen, Boelie and Bram Bos, 2016. The RIO approach: Design and anchoring of sustainable animal husbandry systems, Technological Forecasting and Social Change. http://dx.doi.org/10.1016/j.techfore.2016.05.023


Geels, F. W. 2004. From sectoral systems of innovation to socio-technical systems; Insight about dynamics and change form sociology and institutional theory. Research Policy, 33, 897-920.


20) Organisational Learning

Author: Egil Petter Stræte

1.0 General Overview of the Approach

1.1 Summary of the Approach

Organisations can be regarded as systems comprised of the actors involved, their social relations, and their mutual dependency. Scott (2003) distinguishes between the rational, natural, and open systems of organisations. The actors in an organisation must have something in common in order for it to make sense to pay special attention to their relationships. This community may be related by interests and/or a shared reality. Organisations can act meaningfully and purposefully in a way that cannot be reduced to the sum of many individuals' knowledge and intentions. Organisational knowledge is knowledge that is shared by multiple individuals and is more than the sum of each individual’s knowledge. Access to relevant knowledge is a first step, but the real challenge is to implement this knowledge and change practices.

Innovation involves changes in action. To achieve change in an organisation, that organisation must be able to develop new knowledge and learn; however, innovation is not limited to a single action but is instead a process (Lundvall, 1992) that is concerned with how the actors influence each other. To create something new involves breaking up established routines and conventions in organisations. The legitimacy associated with established practices must be broken and replaced with new legitimacy and practices. Organisational learning is about being able to break established routines, produce new knowledge, and establish new routines. Routines are the links between the process and the structure.

Organisational learning involves the ability to change or change conventions in different situations. On the one hand, routinizing actions is sometimes desirable (‘agree’ on a convention), but on the other hand there are situations where the ability to break up routines is important, i.e., change conventions. The topic of an organisation's efforts to systematically improve and learn, and to continuously do so, is noted as organisational learning.

The concept of an institution can sometimes be mixed up with organisations and institutes. An institution is a pluralistic concept with numerous applications. In this case, an institution can be regarded as a practice, or more academically, as Scott formulates: ‘Institutions are composed of cultural-cognitive, normative, and regulative elements that, together with associated activities and resources, provide stability and meaning to social life’ (Scott, 2003:48).

Organisational learning is related to several other concepts discussed in the theoretical framework for Agrilink; see especially Theories of knowledge, knowing and learning by Chris Blackmore and Knowledge and organisational learning for innovation by Geneviève N’Guyen.

1.2 Major authors and their disciplines

In organisational learning, five perspectives or theories are mentioned:

- Organisational routines (Nelson and Winter, 1982). Economics, often connected to evolutionary economics and economic geography.

- An important source of this thought is Argyris and Schön's work on organisational learning (Argyris and Schön, 1996: first published 1978) and their work on single- and double-loop learning. Business management and philosophy.

• Learning organisations based on Senges’ work (Senge, 1990). His background is mixed but rooted in business management.

1.3 Key references

1.4 Brief history of how the theory has developed and been applied
Argyris and Schön developed the term ‘organisational learning’ in their book from 1978. They conceptualised learning as something that did not require a cognitive process; specifically, they talked about ‘action theories’ as ‘theories’ that govern our actions, but also established patterns of action as well as what people say they think. Senge brings this a step further by emphasising the systematic approach to become a learning organisation.

Nelson and Winter can be regarded as two of the main contributors to evolutionary economics. They were inspired by Schumpeter’s thoughts on entrepreneurship and innovation. In this sense, Nelson and Winter bridge organisational development and societal development.

Nonaka and Takeuchi describe a model for understanding processes related to knowledge production in organisations. They divide tacit and explicit knowledge. Within and between these two forms of knowledge, there are transfers and conversions, so we can say that four different knowledge states or modes exist: socialisation, externalisation, combination, and internalisation. New knowledge is created or developed and this in itself continues the process; for this model, a spiral is a better metaphor than a circle.

Convention theory is related to French regulation theory and has similarities to actor network theory (ANT) in that it is interpretative and the actor is the starting point for the analysis (Wilkinson, 1997). Actors, most often individuals, develop ‘a sort of “agreement” about what is to be done – in the sense that what each person does meets the expectations of the others on whom he or she depends’ (Storper and Salais, 1997:16). This agreement is a convention; it is not a formal or formulated agreement and, in sociological terms, this agreement is more like rules. The theory of conventions may be applied in both the macro- and micro-levels; macro about ‘long variations, in terms of historical duration or cultural gaps’ and micro about ‘short variations which consist of differences between activities within a single economy, or changes in conventions in an organization, during interaction and so on’ (Eymard-Duvernay, 2002:69). Convention theory may not be so obvious a part of organisational learning, but it can be applied here too.

A wide range of organisational learning studies are rooted in one or several of these theories.
1.5 Basic concepts

Organisational routines are important to explain an organisation's development (Nelson and Winter, 1982). An organisation's ability to generate new knowledge is based on the existing stock of accumulated knowledge and the method of generating new knowledge. This stock and method will typically exist as routines.

Argyris and Schön (1996) discuss single-loop learning, i.e., solving problems based on existing premises and knowledge, and double-loop learning, i.e., establishing new premises and knowledge that can substitute for the existing ones. Loops give association to circles. However, when learning has happened you are not back at starting point, i.e. spirals are may be a better image.

For more on knowledge creation and the spiral process of how new knowledge is developed, see above (Nonaka and Takeuchi, 1995).

For more on conventions, see above.

Diagram

From Stræte (2006).

2.0 Application to the analysis of the role of farm advisory services in innovation

2.1 Relevance to AgriLink Objectives

Organisational learning, in one aspect or another, is considered relevant to all the objectives.
2.2 How this can be applied/developed in AgriLink

In our context, AgriLink, learning will take place in specific situations where the interaction between the individual and the environment will be central. Organisational learning is particularly relevant for advisory service organisations and knowledge environments because the organisation of the advisory group is important both for the development of advisory products and for the implementation of new knowledge into practices for farmers. From this follows the idea that approaches from organisational learning can be applied to explore and explain how organisations (or firms) work with innovation or why they are not doing so. It is also relevant to analyse how organisations can improve their ability to learn and innovate.

Convention theory can also be applied at the inter-organisational and system levels, e.g., AKIS. One example could be to explore how changes in the system happen or why they do not happen. This can typically be caused by different regimes in an operation.

As there are many studies carried out in these issues, a more specific search is recommended.

2.3 Research questions relevant to AgriLink

Organisational learning can be relevant to much of the work in AgriLink and therefore is also relevant for many of the research questions.

Relevance to main research question:

- How do farmers make decisions in their daily farming activities? Who influences them most in their decision-making? Differentiate between main ‘types’ of farmers, e.g., innovators, followers, and laggards.
  - How does advisory service organisations (systematically) meet the needs of the various types of farmers?
  - How does an advisory service develop their relational competence?

- What is the specific role/function of advisory services in farmer decision-making on their farming practices (consulting/facilitation/brokering/knowledge processing, etc.)?
  - How does an advisory service train themselves to be prepared for providing advisory services?
  - How does an advisory service stimulate their own capability in innovation?
  - How does an advisory service systematically keep themselves up-to-date on new knowledge? What is their absorptive capability?

- What is the role of the prevailing (regional/national, EU) AKIS on farmers’ decisions to change their practices and what is the role of farming advisory services therein?
  - How does AKIS recognise and incorporate (the various) farmers’ situations to develop and adjust strategies in AKIS?

- How are the functions of farm advisory services influenced by the institutional settings of advisory systems (the providers, their business models, their relations) at the regional level or within innovation areas?

- How can advisors enhance knowledge flows and accumulation and boost the innovativeness of farms?
  - How does an advisory service boost their own innovativeness?

- What are the factors that facilitate and hinder farmer-advisor-researcher collaborations?

Others:
How can Living Lab be a tool for the permanent stimulation of innovation in an organisation/network/AKIS?
Further, organisational learning seems to be particularly relevant to WP2, 3, and WP5.

2.4 Methodological implications
Applied methods are often qualitative, like observation and interviews or case studies of specific organisations or parts of organisations. Quantitative studies, like surveys, can be applied to support the qualitative study, e.g., make an analysis of the indicators of competence in an organisation or generalise based on a representative sample.
The role of researcher in the study can be problematized. Organisational studies are often part of an action-related approach. The concept of the Living Lab is a strategy for doing action research; how can that be related to organisational learning? There is a need to clarify the role of the researcher, to be explicit if one is an outsider or insider. See also Action research/Reflecting on our methods by Herman Schoorlemmer.

