How to Strengthen Innovation Support Services in European Rural Areas: Lessons Learnt from AgriSpin

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Abstract: The EU AgriSpin project aims at strengthening European capacities for innovation in the agricultural sector by taking into account the non-linear, complex and context-specific innovation processes. Brokering functions and new services are key in supporting actors to innovate by facilitating interactions for co-production of knowledge, co-design of technologies, and identification of new institutional arrangements. This paper aims at characterizing the key innovation support services (ISS) and providing lessons useful for practitioners and policy-makers. Within the EU AGRISPIN project, we carried out participatory analysis of 57 case studies with a team composed of practitioners and researchers. We used a common grid to characterize ISS according to the different phases of innovation process. Based on our data we identified common patterns and drew lessons. Our results show that ISS depend on various factors. ISS are depending on the phase of the innovation process. First, during the initial phases, there is a need for innovative, sometimes not easily anticipated support services (e.g. network building, support to innovator). In the last phases, there is a need for more conventional services (e.g. training, advice, credit) both at farm level, value chain level and territory level. Second, the institutional arrangements set-up to provide services depend on the type of innovation, and the institutional capacities of the actors involved in the innovation process. With these first results we link AgriSpin to previous results regarding advisory services and multi-actor learning, and expand theoretical bases towards an improved understanding of multi-actor innovation processes and support services.

1 Introduction

In the European Union, agricultural innovation policies have been substantiated for decades by the so-called linear innovation model which supposes that innovative knowledge and technologies are generated by science, operationalized and disseminated by advisory services and adopted and implemented by farmers (Rogers 2003; Worldbank 2006). This model has been widely criticized and contested, and consequently, social scientists developed “knowledge system” concepts to more appropriately highlight the interactive, multi-functional complexity of knowledge flows and innovation processes (Röling 1988). Well-known system approaches with specific scientific communities are e.g. the “agricultural knowledge and information system” (AKIS) concept (Röling and Wagemakers 1998) and the “agricultural innovation system” concept (Worldbank 2006), the latter being influenced by technology studies from general economics (Touzard et al. 2015). Common to these concepts is the understanding that innovation emerges from networks of actors as a nonlinear, social, institutional as well as a technical process, where interactive learning takes place around a common concern or impulse for change (Koutsouris 2014, Knierim et al. 2015, Touzard et al. 2015). New ideas are developed and implemented by people who engage in networks and make iterative adjustments in order to achieve desired outcomes (Van de Ven et al., 1999). A systems approach towards innovation, without completely neglecting classical features of innovations (Rogers 2003), puts emphasis on processes around innovations in which
knowledge is considered as being constructed through social interaction (Knierim et al. 2015). Based on this vision the traditional “agricultural advisory body” is not only responsible for the spread of innovations but for fulfilling a range of functions that support the innovation process.

In the latest reforms of the European common agricultural policy (CAP), two instruments were designed and implemented since 2014 with the aim to more comprehensively and interactively tackle the complexity of innovation support processes. The two instruments are (i) the European Innovation Partnership ‘agricultural productivity and sustainability’ (EIP AGRI) and, (ii) the multi-actor approach that has become a key component to a number of Horizon 2020 projects. In this political context, the systems approach to agricultural innovation is translated to a multi-actor setting, also described as “a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect the way different agents interact, share, access, exchange and use knowledge” (Leeuwis & Ban 2004). This important policy shift was accompanied by a high-level, multi-actor reflection group i.e. the SWG AKIS – a substructure to the Standing Committee on Agricultural Research. Not surprisingly, a specific focus is given to the questions, how the interaction and cooperation of multiple actors successfully occur in these innovation networks and what are the key organisational or institutional arrangements and services to support actors to innovate? (Dockès et al. 2012)

Hence, there is a public interest in monitoring such policy-induced, societal transformation processes and to gain a better understanding of what makes successful innovations in the agricultural sector happen. Or, more concretely, to give empirically substantiated answers to the question what supportive actions and forms of cooperation can be identified that enhance multi-actor innovation processes in the European agricultural and rural conditions? Based on empirical cases investigated in the frame of the EU project AgriSpin, this communication aims at analysing (i) the diversity and alignment of innovation support services along the phases of the innovation process and (ii) the influence of the characteristics of the service providers on the ISS.