2.5 Strengths and weaknesses
There are a variety of approaches in and applications of organisational learning; the strength of that is that there is a high chance to find a study that was performed in one way or another that is relevant to the specific AgriLink situation, but the weakness of such is that there may be confusion when there is no existing answer to a specific question.
The organisation is the entity to be studied. This can be helpful to limit the study and can be regarded as a strength.
It can be argued that case studies have a limited value to transfer to other situations, i.e., the lessons learned have less value in other contexts. However, this argument is irrelevant because case studies involve analytical generalisation and not statistical generalisation.

2.6 Potential operational problems
Being involved in organisational studies, like case studies, or even Living Lab may have some commercial implications. There may be commercial interests that the organisation wants to be kept as internal business secrets. This issue is related to attitudes toward openness, like open innovation.
If studies are going to be compared across countries, there is a need to coordinate this and establish a common basis for how that is going to be concretely carried out.

References


23) Social Networks
Author: Lee-Ann Sutherland and Livia Costa Madureira

1.0 General Overview of the Theory or Approach

1.1 Summary of the Theory, Approach or Topic
Social networks refer to the relationships between people. Conceptualisations of the structure and influence of these networks often draws on the concept of 'social capital', which can be defined as “the features of social organization […] that can improve the efficiency of society by facilitating coordinated actions” (Putnam, 1993, p. 167). In essence, 'social capital' is the means by which people access resources of various kinds through interpersonal relationships. Social networks are the representation of these relationships. Social network analysis comprises a range of methods for studying the structure and influence of social networks.

1.2 Major authors and their disciplines
Concepts of social capital have been developed most notably by sociologists Pierre Bourdieu (1986), Robert Putnam (1993) and James S. Coleman (1988). Other social capital theorists include Fukuyama (2000), Loury and Portes (1998). Robert Putnam’s work on social capital is perhaps the best known – his popular books entitled ‘Bowling Alone’ (2001) and ‘Making Democracy Work: Civic traditions in modern Italy’ drew attention to the importance of history in developing cultures of voluntarism and organisational membership, which underpin economic development. James Coleman (1988) focused on the importance of social capital for producing human capital (i.e. the role that families play in ensuring the education and skill development of their children). Bourdieu focused on the different types of resources (economic, social and cultural) that can be accessed through social relationships, and the socialised access and interplay between these resources.

1.4 Brief history of how the theory has developed and been applied
Burt (2004) developed the concepts of ‘brokerage’ – innovations occurring through connections made between otherwise separate groups… 'bonding' versus 'bridging' social capital

Social capital became a mainstream concept within rural development studies in the 1990s. The term is widely used in international development (e.g. the World Bank, UNDP).

Social capital is linked to trust (e.g. that a reciprocal obligation will be met).

We also worked with network theory in PRO AKIS (e.g. Sutherland et al., 2017)

2.0 Application to the analysing the role of farm advisory services in innovation
2.1 Relevance to AgriLink Objectives

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Assess the diversity of farmers’ use of knowledge and services from both formal and informal sources (micro-AKIS), and how they translate this into changes on their own farms [WP2];

Develop and utilise cutting edge research methods to assess new advisory service models and their innovation potential [WP2];

Identify thoroughly the roles of the R-FAS (regional FAS) in innovation development, evaluation, adoption and dissemination in various EU rural and agricultural contexts [WP2];

Test how various forms of (national and regional) governance and funding schemes of farm advice i) support (or not) farmers’ micro-AKIS, ii) sustain the relation between research, advice, farmers and facilitate knowledge assemblage iii) enable evaluation of the (positive and negative) effects of innovation for sustainable development of agriculture [WP4];

Assess the effectiveness of formal support to agricultural advisory organisations forming the R-FAS by combining quantitative and qualitative methods, with a focus on the EU-FAS policy instrument (the first and second version of the regulation) and by relating them to other findings of AgriLink. [WP4].

At the applied level, the objectives of AgriLink are to:

Develop recommendations to enhance farm advisory systems from a multi-level perspective, from the viewpoint of farmers’ access to knowledge and services (micro-AKIS) up to the question of governance, also recommending supports to encourage advisors to utilise specific tools, methods to better link science and practice, encourage life-long learning and interactivity between advisors [WP5];

Build socio-technical transition scenarios for improving the performance of advisory systems and achieving more sustainable systems - through interactive sessions with policy makers and advisory organisations; explore the practical relevance of AgriLink’s recommendations in this process [WP5];

Test and validate innovative advisory tools and services to better connect research and practice [WP3];

Develop new learning and interaction methods for fruitful exchanges between farmers, researchers and advisors, with a focus on advisors’ needs for new skills and new roles [WP3];

 Guarantee the quality of practitioners’ involvement throughout the project to support the identification of best fit practices for various types of farm advisory services (use of new technologies, methods, tools) in different European contexts, and for the governance of their public supports [WP6].

2.2 How this can be applied/developed in AgriLink

Social network analysis draws attention to the nature of relationships between people.

Inclusion of actor-network approaches would also enable us to reflect on the role of material objects in advisory processes (particularly digital technologies).
2.5 Strengths and weaknesses/Sensitivities regarding use

Social capital gained popularity as a term because it puts a name to a resource that most people can easily recognise – social ties. However, critics identify issues with circular logic (e.g. that social capital leads to social capital) – it is far easier to identify where social capital exists than it is to develop effective measures to produce or increase it.

2.6 Potential operational problems

(e.g. theories may be ‘vague’ and difficult to operationalise, they may require labour-intensive data collection, may require data that are hard to get, etc.)

Social capital and social networks have a wide variety of meanings and applications. It will be important to ensure that AgriLink consortiums use consistent definitions in their empirical research and analysis.

References (to documents referenced in this template only)


24) Science and Technology Studies  
Author: Anda Adamsone-Fiskovica

1.0 General Overview of the Theory or Approach

1.1 Summary of the Theory, Approach or Topic

Based on disciplines like philosophy and history of science and technology, sociology of science and technology, sociology of scientific knowledge, innovation studies etc., the late 20th century saw the formation of a general interdisciplinary field of science and technology studies (STS) or social studies of science and technology (S&T). This discipline joins researchers from various branches of science sharing interest in processes occurring in the sphere of S&T and their impact on society (and vice versa), focusing on investigation of science as a social phenomenon. STS scholars aim to reveal the ways S&T shape human life and how society and culture influence the development of S&T both historically and nowadays. STS research covers a wide diversity of topic ranging from written and unwritten norms governing science, to the processes of scientific knowledge (co)creation and technological innovation, to public engagement in S&T development. Theoretical approaches developed within the frame of the disciplinary sphere of STS (also sociology of science and technology) int. al. focus on issues of institutionalisation, public understanding, public communication, and governance of science. STS generally provides an academic platform for investigation and critical reflections on the diverse social, cultural, economic and political processes taking place both within the scientific community and in a wider society regarding the developments in the domain of science and technology.

1.2 Major authors and their disciplines

STS represents a very broad and diverse interdisciplinary field bringing together sociologists, anthropologists, historians, philosophers, political scientists, communication specialists and other researchers and practitioners interested in the social aspects of science and technology, int. al. placing the scientific expertise in a wider social, historical and philosophical context. (See, for instance, the website of the European Association for the Study of Science and Technology (EASST): https://easst.net/).

1.3 Key references


1.4 Brief history of how the theory has developed and been applied

Origins of STS can be traced back to the beginning of the 20th century and the idea of the social origins of knowledge (socially agreed rules/principles governing the actions and
reasoning of different societies), which lead to the development of the sociology of knowledge int. al. represented by Emile Durkheim, Karl Mannheim, Max Scheler and Karl Marx. The 1940ties-50ties witnessed a pronounced interest in science as a specific domain of knowledge and system of rules that gave birth to the (traditional or institutional) sociology of science founded by Robert King Merton focusing on the organisational and functional aspects of science (incl. scientometrics). An important turning point in this analysis was marked by shifting attention to the conditions of scientific knowledge production stimulated by ideas developed by scholars in philosophy and history science in the 1960ties (e.g. Karl Popper, Thomas Kuhn). Their social analysis of scientific knowledge emphasised the temporal status of this knowledge in a given society and/or period of time, whereby they are prone to be replaced by new knowledge either in evolutionary or revolutionary way (paradigm shift). These ideas set the ground for a renewed interest in the sociology knowledge represented by representaties of the so-called phenomenological sociology of knowledge (e.g. Peter Berger and Thomas Luckmann) looking into the ways different kinds of knowledge (incl. scientific one) gain their status in a society.

Since 1970ties there has been a further shift towards sociological analysis of the very contents of science (concepts, data, theories, methods) in the framework of the so-called new sociology of science or sociology of scientific knowledge (e.g. “Edinburgh school”, “Bath school”), dealing specifically with the role of social and historical conditions determining the fate of competing scientific ideas and the social construction of scientific facts (e.g. Steven Shapin, David Bloor, Barry Barnes, Harry Collins, Bruno Latour, Steve Woolgar, Karin Knorr Cetina). The 1980ties were characterised by the so-called technological turn in STS aiming to apply the afore-mentioned ideas also to the domain of technology by means of analysing the technological change, process and outcome of technological innovation, its societal implications (e.g. theories of social shaping of technology, social construction of technology; Donald MacKenzie and Judy Wajcman, Viebe Bijker, Trevor Pinch, Thomas P. Hughes).

An important role in STS research nowadays is played by studies on public understanding of science and technology (incl. the relation between lay and expert knowledge) as well as public communication of S&T, citizen engagement and governance of S&T (e.g. John Durant, Brian Wynne, Martin Bauer, Alan Irwin, Sheila Jasanoff, Bruce Lewenstein, Massimiano Bucchi). There has been a gradual shift from the traditional positivist to the more critical interpretative approach in the treatment of science-society relations, which implies a move away from expert monopoly over what counts as valid and useful knowledge towards wider stakeholder engagement in setting the research agenda and contributing to the production of scientific knowledge. This reasoning has thus provided room for more interactive and dialogue-based practices of knowledge co-creating and more democratic forms of science governance.

While the domain of agricultural research and practice has not been the primary focus area of STS scholars, the ideas developed in this interdisciplinary field can and have been successfully applied also in studying the role of different stakeholders in the agricultural knowledge and innovation system. While more focused on the environmental issues, a notable example is represented by the seminal study by the STS scholar Brian Wynne on the clash between expert knowledge of scientists and the officially underestimated lay knowledge possessed by local sheep farmers in Northern England (Cumbria) when analysing and developing recommendations for managing the ecological and agricultural situation after the radioactive contamination of soil allegedly caused by the nuclear accident at Chernobil in 1986 (Wynne 1996).

1.5 Basic concepts

Social construction of science and technology; Expert-lay knowledge divide; Public understanding of science; Public communication of science; Science governance.
The diagram below represents a synthesis of the prevailing models in the domain of STS research regarding the conceptualisation of science-society relations in terms of public understanding of S&T, public communication of S&T, and S&T governance. While one spectrum of these bipolar models (A) is united by emphasis laid on epistemological and cognitive superiority of science over other forms of knowledge and their agents, its self-sufficiency and asociality, the other one (B) is characterised by the position that provides for complementarity of various forms of knowledge and agents, their equal significance and legitimacy in determining the progression of S&T, within the frame of different flexible competencies inherent to these groups of agents.


2.0 Application to the analysing the role of farm advisory services in innovation

2.1 Relevance to AgriLink Objectives

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<td>X</td>
<td>Develop a theoretical framework utilising a multi-level perspective to integrate sociological and economic theories with inputs from psychology and learning studies; and assess the functions played by advisory organisations in innovation dynamics at multiple levels (micro-, meso-, macro-levels) [WP1];</td>
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<td>X</td>
<td>Assess the diversity of farmers’ use of knowledge and services from both formal and informal sources (micro-AKIS), and how they translate this into changes on their own farms [WP2];</td>
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<td>X</td>
<td>Develop and utilise cutting edge research methods to assess new advisory service models and their innovation potential [WP2];</td>
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<td></td>
<td>Identify thoroughly the roles of the R-FAS (regional FAS) in innovation development, evaluation, adoption and dissemination in various EU rural and agricultural contexts [WP2];</td>
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<td>X</td>
<td>Test how various forms of (national and regional) governance and funding schemes of farm advice i) support (or not) farmers’ micro-AKIS, ii) sustain the relation between research, advice, farmers and facilitate knowledge assemblage iii) enable evaluation of the (positive and negative) effects of innovation for sustainable development of agriculture [WP4];</td>
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<td>Assess the effectiveness of formal support to agricultural advisory organisations forming the R-FAS by combining quantitative and qualitative</td>
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methods, with a focus on the EU-FAS policy instrument (the first and second version of the regulation) and by relating them to other findings of AgriLink. [WP4].

At the applied level, the objectives of AgriLink are to:

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<td><strong>X</strong></td>
<td>Develop recommendations to enhance farm advisory systems from a multi-level perspective, from the viewpoint of farmers’ access to knowledge and services (micro-AKIS) up to the question of governance, also recommending supports to encourage advisors to utilise specific tools, methods to better link science and practice, encourage life-long learning and interactivity between advisors [WP5];</td>
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<td><strong>X</strong></td>
<td>Build socio-technical transition scenarios for improving the performance of advisory systems and achieving more sustainable systems - through interactive sessions with policy makers and advisory organisations; explore the practical relevance of AgriLink’s recommendations in this process [WP5];</td>
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<td><strong>X</strong></td>
<td>Test and validate innovative advisory tools and services to better connect research and practice [WP5];</td>
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<td><strong>X</strong></td>
<td>Develop new learning and interaction methods for fruitful exchanges between farmers, researchers and advisors, with a focus on advisors’ needs for new skills and new roles [WP3];</td>
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<td><strong>X</strong></td>
<td>Guarantee the quality of practitioners’ involvement throughout the project to support the identification of best fit practices for various types of farm advisory services (use of new technologies, methods, tools) in different European contexts, and for the governance of their public supports [WP6].</td>
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2.2 How this can be applied/developed in AgriLink

The broader STS framework can be used to investigate the relations between different kinds of knowledge possessed by various stakeholder groups in the agricultural knowledge and innovation system and the way this knowledge (incl. science-based) is being validated, communicated and applied. It would be useful to draw on the vast insights from STS research on public communication of science and public understanding of science to assess and to develop efficient and inclusive communication tools in the domain of farm advisory services.

2.3 Research questions relevant to AgriLink

- What is the role played by and the status of scientific research as a source of knowledge for farmers and for agricultural advisors?
- What model of public communication of science (diffusion vs. dialogue-based) is underlying a given form of advisory service?
- How local/lay/folk knowledge (also feedback to advisors) of farmers is incorporated in the provision of farm advisory services and in setting the agricultural research agenda? Is there any room for a co-production of knowledge by different stakeholders?
- What are the factors facilitating and hindering farmer-advisor-researcher collaboration?

2.4 Methodological implications
Research carried out in the framework of STS employs a wide diversity of research methods – both quantitative and qualitative. Micro-sociological STS studies make more extensive use of in-depth interviews, participatory observations (in various communities, events), diaries. Other methods commonly used are focus group discussions, as well as document analysis (originating from both historical and modern sources) and discourse analysis. A common methodological approach is represented by case studies. STS research into public understanding and perception of science is also based on population surveys of various scales. Quantitative data analysis covers also the use of data on patents, scientific publications and other S&T indicators.

In the context of AgriLink the use of the more micro-sociological approaches and qualitative research methods to studying the formats and contents of interactions between various agents (as carriers of different kinds and forms of agricultural knowledge) could prove to be highly valuable.

2.5 Strengths and weaknesses/Sensitivities regarding use

The STS perspective requires the component of scientific (research-based) knowledge and/or technological innovation to be present in the domain under investigation, which should not be a problem in the case of farm advisory services that largely serve as an intermediary between agricultural research and practice and thereby represents an interesting arena for studying the involved processes of knowledge exchange.

2.6 Potential operational problems

Since the STS field covers a wide diversity of topics, approaches, perspectives, theories and authors, it would require selecting a more focused sub-set of key concepts (to some extent attempted in section 1.5) and match those to specific research questioned aimed to be addressed by AgriLink.

Optional Section 4: Recommended further reading


25) Sustainable Development
Boelie Elzen, with inputs from Bram Bos and Rob Burton

1.0 Introduction

One of the expected impacts of the AgriLink project, as specified in the Call from the EU H2020 Work Programme (EC, 2105), is to provide an "improved understanding of farmers' decision-making processes across the EU and the impact of advice/advisory services on the sustainability of agricultural practices". In another expected impact the Call specifies that AgriLink should develop "suggestions for governance approaches and public policy mechanisms ... to support the transition to more sustainable and climate-smart agriculture". Hence the call explicitly specifies that AgriLink should study the farming advisory system within the context of its contribution to making agriculture more sustainable.

Advisors' short- and long-term influence on farm decisions, their impartiality and the way practical knowledge is kept public and conserved in the longer term are determined by how various types of advisors are embedded in their national or regional AKIS, by how public and private advisory services interact, and by the type or combination of financing sources they use. This complex relationship is governed by public policies at national, regional and EU levels and increasingly impacts whether and how society moves towards more sustainable agricultural systems. This raises the question of how the notion of sustainability or sustainable development can best be operationalised in the project.

The term 'sustainable development' was coined in 1987 by the World Commission on Environment and Development, also known as the Brundtland Commission (WCED 1987). The WCED used the following definition:

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

In this definition Sustainable Development describes a discrete characteristic: either it's there or it's not. Any activity that has any negative effect is not sustainable by definition. Semantically, in the WCED view sustainability has a static meaning which, at the same time, all-encompassing. In this view, sustainable agriculture should be sustainable in any respect. Sustainability is like being pregnant: one cannot be a little bit pregnant.