2 The Framework

Relevant ISS are needed to make innovation happen by fostering interactions and constructing knowledge. At first sight, the term innovation support service (ISS) may be understood either as an organisational body (called service provider1) or as an activity (Albert 2000). With a process perspective, Following Gadrey (1994) and Labarthe et al. (2013), we consider innovation support services (ISS) as activities. These authors propose to conceive a service as an activity based on “the service relationship” between the supplier of a service and the client. They emphasized the joint involvement of the providers and the beneficiaries of the service in the production of the service through interactions leading to a coproduction process. Labarthe et al. (2013) Furthermore, they distinguish three types of service providers: public sector, private sector (companies) and third sector (farmer-based organizations and NGOs). Knierim et al. (2017) argue that farmer-led organizations as hybrid organization (public and/or private) but with a farmer leadership should be taken separately; therefore they maintain that ISS stemming from corporate actors can be differentiated among public and private sector bodies, FBOs, and other third sector organizations.

1 Service providers provide immaterial services which are found under different labels in the literature such as advisory services, extension organization, bridging organizations, intermediary organizations, etc. Service providers also provide tangible services such as credit, inputs, etc. Following, the term ‘service provider’ is used to take account of this diversity of situations
Within a multi-actor perspective, ISS may result in different kinds of products aiming at achieving a “wider intervention purpose” that is closely related “to the assumed nature of a problematic situation” (Leeuwis and van den Ban 2004). Based on the state of ‘service’ discussion in economic and agricultural extension literature (Faure et al. 2012; Labarthe et al. 2013) Mathe et al. (2016: p 6) argue that “...by its nature, an ISS is immaterial and intangible and involves one or several providers and one or several beneficiaries in activities in which they interact to address a more or less explicit demand emerging from a problematic situation and formulated by the beneficiaries and to co-produce the services aimed at solving the problem. The interactions aim at achieving one or several beneficiaries’ objectives based on the willingness to enhance an innovation process, i.e. fostering technical and social design, enabling the appropriation and use of innovations, facilitating access to resources, helping transform the environment and strengthening the capacities to innovate”.

A comprehensive literature review on support services in agricultural innovation shows that farmers obtain numerous types of services that can be defined by their content (Faure et al. 2012; Mathe et al. 2016). This review led to the development of an initial classification of ISS identifying seven classes of support activities: technical; legal; financial/insurance; marketing; environmental; organizational; and social. However ISS may be better understood and defined based on functions (Labarthe et al. 2013; Leeuwis and Van den Ban 2004). For example, Kilelu et al. (2013) identify 6 functions of ISS: 1) demand articulation (vision building, diagnosis, foresight), 2) institutional support (institutional change and boundary spanning), 3) knowledge brokering (connecting to knowledge and technology) 4) network brokering (match-making of partners), 5) capacity building (training, coaching, organizational development) and 6) innovation process management (aligning agendas and learning). From another perspective, Heemskerk et al. (2011) identify and discuss a slightly different set of functions: Facilitation (stimulating and assisting the process between stakeholders with the objective of improving the quality of interaction), strategic networking (facilitation of network design and support), mediation (conflicts management between stakeholders), technical backstopping (providing advice on economic, social or technical issues), advocacy (informing policy makers and key actors for supporting policy change), capacity building (equipping stakeholders to play their roles) and documenting learning (stimulating reflection on the innovation process. Based on this literature review we propose to use the following typology of ISS (Mathe et al., 2016): access to knowledge; advisory, consultancy and backstopping; marketing and demand articulation; networking facilitation and brokerage; capacity building; access to resources; institutional support for niche innovation and scaling mechanisms stimulation. However, the frontiers between ISS are not always clear cut (e.g. between “access to knowledge” and “advisory, consultancy and back stopping”).

In the complex field of agricultural innovation processes, service providers can act individually or collectively to develop these functions. Service providers can compete or constitute networks of practitioners with complementary skills to support innovations at territory level or value chain level. These networks form an innovation support system where providers interact in various ways: cooperation, competition, or coopetition. However, articulation of services and alignment of ISS with farmers’ demands remain challenging (Kilelu et al. 2013). That the reason why the different classification of ISS put emphasis on functions such as articulation of demand and networking facilitation. Intermediaries are seen to act as a bridge between the demand and supply side of agricultural knowledge infrastructure (Klerkx and Leeuwis 2008a, 2008b);

However innovation is a complex process with different phases of development and ISS needs may vary depending on these stages of the innovation. For example, Geels (2002) with a
multi-level perspective focusing on niche innovations and innovation occurring at the regime level shows that the ISS needed are different depending on the degree of development of the innovation process. Following Wielinga (2016) the innovation process may be analyzed through phases even if we need to avoid linear thinking and to focus on the continuous feedback between the different phases (Leeuwis and van den Ban 2004, Faure et al. 2014). Actors and activities are not the same for each of these phases

3 The Method

3.1 Data sources and gathering procedure

Data for this communication is derived from an action research approach (Checkland and Holwell 1998, O’Brien 1998, Faure et al. 2014) where a specific exploratory case study method was used as part of an EU funded project (AgriSpin: www.agrispin.eu).