The Brundland report has spurred an enormous array of activities, in research as well as in practice. It appeared that the WCED definition had the charm of simplicity but was anything but practical. Dozens of definitions have been developed since, many of which share two important characteristics that deviate from the initial definition:

Rather than being objective, sustainability is an inherently normative concept, implying that different opinions will exist concerning what it entails;

Rather than being all-encompassing, the definition of what is sustainable in a concrete case is time-dependent and (partially) situation dependent.

Though it thus seems that sustainability could mean anything (and examples of 'perverse' operationalisations of sustainability indeed abound), in many cases it has proven to be a useful heuristic to induce innovation processes towards more sustainable practices. In many

practical situations it appears that a useful distinction can be made between what is more sustainable and what is less sustainable.

2.0 Definitions of sustainability

There are at least 50 different definitions and circumscriptions the concept of “sustainability” (Faber et al., 2014) and, as a result, it is regularly subject to critique. For example, the concept is seen as being confused (Bolis et al., 2014), in a state of “conceptual chaos” (Vallance et al., 2011) or vague and it is often used in meaningless ways (Simmons et al., 2017). The more specific concept of “sustainable agriculture” has similar problems. Even early in its use, researchers noted that it was vague and thus easily adopted by special interest groups (Keeney et al., 1994) as well as being dependent on subjective visions of what sustainable agriculture should look like (Hansen, 1996). Although often addressed, this problem has not been resolved over time. Velten et al. (2015) recently reviewed the literature in an attempt to provide a comprehensive definition of ‘sustainable agriculture’. They concluded that the current concept of sustainable agriculture “cannot be streamlined” into a single definition because of its varied and contradictory aspects.

Many publications cite the US Department of Agriculture’s definition from the 1990 Farm Bill as the most comprehensive and accepted single definition of sustainable agriculture (e.g. Aldey et al., 1998; Hilden et al., 2012; Schaffril, 2012; Velten et al., 2015). This defines sustainable agriculture as an integrated system of plant and animal production that should

- satisfy human food and fibre needs;
- enhance environmental quality and the natural resource base upon which the agriculture economy depends;
- make the most efficient use of non-renewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls;
- sustain the economic viability of farm operations; and
- enhance the quality of life for farmers and society as a whole.

References in European Union documents have various emphases. The 1999 communication “Directions towards sustainable agriculture” (EC, 1999) has a strong focus on environmental sustainability, suggesting that sustainability is about balancing the use of natural resources for long-term agricultural production with the protection of the environmental and cultural heritage in line with society’s values. As a result, according to Binder et al. (2010), much research into sustainability of agriculture has focused on environmental sustainability and neglected both the economic and social aspects of agriculture. However, the 2012 brochure “Sustainable agriculture for the future we want” (EC, 2012, 2) employs a triple bottom line approach to sustainability, defining sustainability as going beyond a purely environmental issue to include economic viability as well as social acceptability such that:

“The delivery of public goods such as environmental benefits is closely interlinked with the capacity of agriculture to be economically sustainable, generate adequate family income, and be socially sustainable. The thrust is to improve the quality of life in rural areas.”

A recently emerged concept within the sustainability field is that of “sustainable intensification” (also termed ‘ecological modernisation’ and ‘eco-efficiency’; Tittonell, 2014). A 2014 report commissioned by the RISE foundation for the EU (Buckland et al., 2014) describes sustainable intensification as to involve the simultaneous improvement of productivity and environmental management such that yields are increased without adverse environmental damage. This concept is being promoted by the EU, for example, in the recent establishment of a European Training Network (2016-2020) to train 15 early stage researchers in managing the soil and water impacts of agriculture for sustainable intensification. While Schiefer et al. (2016) contend that within the EU 40% of agricultural land is suitable for sustainable
intensification, other researchers are strongly critical of the concept, suggesting it constitutes only a "slight greening" of the industrial agricultural model and thus is essentially meaningless (e.g. Altieri et al., 2017).

In AgriLink we take the starting point that agriculture cannot be sustainable unless it is economically viable. Hence, we will move beyond the earliest definitions of sustainability as purely an environmental issue and incorporate wider concepts of sustainability. To achieve this we start from the triple bottom line or three pillars of sustainability model (e.g. Maxey, 2006; Kuhlman & Farrington, 2010; Sardain et al., 2016). This model has its early origins in the Brundtland report (WCED, 1987) and suggests that there are three main dimensions to sustainability, the triple P model: social sustainability (people), environmental sustainability (place or planet) and economic sustainability (profit) with sustainability being achieved when these three pillars are balanced such that all can be maintained simultaneously in the long term (Murphy, 2016). Although some researchers have argued for changes to the model (e.g. the inclusion of cultural sustainability as a pillar (Soini & Birkeland, 2014) or incorporating three dimensions to the "place" pillar (Seghezzi, 2009), while others have suggested that the distinction between the pillars is “conceptually fuzzy” (Kuhlman & Farrington, 2010), this model has been widely used in the sustainable agriculture literature (e.g. Rasul & Thapa, 2004; van Calker et al., 2005; van Cauwenbergh et al., 2007) and provides a practical, though not perfect, solution to conceptualising sustainability.

3. Sustainable agriculture and innovation

Developing a practical means of assessing whether development is sustainable has proved extremely difficult. Sardain et al. (2016) argue, for example, that over 20 years after sustainability was identified in Agenda 21 as a principal objective for nations, there is anything but agreement on how to measure sustainability. Tait and Morris (2000, 253) identify a similar issue with agricultural sustainability noting that “precise, repeatable and value free” measures of sustainability are required if sustainability is to become a useful concept for farming systems. This issue is even more problematic on the individual innovation level. On the one hand, innovation is critical to the development of an agriculture that is both productive and sustainable. The level of innovation itself can even be an indicator of the long term sustainability of farms since meeting sustainability objectives requires constant innovation (Ryan et al., 2016). On the other hand, however, the extent to which innovation contributes to sustainability is extremely difficult to measure as it is the collective effect of innovativeness that determines the sustainability of the farming system as a whole, not the characteristics of any individual innovation. The systemic nature of agriculture means that it is the overall performance of the system that determines its “sustainability” and this depends on many interrelated factors that differ among systems and that change over time (Ripoll-Bosch et al., 2012). Therefore, as Pretty (1994, 39) observes, there is no “fixed set of practices or technologies” that will necessarily lead to sustainable agriculture.

For AgriLink, a key problem is that farming advice typically addresses individual farmers while sustainable agriculture should be defined at the farm system level (Frater & Franks, 2013; Ryan et al., 2016). Thus the focus of the study on the advisory system and the objective of assessing innovation for sustainable agriculture are not easily compatible. As Ryan et al. (2016, 116) put it with respect to innovation for sustainability:

“Research and business [and farming advice; add. by authors] provide inputs into farm-level innovation, but actual innovation only occurs when farmers put something new into use.”

Consequently, sustainability can only be accurately assessed through observing how the innovation is applied within the overall farm system, not by assessing any characteristics of the innovation itself at the farm where it is initially applied. Even innovations that appear to be focused solely on profitability and could be used in a manner that promotes unsustainable
land use may yet contribute to sustainability when applied to a farming system in a sustainable manner.

A further problem for assessing innovation’s contribution to sustainability relates to the stage in the development process at which the sustainability of innovations is often assessed. In their review article on strategic niche management, Schot & Geels (2008) observe that new agricultural innovations with “sustainability promise” tend to be crude and inefficient when they are recognised as ‘innovative’, implying that they are unable to compete immediately with established technologies. Furthermore, many farmers initially are unwilling to make a transition to new and more sustainable approaches because of “… (perceived or real) increased economic risk, including the cost of materials and equipment, the uncertainty of profitability and potential reduction in yields” (Teschner et al., 2017, 99). This has consequences for any assessment of the sustainability potential of innovations as innovations that promote sustainability may not be adopted in the short term, however large the ‘theoretical’ potential is. The necessity of being put into use on the farm for the innovation to become evident (Ryan et al., 2016) suggests that the true extent to which innovations contribute to sustainability may only be assessible years after they have been initially demonstrated.

4.0 AgriLink’s conceptual approach to assessing agricultural sustainability

AgriLink focuses on the role of the farming advisory system. But it will do so within the overall context of stimulating sustainable development in agriculture. This implies that in assessing sustainability, AgriLink in fact has two tasks:

Assess which sustainability objectives farming advisors use in their interaction with farmers, how they do so and how this affects the decisions taken by farmers.

Assess the effect that the previous point has on sustainable development in the farming system at large, taking into account the AKIS context in which this takes place.

Each of these tasks will be briefly discussed below.

5.0 Role of sustainability in farming advice

Farming advisors will not use the complex type of assessments of sustainability that researchers work with. Their use will be based on fairly simple models and in a very practical way. This implies that in mapping how they approach sustainability (via the AgriLink cases studies) we can probably also use fairly simple schemes

A number of studies have proposed that overall agricultural sustainability can be assessed by considering whether the system achieves a balance between economic, environmental and social dimensions of sustainability (e.g. Meul et al., 2008; Bezlepkina et al., 2011; Bachev, 2017). Others have suggested that bottom up participatory assessments of sustainability are most effective at assessing the relationships between the sustainability pillars and therefore any integrated assessment of agricultural sustainability in multi-functional agriculture (Binder et al., 2010; Rippoll-Bosch et al., 2012). However, others still have tried to develop quantitative measures of integrated sustainability (e.g. Bachev, 2017).

In AgriLink we propose to gather information on sustainability from within a broader set of objectives that advisors may, either implicitly or explicitly, seek to realise in their interaction with farmers, including:

- Strengthen the farming community (Social pillar)
- Assist farm families (Social pillar)
- Local economic development (Economic pillar)
• Profit/Financial (Economic pillar)
• Improved environmental conditions (Environmental pillar)
• Nature conservation (Environmental pillar)
• Competitiveness/Productivity (Economic pillar)

Note: we need to discuss this list in some depth to ensure this is indeed the list we need.

From this we do not intend to develop an overall integrative numerical measure of ‘contribution to sustainability’ for each innovation that an advisor provides advice on. However, what we can explore is which sustainability measures are important considerations for advisors in their interaction with farmers.

Although advisors themselves may use rather simple models, to assess these models, how they are applied and their impacts, the AgriLink analytical framework will use a more refined scheme to categorize how they deal with sustainability. In this framework we will address the following aspects:16

• **Unit of analysis:** farms vs. ‘agro-food systems’: to what extent do advisors focus on the farm (farming procedures, use of pesticides, husbandry system, etc.) or do they also address wider aspects of the whole agro-food chain, such as raw materials, transport of these materials and produce (including animals), production of food, etc.?
• **Static or dynamic criteria:** Do advisors use a fixed set of parameters to measure sustainability that are taken to be valid now and in the future? Or do they leave room for adaptation of parameters on the basis of new future insights and considerations.
• **Sustainability versus sustainable development:** Do advisors see sustainability as a situation at a certain point in time or do they see it as a continuous process of making things more sustainable?
• **Discrete or gradual:** Do they distinguish between sustainable and non-sustainable situations or do they see it as a gradual concept in which things can be sustainable to a certain extent, e.g. a percentage.
• **Absolute versus relative:** Do they define sustainability in absolute terms that defines the situation at a specific farm as sustainable, independent of the situation at other farms? Or do they ‘measure’ the degree of sustainability in relation to other farms.
• **Attainable versus desirable:** Do they define sustainability (implicitly or explicitly) in relation to what is considered attainable? Or do they define it in relation to what is considered desirable, independent of what is considered attainable? In the latter case, do they think of a process of intermediate steps that are considered attainable?
• **Goals versus means:** Do they see sustainability in terms of the goals to be achieved, e.g. emissions of ammonia lower than a certain threshold? Or do they define it largely in terms of concrete means and measures, e.g. equipment, substances, procedures?
• **Range:** single issue, connected, or integral. Do they relate sustainability to a single issue (e.g. environment), to connected issues (several issues, e.g. environment and animal welfare) or do they see it as all-encompassing or “integral” (spanning all relevant sustainability dimensions, including environmental, societal and economic dimensions).

Note: we should also discuss this list in some depth to ensure this is indeed the list we need.

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16 Based on and adapted from Bram Bos, 7 October 2011. “Memo integrale duurzaamheid voor UDV”, v2.1 (Memo on integral sustainability for UDV; UDV = Dutch Action Plan for Sustainable Animal Production).
6.0 Assessing sustainable development of the farming system

As an overall objective, AgriLink should contribute to the development of sustainable agriculture at large. Above, we have argued it is more appropriate and practical focus on 'sustainable development' as a continuous process rather than on sustainability as a state of affairs with concrete characteristics. This emphasises the importance of innovation as a continuous process to realise sustainable agriculture. In this, innovation does not just refer to the creation of novelty but, equally important, also to the uptake of this novelty by the larger farming community. And, as is argued in ##,17 this uptake is an active process in which the novelty undergoes further change to be made to work in the farming context of larger groups of farmers.

This uptake takes place within the context of the prevailing (regional, national) AKIS that can have an substantial (stimulating or impeding) effect on the wider process of sustainable development. To characterise the 'sustainability pressure' coming from this AKIS we can largely use the same parameters as were listed above for individual advisors with the important difference that these parameters are now operationalised at the farming system level. These parameters are (excluding some that are only relevant at the farm level):

- Static or dynamic sustainability criteria;
- Focus on sustainability or sustainable development;
- Is sustainability seen as discrete or gradual;
- Attainable versus desirable objectives;
- Defining goals versus defining means;
- Range of sustainability dimensions: single issue, connected issues, or integral sustainability.

These factors are largely descriptive, helping to map what goes on. Next to that, we can identify a number of parameters that are more prescriptive which derive from insights in innovation processes, more specifically innovation for sustainability. These are not without problems, though, and each of them is associated with one or more dilemma's. These parameters include:

It is wise to set ‘integral sustainability’ as a long-term goal but to seek and achieve that via concrete intermediary steps which in themselves will not be ‘integrally sustainable”.

**Dilemma:** Keeping ‘integral sustainability’ as a longer-term vision helps to keep the objective alive to strive for improvements that may not seem very realistic in the near term. On the other hand, to make a sense of urgency tangible for stakeholders requires the formulation of attainable near-term steps. The dilemma is what to emphasise: the progress that has been made or the remaining gap that needs to be bridged.

It is better to define goals rather than means to stimulate diversity of approaches and appeal to the innovative power of various stakeholders.

**Dilemma:** goals may often be general and not very specific. This will make it complicated to monitor (lack of) progress.

The primary goal of stimulating sustainable development should be to spur a wider process of change and innovation, taking into consideration the factors that stimulate this process and ones that impede. Only in the second place should it set concrete targets.

**Dilemma:** this stimulates the innovative activities by farmers and other stakeholders but may make it difficult to provide legitimation for public funding that usually require measurable targets. It may also make it more complicated to provide guidance on the courses taken.

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17 Cf. the section on MLP in the CF.
Innovation studies have shown that what is considered attainable may vary widely across stakeholders. A small group of ‘innovators’ tend to tinker with changes that most others consider unrealistic. Once these innovators have demonstrated a novelty to work in practice, however, others (the ‘followers’) may follow. The definition of sustainability should acknowledge these different roles.

**Dilemma:** This makes the definition and governance measures derived from it complicated. Politically it is often difficult to target different groups from the same population with different instruments.

By a clever combination of the descriptive and prescriptive parameters above in the analysis of our case studies we can both analyse how the system works as well as develop recommendations on how the farming advisory system may be improved as to improve its contribution to the development of sustainable agriculture.

**References**


26) Systems and complexity

Author: Andy Lane

1.0 General Overview of the Theory or Approach

1.1 Summary of the Theory, Approach or Topic

Both 'systems' and 'complexity' are terms used in everyday discourse but have more specific connotations within and across academic disciplines.

Systems thinking (or systems practice or systems thinking in practice) is an approach to thinking about and acting in the world that recognises interconnections and contexts by creating systemic (holistic) representations of what 'we' perceive about situations. It is a particular way of approaching the understanding of messy or complex situations for some purpose, usually to effect some changes. It is very suited to participatory, action-oriented research; is complementary to more systematic, reductionist methods embodied in the scientific approach; and is informed by many different disciplines and fields of inquiry. In essence systems thinking in practice deals with: understanding inter-relationships, engaging with multiple perspectives and reflecting on boundary judgements.

Complexity is both a theory and a topic in that complexity sciences uses mainly quantitative methods and models to represent large, complex, rational, non-linear, dynamical 'systems' that exhibit unpredictable, stochastic or chaotic behaviours while systems thinking in practice largely views complexity as being a property perceived by the observer (a mix of rational and emotional responses to messy or complex situations) rather than as a defined property of the situation itself.

A key feature of systems thinking in practice is to use diagrams to represent 'systems of interest' and/or collate multiple perspectives on such 'systems of interest'. The apostrophes indicate that epistemologically different disciplines can take more positivist (this is a system for...) or more constructivist (I see this as a system for...) approaches in their thinking and actions.

1.2 Major authors and their disciplines

As noted above both 'topics' are employed across a wide range of disciplines over many decades, with a number of key writers supported by many followers and other researchers and practitioners. For systems thinking in practice I make no apologies for listing 3 key books here written by colleagues of mine at The Open University, books which are central to our Masters programme in Systems Thinking in Practice, but also two more accessible books or sources by Armson and Meadows respectively. They between them provide guides to a wealth of authors. If these are longer and more detailed than expected then there are any number of both popular and academic books on complexity, complexity theory and complexity science but I do not list any as I instead focus this primer on the ‘systems thinking in practice’ views of complexity rather than these more ‘scientific’ views of complexity.