Following the design of the method (Wielinga 2016), a total of 13 Cross Visits in 12 European countries were realised. A cross-visit typically lasted 3 – 4 days and involved a mixed team of between 7 and 10 project partner members drawn from science and practice. The aim of each Cross Visit was to study innovation support services (ISS) in 4 to 5 concrete innovation cases proposed by one host organisation and validated by the projects’ Steering Committee. The selection of the innovation cases is aiming at observing a diversity of situations in terms of main topics addressed (agriculture sector, food sector, etc.), the scale of innovation (farm, value chain, territory) or in terms of main actors leading the innovation (Ndah et al. 2016a). 57 case studies were identified and analysed. Documents were prepared by the host partners to describe each case. The visits of each case included interviews of key actors, visits of farm and firms, and time dedicated to collective analysis. The documents elaborated after the cross-visit included information regarding analysis of the innovation process, provision of ISS and main outcomes achieved (visits reports, innovation case narratives, time-line and visualised spiral of innovation).

We may present the diversity of innovations (table 1) according to both:

a) the degree of novelty (radical innovations, incremental innovations) (WordPress 2015)

b) the main dimension of innovation (“hardware” related the technical change, “software” related to the changes regarding the values and rules, and “orgware” related to the new institutional arrangements (Leeuwis and Arts, 2011).

We acknowledge (i) the degree of novelty is not easy to determine and, (ii) the innovation process embodies to varying degrees all the 3 dimensions listed. However, we argue that one dimension exhibits some degree of dominance at a particular phase of the innovation process or for the entire innovation process.

Table 1 : Characterisation of innovation cases

<table>
<thead>
<tr>
<th>Degree of novelty</th>
<th>Main dimension</th>
<th>Total number of case studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radical (23)</td>
<td>Orgware</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Hardware</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Software</td>
<td>7</td>
</tr>
<tr>
<td>Incremental (34)</td>
<td>Orgware</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Hardware</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Software</td>
<td>9</td>
</tr>
</tbody>
</table>
Table 1 shows that radical innovation is less frequent in our sample and are slightly more focused on the “orgware” dimension. Radical innovation may require a more diverse range of ISS and especially networking and institutional support. Incremental innovations are more frequent and are more focused on the “hardware” dimension. Incremental innovation may require more or less specialized ISS.

3.2 Data analysis: analytical frame and procedure

Guided by the principles behind a qualitative inductive content analysis (Thomas 2006, Punch 2005) we used two tools to analyse the data: i) an innovation characterisation matrix and, ii) an innovation support service matrix (Ndah et al. 2017). The innovation characterisation matrix contains information about the geographical scale of the innovation, main actors driving the innovation, main issue addressed and the main support service functions. The innovation support service matrix on the one hand contained for each case study the types of support service functions, the content of the support functions, the providers involved, and the phases of the innovation process.

In line with Wielinga (2016), we used the following phases to analyse the innovation process (Figure 1).

![Figure 1: the spiral of innovation with different phases](image)

<table>
<thead>
<tr>
<th>Initial idea phase</th>
<th>At this phase, actors get a new idea because of a problem or an opportunity.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspiration phase</td>
<td>At this phase, others become inspired and form a warm informal network around the initiative.</td>
</tr>
<tr>
<td>Planning phase</td>
<td>At this phase, initiators formulate plan for action, they negotiate space for experiments</td>
</tr>
<tr>
<td>Development phase</td>
<td>This is the phase of experimentation to develop new practices and to collect evidences.</td>
</tr>
<tr>
<td>Realization phase</td>
<td>The innovation here goes into implementation at full scale.</td>
</tr>
<tr>
<td>Dissemination phase</td>
<td>This is the phase where effective new practices are being picked up by others.</td>
</tr>
<tr>
<td>Embedding phase</td>
<td>As the last phase in the process, the new practice becomes widely accepted. What matter is new rules, laws, subsidies, taxes, etc. to mainstream the innovation</td>
</tr>
</tbody>
</table>

To analyse service provision, for each phase of the innovation we observed how the services was provided in specific situation. A situation regarding service provision was understood as “a moment identified in the “spiral” or in the “narrative” where one actor (or a group of actors) were providing a service to other actors which is considered key to enhancing the innovation process. For each case study a parallel analysis was carried out by two members of the research institutions who participated in the respective cross visit and who were not part of the organising team.

4 Results

4.1 Innovation support service and phases of the innovation process

A quantitative analysis that crosses the ISS functions with the innovation phases reveals a broad presence of all types of services across (almost) all phases (Table 2).
Table 2: Number of ISS observations per phase of innovation cases from 10 Cross Visits

<table>
<thead>
<tr>
<th>Innovation Support Service functions (interventions)</th>
<th>Initial idea phase</th>
<th>Inspiration phase</th>
<th>Planning phase</th>
<th>Development phase</th>
<th>Realisation phase</th>
<th>Dissemination phase</th>
<th>Embedding phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to knowledge</td>
<td>12</td>
<td>9</td>
<td>4</td>
<td>19</td>
<td>10</td>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td>Advisory, consultancy and backstopping</td>
<td>4</td>
<td>7</td>
<td>14</td>
<td>17</td>
<td>7</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Marketing and demand articulation</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>7</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Networking, facilitation and brokerage</td>
<td>12</td>
<td>17</td>
<td>14</td>
<td>12</td>
<td>14</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>Capacity building</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>7</td>
<td>10</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Access to resources</td>
<td>2</td>
<td>3</td>
<td>15</td>
<td>16</td>
<td>6</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Institutional support for niche innovation and scaling mechanisms stimulation</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>12</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td><strong>38</strong></td>
<td><strong>47</strong></td>
<td><strong>58</strong></td>
<td><strong>88</strong></td>
<td><strong>56</strong></td>
<td><strong>54</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

Data from 43 innovation cases in 10 countries: Netherland (NL), Belgium (BE), Denmark (DK), Spain (SP), Finland (FL), Greece (GR), Germany (DE), Italy-Campania (IT-C), Italy-Tuscany (IT-T), Guadeloupe (FR), Ireland (IE).

First, this table shows that more services are provided in the development phase than in any other phase (88 counts). It probably reflects that intensive activities take place during this phase. Second, “networking, facilitation and brokerage” ISS dominate in all the phases (90 counts). This finding reflects our focus and interest on ‘multi-actor approaches’, which was one of our key selection criteria. Third, the high frequency of counts (72) for the “Access to knowledge” ISS in almost all the phases reflects a cross-cutting need for actors. This ISS could be based on a mix of mechanisms (informal interaction, active role of key actors to look for and access to information, etc.) and still vivid “knowledge transfer” approaches despite the widely promoted multi-actor and interactive discourse. Fourth, “access to resources” (especially financial) is key from the actors’ perspective at the planning and development phase. Fifth, it is not surprising that ‘Institutional support for niche innovation and scaling mechanisms stimulation” is key at the development phase.

However, table 2 do not clearly indentify key ISS at the different phases of the innovation process. Table 3 shows our main results with examples of concrete services provided at each phase of the innovation process.
Table 3: Examples to illustrate ISS across phases on innovation