1.3 Key references (3 to 5 maximum, ideally overview papers if these exist)


Meadows, D. Thinking in Systems - see Donella Meadows project, http://donellameadows.org/

1.4 Brief history of how the theory has developed and been applied

Evolution of systems thinking in practice

This can be quickly summarised in the following diagram from Ison (2010) which outlines the 'Influences that have shaped contemporary systems approaches and the lineages from which they have emerged' and some key writers in each of the lineages:

Ison’s viewpoint is explicitly ‘partial’ in the dual sense of the term: firstly, he does not claim to be exhaustive of all systems thinking ideas; and secondly, he is openly biased towards his own privileging of particular trajectories and the importance of particular named systems practitioners. Its heuristic value as a diagram here is in depicting not only some key historic lineages but also some distinctions on the way in which the systems idea can be used for understanding and managing complex issues, most notably in the axis/continuum on the right side of the diagram which highlights whether those people and associated approaches think of systems as epistemological devices for providing perspectives on the world we experience or whether they seem them as ontological realities, out there in the world (see more on this in the next section).

How systems thinking in practice (for managing complexity) has been applied

Systems thinking practitioners use a number of tools, techniques and skills borrowed from other disciplines, developed within systems thinking itself or derived from practical experiences to represent, understand and design interventions within systems of interest. These tools, techniques and skills are also components of a number of methods (codified use of tools as 'techniques'), approaches (a set of theories/assumptions that have informed the development of methods) and methodologies (the conscious braiding of theory and practice in a given context). A key feature is that one part of the praxis around systems thinking is finding ways of representing a chosen 'system of interest' as a mental construct rather than existing out there in the world, and that is often best done through diagrams, maps or other visual techniques.

Whether systems thinking in practice (for managing complexity) has been utilised to consider AKIS and/or agricultural innovation[1]

The simple answer is yes and has been done so by many of the folk involved in AgriLink or their close associates. The list of publications below is a very small sample from a 5 minute search on Google Scholar for articles on 'systems thinking and AKIS', with notable groups of scholars in Europe, Australasia, North America and Southern Africa. Of course the systems tools and techniques, methods and methodologies that each set of researchers has applied in their studies and to what extent will differ in some way.


Two well-known writers in this area are Richard Bawden and Niels Röling:


To these I can add the theses of two doctoral students I helped supervise, one of which has been published, the other accepted subject to revisions that will be completed shortly:


O’Flynn, P. (2017) From Knowledge to Invention: Exploring User Innovation in Irish Agriculture

1.5 Basic concepts

Complexity and uncertainty can be features of any human activity system but this is more so when considering many larger scale agriculture situations (Ison, 2010). The number of facts and factors involved, the number of people with different perspectives and disciplinary expertise, all grow larger and seemingly more intractable. To be able to represent a complex messy situation by showing most of the components and how they are thought to fit and work together is therefore very helpful when understanding, researching, designing and implementing systemic changes that draw upon and integrates the thinking from many disciplines.

Drawing on some basic features of systems thinking, there are three generic elements underpinning systems thinking in practice:

- understanding inter-relationships (‘thinking’ about the bigger picture)
- engaging with multiple perspectives (the ‘practice’ of joined-up thinking)
- reflecting on boundary judgements (the praxis of thinking in practice).

Something which connects these three elements is finding ways of representing a chosen ‘system of interest’, and that is often best done through diagrams, maps or other visual techniques. At the Open University we believe that representing ‘systems of interest’ using visual techniques is therefore an essential part of any participatory and action-oriented researcher’s personal toolkit (Armson, 2011).

In identifying ‘systems of interest’ in any particular situation it is helpful to appreciate three broad areas in which ‘systems’ are generally understood and used by people, practitioners and academics alike:

- Natural systems — individual living organisms or wider biophysical entities like ecosystems, the planet Earth or the solar system.
- Engineered (purposive) systems — mechanical equipment, vehicles, computers, heating or irrigation systems etc., and
- Human (purposeful) systems — organizations (agricultural advisory agencies, NGOs, government departments, community services etc.), the food economy, agricultural education, agricultural policies, programmes, projects, etc.
Across these three broad areas the first two are usually approached using more systematic and scientific methods and methodologies as the systems are more often seen as ontological realities (see diagram above) while the third area is more often treated through a systemic lens where the representation of the system of interest is used as an epistemological device and the systemic inquiry framed as supporting a learning system (Checkland, 1999; Blackmore, 2010). Of course any such typology is subject to challenge and in recent years there has been much interest in social-ecological and socio-ecological systems which tend to merge the first and third types mentioned here and which also bring to the fore the tensions between those disciplines focusing on ecosystems and earth systems as real entities with those disciplines focussing on human activities who take a more fluid focus on ‘systems of interest’.

The core systems concept is that of an adaptive whole (a ‘system of interest’) with irreducible properties that is able to create and maintain itself in response to its changing environment (Checkland, 1999). Such wholes can be regarded as complex adaptive systems or more simply defined as a collection of entities that are seen by someone as interacting together to do something (Morris, 2009). The underlying philosophy of purposeful systems thinking is to be holistic, to look for wholes at the highest appropriate level, rather than to reduce things to ever smaller components. This concept is both simple to state and yet complex to enact because of differing philosophical and practical approaches to the concept of a system.

Given this simple definition of a system and noting the three elements of systems thinking in practice noted above it is not surprising that graphical/diagrammatic/visual representations of systems of interest are a common and widely used tool or technique for representing a chosen ‘system of interest’ by visually showing relationships and boundaries in ways that can stimulate and support the sharing of multiple perspectives and to work towards more informed actions. Many believe that representing ‘systems of interest’ using visual techniques is therefore an essential part of any participatory and action-oriented researcher’s personal toolkit particularly as diagrams can include both rational thoughts and emotional feelings and where the participants are seen as co-researchers who have some stake in the conception, design, implementation and/or reporting of the research and some stake in implementing any outcomes or recommendations that arise from that research (Oreszczyn and Lane, 2017 – shameless plug!).

2.0 Application to the analysing the role of farm advisory services in innovation

2.1 Relevance to AgriLink Objectives

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<td>Assess the diversity of farmers’ use of knowledge and services from both formal and informal sources (micro-AKIS), and how they translate this into changes on their own farms [WP2];</td>
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Test how various forms of (national and regional) governance and funding schemes of farm advice i) support (or not) farmers' micro-AKIS, ii) sustain the relation between research, advice, farmers and facilitate knowledge assemblage iii) enable evaluation of the (positive and negative) effects of innovation for sustainable development of agriculture [WP4];

Assess the effectiveness of formal support to agricultural advisory organisations forming the R-FAS by combining quantitative and qualitative methods, with a focus on the EU-FAS policy instrument (the first and second version of the regulation) and by relating them to other findings of AgriLink. [WP4].

At the applied level, the objectives of AgriLink are to:

- Develop recommendations to enhance farm advisory systems from a multi-level perspective, from the viewpoint of farmers’ access to knowledge and services (micro-AKIS) up to the question of governance, also recommending supports to encourage advisors to utilise specific tools, methods to better link science and practice, encourage life-long learning and interactivity between advisors [WP5];
- Build socio-technical transition scenarios for improving the performance of advisory systems and achieving more sustainable systems - through interactive sessions with policy makers and advisory organisations; explore the practical relevance of AgriLink’s recommendations in this process [WP5];
- Test and validate innovative advisory tools and services to better connect research and practice [WP5];
- Develop new learning and interaction methods for fruitful exchanges between farmers, researchers and advisors, with a focus on advisors’ needs for new skills and new roles [WP3];
- Guarantee the quality of practitioners’ involvement throughout the project to support the identification of best fit practices for various types of farm advisory services (use of new technologies, methods, tools) in different European contexts, and for the governance of their public supports [WP6].

2.2 How this can be applied/developed in AgriLink

From this account of ‘systems’ and ‘complexity’ arising from my professional history I can see both a strategic and a tactical level application of systems and complexity within AgriLink.

The strategic level application would be around using the concepts and terminology briefly set out here as one of the overarching frames for the project. At the moment the Multi-Level Perspective is proposed as an overarching framework and I am not suggesting dropping that. Rather I am proposing that the MLP can be more explicitly stated as fitting within a systems thinking in practice frame and that it is being used to deal with the perceived complexity of this messy and complex situation across Europe. This could include developing/adapting/evolving the diagrammatic as well as textual representation of the MLP; critiquing other such diagrams in the literature as to whether and how they portray systems of interest, such as the general view of AKIS (Figure 1) or more contextualised representations of AKIS (Figure 2); and/or developing new diagrams to represent key features of our research. But equally there are other potential uses of systems theories and concepts that could be used if thought appropriate to AgriLink.

The tactical level application would be to collectively decide whether and how we use diagrams as specific tools for capturing our own thinking and experiences during the projects and for eliciting evidence from formal participant and others e.g. in the Living Labs (the request to
provide spray diagrams or rich pictures for each LL at the kick-off meeting is an example of capturing and sharing perspectives/information/evidence which can also be record of changes if repeated periodically during the project lifespan). If nothing else we need to be very critical and self-reflective on how we use diagrammatic representations, which is something that could also feature within monitoring and evaluation activities.

2.3 Research questions relevant to AgriLink
I do not see how the main concepts of systems and complexity can be used to directly inform the research questions. There are a number of research questions that flow from my own (and colleagues) use of systems concepts in practice around ‘AKIS’ which I will feed in separately.

2.4 Methodological implications

Types of methods typically associated with the theory or approach
As I have already noted these are numerous but the use of visual representations is one that needs discussing further

Implications for specific workpackages (e.g. sampling, data collection, research questions)
Again, as already noted, some data collection could be facilitated through the use of diagrams but equally diagrams could also play a part in monitoring and evaluation activities.

2.5 Strengths and weaknesses/Sensitivities regarding use
None beyond those mentioned elsewhere.

2.6 Potential operational problems
The use of visual representations/diagrams does not suit all researchers or all participants which can influence what they do (or not do) with them. So there use in practice requires careful handling and in some cases (such as large workshops) professional facilitation to attend to the running of the event leaving researchers with a more directed role in the evidence gathering/data elicitation as co-participant or participant observer. Suitable guidance/training in chosen techniques would be essential.

Optional Section 3: Practical example
Oreszczyn and Lane (2017) includes lots of examples of using diagrams in participatory research but in the meantime two of the cases discussed there can also be read about in Oreszczyn and Lane (2010 or 2012).

Optional Section 4: Recommended further reading
If systems and complexity are very new topics to you the, apart from the many publications already mentioned, you could look at this free course on systems thinking and practice (http://www.open.edu/openlearn/science-maths-technology/computing-and-ict/systems-computer/systems-thinking-and-practice/content-section-0) or another one on Mastering systems thinking in practice which will hopefully be live by the time you read this and I can add or circulate the weblink.

References (to documents referenced in this template only)


[1] And related topics such as ‘Environmental tipping points and food system dynamics’ as seen from the global food security programme which does focus a lot on agricultural innovation. E.g. see https://www.foodsecurity.ac.uk/publications/
27) Triggering Change  
Author: Lee-Ann Sutherland

1.0 General Overview of the Approach  
1.1 Summary of the Approach

Farmers typically maintain the status quo, making incremental changes, and giving limited attention to new opportunities and innovations, owing to path dependency. Major changes in farming trajectory occur largely in response to trigger event(s) (e.g. crop failures, low commodity prices, succession, retirement). In response to these trigger events, farmers become more active knowledge seekers, choosing and implementing a new course of action. If successful, these new actions become part of a new path dependency.

1.2 Major authors and their disciplines

The ‘triggering change’ model was developed by Sutherland et al. (2012), using social psychological approaches (Petty and Carpaccio, 1986, the ‘elaboration likelihood model’). The conceptualisation was derived inductively from multiple UK-based empirical studies. The concept of ‘path dependency’ has been developed – and challenged – primarily by economists (e.g. Arrow, 1963; Haydu, 2010, McGuire, 2008, Orderud and Polickova-Dobiasova, 2010; Chehetri et al. 2010, Liebowitz and Margolis (1995)). Changing farming trajectories have also been developed by Wilson (2007, 2008). The approach thus brings together social psychology and economics, but can also be linked to complexity theory (e.g. Holling and Gunderson’s (2002) four-stage ‘adaptive’ cycle of creative destruction).

To date, the triggering change has been narrowly developed – there is a substantial literature using the elaboration likelihood model, but this has had limited application to agriculture. However, triggering change was developed specifically in relation to farming trajectories.

1.3 Key references


1.4 Brief history of how the theory has developed and been applied:

The approach was developed initially in 2008 (the Dwyer et al. publication above) and then further developed and formally published in 2012 (Sutherland et al. publication above). It focuses specifically on application to farm-level decision-making, particularly in relation to agri-environmental innovations (e.g. organic farm conversion).

The triggering change model was specifically developed in relation to farmers, but not in relation to AKIS per se. Triggering change is specifically identified within the AgriLink grant agreement as an approach that will be developed.
1.5 Basic concepts

The model draws on social psychology theory (the ‘elaboration likelihood model’ – Petty and Carpaccio, 1986) to demonstrate that while farmers are locked in path dependency, they engage largely in ‘peripheral route processing’ of new information – giving it superficial attention but storing it for potential later use. Changes are incremental. Following a ‘trigger event’ (which can range from the gradual integration of a successor or recognition of long-term financial losses to more sudden shifts such as loss of staff or the emergence of new market opportunities), farmers more actively seek and assess information using ‘central route processing’, which leads to more durable change. New changes are implemented but take time to develop and consolidate, and if unsuccessful, the period of active assessment continues; if successful, the changes become the new norm and farmers become path dependent on using the new innovation.

1. Path Dependency: All components of the new system are working together and the system has demonstrated its resilience. Investment in skills, knowledge and technology is integrated into cultural capital, tying the farm manager(s) to this particular approach and limiting the incentive for major change. Incremental change may occur along the existing trajectory. Farmers access new information but largely through ‘peripheral route processing’, where it is given limited attention and potentially stored for possible, later in-depth consideration. The farm system remains in this state for indefinite periods of time.

2. Trigger Event: The farm manager of the existing ‘path dependent’ system encounters or anticipates one or more triggers (e.g. changes in the farm household through succession, injury or sudden death, new market opportunities or failures) leading to a ‘trigger event’: the realisation that system change is necessary to meet farm management objectives, and/or exploit new opportunities.

3. Active Assessment: Routine scanning for information intensifies, becoming actively focused on available options (‘central route processing’). This is an iterative process, including practical assessment of options and current farm and farm household resources, which may involve testing of options (e.g. experimentation) and networking/talking to other farmers or advisors. The farm manager explores the economic, managerial and social implications of changing the system.

4. Implementation: A choice is made and implementation of a ‘new system’ begins. This not only commits the farm manager to financial investments in structural change, but also to developing new skills, knowledge and establishing new social and business networks around the new system.

5. Consolidation: New knowledge, skills and networks are developed, and the success of the new system in addressing issues resulting from identified triggers, are evaluated. If the new approach is deemed unsuccessful, the farm manager returns to Stage 3. However, the investment undertaken during implementation may weaken the ability of the farm manager to implement further new changes.

6. Path Dependency: If the new system is deemed successful, return to Stage 1.

It is important to note that the triggering change conceptualisation represents an idealised process. Triggers are often unpredictable, and thus may occur at any stage in the change process, or may indeed be removed. This can result in deviations from the process as outlined. (Source: Sutherland et al, 2012, pp. 144).
Diagrams

Source: Sutherland et al., 2012, p. 144

2.0 Application to the analysing the role of farm advisory services in innovation

2.1 Relevance to AgriLink Objectives

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At the applied level, the objectives of AgriLink are to:

Develop recommendations to enhance farm advisory systems from a multi-level perspective, from the viewpoint of farmers’ access to knowledge and services (micro-AKIS) up to the question of governance, also recommending supports to encourage advisors to utilise specific tools, methods to better link science and practice, encourage life-long learning and interactivity between advisors [WP5];

Build socio-technical transition scenarios for improving the performance of advisory systems and achieving more sustainable systems - through interactive sessions with policy makers and advisory organisations; explore the practical relevance of AgriLink’s recommendations in this process [WP5];

Test and validate innovative advisory tools and services to better connect research and practice [WP3];

Develop new learning and interaction methods for fruitful exchanges between farmers, researchers and advisors, with a focus on advisors’ needs for new skills and new roles [WP3];

Guarantee the quality of practitioners’ involvement throughout the project to support the identification of best fit practices for various types of farm advisory services (use of new technologies, methods, tools) in different European contexts, and for the governance of their public supports [WP6].

2.2 How this can be applied/developed in AgriLink

The Triggering Change cycle represents an idealised process, simplifying farmer decision-making into a single process: in reality, decision-making is messier, with farmers making decisions on multiple issues, and integrating information on different topics, at the same time. Understudied areas in this model include the complexity for farmers to access, sort and evaluate knowledge and evidence in emerging innovation areas, and the specific processes they undertake to acquire and adapt this knowledge. This is partly due to the increasing fragmentation of AKIS and the increasing complexity of innovation areas, as well as the rapid growth of ICT. AgriLink will further develop the information access and processing aspects of this model through application in the 8 innovation topics considering how farmers actively assemble information and knowledge on each topic; the different individuals and organisations farmers draw on for information, and how these are prioritised; the role of technologies in these knowledge acquisition processes (i.e. the practices of information access).

The diversity of micro-AKIS and triggering change cycle is of course determined by farm characteristics and by farmers’ attitude towards the innovation areas studied. To account for this AgriLink will analyse the micro-AKIS of a diversity of farms. It will include pioneers farms in innovation areas, but also farms who could not (or chose not to) implement them. Change cycle may also be framed by the types of services offered in a given region by various advisory suppliers, and by the type of intervention proposed (e.g. face-to-face interactions, use of ICTs, collective dimension of advice). Particular emphasis will be placed on the role of ICTs in accessing information directly and for mediating farmer/advisor interactions.

2.3 Research questions relevant to AgriLink:

- What is the role of knowledge in farmer up-take of innovations?
How do farmers integrate different types of knowledge into day-to-day practices?
How does farmer knowledge-seeking behaviour and receptivity change over time?
What role do different types of advisors play in farmer up-take of innovations?
How can input from advisory services be targeted to increase impact?

2.4 Methodological implications
The Triggering Change model was developed using a form of grounded theory (i.e. inductive research), which was then grounded in existing theories of information processing and path dependency. The data utilised was primarily based on questions about farming history. In AgriLink WP2, we will be interviewing farmers who have and have not adopted specific innovations. It will be appropriate to ask how these innovations fit in with other activities, and if there were particular events or reasons that they developed, took up or adapted the identified innovations at specific points in time.

2.5 Strengths and weaknesses
The Triggering Change model is particularly useful for understanding farm-level decision-making and path dependency. It draws attention to the different periods of time in which farmers are particularly open to making changes on their farms, and the different ways they process information. The Triggering Change model also recognises that lock in can be technological, financial, social, cultural and knowledge based (i.e. farmers may be limited by their education and knowledge access about what options they are willing to consider).

The Triggering Change conceptualisation has not yet been developed for knowledge systems, or in relation to multiple decisions (i.e. it has simplified decision-making to be about a single issue). It also focuses on major transitions (i.e. noticeable changes in farming trajectory); it has not yet been developed in relation to incremental transitions. It does not address governance or advisory services. It also focuses on individual farms, rather than system-level changes.

2.6 Potential operational problems
This model has been used in in-depth qualitative interviews. It has not been used in combination with social network analysis. The two in combination may prove to be quite labour intensive.

Optional Section 3: Practical example
The triggering change model has been used to understand major changes in farming trajectory, particularly from conventional to mainstream production. Using this theory demonstrated that farmers seek and digest new information differently depending on the stage of the cycle their farm is in – most of the time, they passively assess information, but during periods where they’re actively considering making a change, they are much more active. So a farmer may have been receiving information about organic farming passively for years, but it’s not until something happens (a ‘trigger’ event, like farm succession, several years of financial loss, a health crisis like BSE) that the farmer (and household) start to actively consider options for making a change. This means that the same information (in the same format etc) will have different levels of up-take at different points. The authors therefore recommended that efforts to engage farmers with innovations be targeted to farm households who are likely to be actively considering changes (such as farms with identified successors, farms which are thought to be at high financial risk owing to low commodity prices etc).
Optional Section 4: Recommended further reading

Not applicable to this theory, as it's had limited development to-date.
References


In ’t Veld, R.J., 2011. Transgovernance: The Quest for Governance of Sustainable Development. IASS, Potsdam, Germany.


Glossary

AKIS (Agricultural Knowledge and Innovation System): the collection of agricultural information providers, the flows of information between them, and the institutions regulating these relations. Alternative acronyms AKS and AIS are sometimes used to refer to variations of this definition.

Back-Office/Front-Office: Front office is where relationships between farmers and advisors are built; Back-office is where evidence and knowledge are accumulated and up-dated (e.g. training and networking of advisors, research and development)

European Commission (EC): the politically independent executive arm of the European Union (EU). It draws up proposals for new European legislation and implements the decisions of the European Parliament and the Council of the EU.

E-Agriculture: agriculture with substantial information and communications technology (ICT) involvement.

European Innovation Partnership “Promoting Productivity and Sustainability” (EIP-Agr): A European Commission-funded initiative to support interactive innovation in the agricultural and forestry sectors that ‘achieves more from less’ input and works in harmony with the environment. It is one of five EIPs implemented in Europe.

EU-FAS (European Union Farm Advisory Service): the advisory services formally supported by the EU through national governments. This represents a subset of the Farm Advisory Services described below.

Farm advisory services: the set of organisations that enable farmers to develop farm-level solutions, enhance skills and coproduce knowledge with advisors. These organisations often combine front- and back-office activities. These organisations include traditional advice providers (chambers of agriculture, public bodies, etc.), farmer-based organisations (unions, associations, cooperatives, etc.), independent consultants, NGOs, upstream or downstream industries, and high-tech sectors.

Farmer: a producer of agricultural commodities. The term includes the full range of scales and land holding types (e.g. tenant farmers, contract farmers). Multiple household members can be farmers (e.g. spouses, successors, employees).

Focus region: an agricultural census region (NUTS3 or NUTS4) in which most of the data collection will be undertaken.

Government: the formal institutional structure and decision-making process of the modern State (Mantino, 2010: 4).

Governance: markets, policies, regulations, networks and social norms producing and enforcing rules for activities in specified contexts.


Information and Communications Technology (ICT): technologies that provide access to information through telecommunications.

Innovation: the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations. Innovation activities are all scientific, technological, organisational, financial and commercial steps which actually, or are intended to, lead to the implementation of innovations (OECD 2009). Examples of innovations promoted by the EIP Agri include technological breakthroughs, new processes and business models, non-technological innovation and innovation in the services sector.
Innovation areas: eight innovations selected for empirical research in AgriLink WP2.

Interactivity: the degree of interactions between researchers and practitioners through the project

Internet of Things (IoT): A network of internet-connected objectives able to collect and exchange data using embedded sensors.

Knowledge Intensive Business Services (KIBS): businesses whose primary input and service output is knowledge

Knowledge: facts, information, understanding and skills acquired through experience or education or research; the theoretical or practical understanding of a subject\(^\text{18}\)

Learning: The acquisition of knowledge or skills through study, experience, or being taught\(^\text{19}\).

LINSA (Learning and Innovation Networks for Sustainable Agriculture): Networks of producers, customers, experts, NGOs, SMEs, local administrations, as well as official researchers and extensionists, that are mutually engaged with common goals for sustainable agriculture and rural development - cooperating, sharing resources and co-producing new knowledge by creating conditions for communication (Brunori et al., 2013). LINSAs were the focus of the SOLINSA FP7 project.

Living Labs: a gathering of partnerships in which businesses, authorities, citizens and other relevant stakeholders work together to create, validate, and test new services, business ideas, markets and technologies in real-life-contexts.

Micro-level Agricultural Knowledge and Information Systems (micro-AKIS): the knowledge-system that farmers personally assemble, including the range of individuals and organisations from whom farmers seek services and exchange knowledge, the processes involved, and how they translate this into innovative activities (or not).

Multi-level perspective (MLP): a framework for analysing socio-technical transitions to sustainability.

Operational Groups: A group of people who come together to work on a concrete, practical solution or innovative opportunity, funded through the EU Rural Development Policy.

Regional Farm Advisory System (R-FAS): the full range of organisations providing advice to farms in a given region, and their connection to wider AKIS organisations.

Regional multi-actor group: 5 to 6 persons, representing farmers, advisory organisations researchers, policy makers, agricultural educators, and other relevant actors, such as industry representatives, members of operational groups, rural networks or local development associations

SCAR: the European Commission’s Standing Committee on Agricultural Research. The committee advises the European Commission and member states on the coordination of research in agriculture, providing strategic policy advice, developing a strong foresight process, developing research agendas and mapping SCAR research capacities.

SCAR AKIS Strategic Working Group (SCAR AKIS SWG): The European Commission’s Standing Committee on Agricultural Research, Working Group on Agricultural Knowledge and Innovation Systems. Since the first AKIS SWG in 2010, a succession of AKIS SWGs have been formed to address specific issues relating to AKIS in Europe. The fourth SCAR AKIS SWG is currently in progress, and has been focusing on the future of advisory services.

\(^{18}\) https://en.oxforddictionaries.com/definition/knowledge

\(^{19}\) Ibid.
**Small and medium-sized enterprises (SME):** Enterprises with 10-49 staff and turnover or balance sheet total of €2-10 million. This definition is important for access to finance and EU support programmes; the definition is currently under review.

**Socio-technical scenarios:** transition pathways that describe how, starting from the present, a future, more sustainable farm advisory system configurations, may develop.

**Sustainable agriculture:** practices which are economically viable, environmentally beneficial, and yield appreciable benefits to society, while not limiting the potential of future generations to meet their own needs.

**Transdisciplinary:** approaches and methodologies that integrate as necessary (a) theories, concepts, knowledge, data, and techniques from two or more scientific disciplines, and (b) non-academic and non-formalized knowledge.