<table>
<thead>
<tr>
<th>Access to knowledge</th>
<th>initial ideas</th>
<th>Inspiration</th>
<th>planning</th>
<th>development</th>
<th>realization</th>
<th>Dissemination</th>
<th>Embedding</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Emergence of new ideas based on research findings, projects or initiatives</td>
<td>External visits and exchanges where innovative ideas are being practiced</td>
<td>Searching relevant information from outside to learn</td>
<td>Knowledge transfer based on experiences from the previous development phase</td>
<td>Information dissemination of technical or management practices regarding farming, processing or market opportunities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advisory, consultancy and backstopping at farm level</td>
<td>Key consultancies to generate new ideas at farm level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advisory, consultancy and backstopping at organization level</td>
<td>Key consultancy to generate innovations for organizations</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Key consultancy to fine tune ideas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Key technical or financial consultancy from outside the network (including research, consultants) to fine tune ideas</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Capacity building</td>
<td>Boosting individual competencies, to think outside the box, generate new ideas</td>
<td>Support to key individuals (pioneer, entrepreneur, change agent)</td>
<td></td>
<td>Training programme based on learning from the development</td>
<td>Capacity building at larger scale through regular training based on more or less participatory method to new comers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand articulation</td>
<td>Award to identify and valorize innovators. Call for innovative proposal in the organization (example 1)</td>
<td>Workshop to share experiences. Trips and cross-visits</td>
<td>Workshops for diagnosis and organizing ideas. Workshop for coordinating actions (production, access to market)</td>
<td>Support to the creation of private firms to provide inputs or market products Support to new farmers’ organizations (cooperatives, association, etc.) to collect, process or market products</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Networking facilitation and brokerage</td>
<td>Facilitation for emergent informal networks aiming at generating new ideas as well as inspiration</td>
<td>Facilitation of informal network connecting people who matter (pioneer, entrepreneur, and others) or influential</td>
<td>Strengthening of informal networks Building innovation platforms</td>
<td>Strengthening networks to become more formalized</td>
<td>Facilitation for documenting and facilitating collective learning based on past</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Steering committee to</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Connecting actors with outside to share their experiences and get new ideas (keep being</td>
</tr>
<tr>
<td>Access to resources</td>
<td>Institutional support for niche innovation and scaling mechanisms stimulation</td>
<td></td>
<td></td>
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<td>---------------------</td>
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<tr>
<td>People able to move the idea forward. Support to temporary association of actors</td>
<td>Endorsement of an initial idea from the start by institutions and key actors to encourage and protect the innovation process at the beginning</td>
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<tr>
<td>Organizing permanent workshops</td>
<td>Space to innovate within the organization or with other organizations</td>
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<tr>
<td>Designing participatory monitoring and evaluation</td>
<td>Legal authorization to experiment out of the legal institutional framework</td>
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<tr>
<td>Negotiation with actors who are affected by the change.</td>
<td>Design of new certifications (for products, process or advisors).</td>
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<tr>
<td>Improving the multilevel governance at territorial or value chain level</td>
<td>Identification of certification bodies</td>
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<tr>
<td>Access to credit subsidies to invest especially for new comers</td>
<td>Taxes and subsidies for orienting individual and collective actions.</td>
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<tr>
<td>Building alliance to be eligible for access to funding and support from national and international projects or programs</td>
<td>New norms for production and processing</td>
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<tr>
<td>Short term financial support to boost the sustainability of the innovation</td>
<td>New indicators for monitoring and assessing advisory services</td>
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<tr>
<td>Provision of seed money.</td>
<td>Implementation of competitive grants</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Implementing competitive grants</td>
<td>Access to financial resources for experimenting.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implementing incubators to support start-ups and collective action</td>
<td>Access to credit subsidies to invest especially for new comers</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Access to financial resources for experimenting.</td>
<td>Building alliance to be eligible for access to funding and support from national and international projects or programs</td>
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<tr>
<td></td>
<td>Short term financial support to boost the sustainability of the innovation</td>
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</tbody>
</table>
Table 3 confirms that ISS depend on the innovation phases and shows that for each function, ISS cover a large range of actual activities. During the first phases (initial idea, inspiration, and to a lesser extent planning), the services are mainly aimed at provoking exchanges, generating new knowledge and facilitating access to seed funds for key actors to innovate. During such phases, using the classical definition of services (Labarthe et al., 2013) is not very useful. What really matters is not providing a well-defined service but to create space for innovation. That is why we decided to use the term “innovation support service”. During the final phases of the innovation process (dissemination and embedding), the service provision is more standardized and many services are oriented to farmers to disseminate the innovation based on knowledge transfer or advisory services. Hence the classical definition of services remains appropriate.

Table 2 also confirms that the “Networking, facilitation and brokerage” ISS is crucial across all phases of the innovation process, but it takes different forms depending on the phases, the actors involved and the intended purposes. This ISS takes different forms according to the phases of the innovation, because different actors and needs are involved. During the first phases, ISS aimed at supporting and facilitating informal and flexible networks or temporary association of actors. During the last phases, ISS aimed at supporting more formalized networks (e.g., formal association, innovation platform) to design and enforce new arrangements towards institutionalisation.

4.2 Innovation support services and types of providers

Across the different case studies, we acquired insights into the service providers to understand especially on whether ISS depend on the characteristics of the service providers. We already know that service provision depends on characteristics of the service provider such as the governance mechanisms including the mandate of the provider, funding mechanisms and the human capacities of the advisors (Faure et al. 2011). Based both on Labarthe et al. (2013) and our results, we propose a four-category typology of service providers:

1) Public service providers

They have specific goals, target specific groups and provide specific services due to their public good orientation, societal influences and long-term continuity. However, we have to distinguish:

- **Public service providers with a large mandate** for offering a large range of ISS to the agricultural sector.
  
  One example is Teagasc (Ireland), with a research and extension mandate, and offering many ISS to farmers (access to knowledge, advisory, consultancy, demand articulation, networking, access to resources) which implies a need to coordinate the actions within the organisation.

- **Public service providers with a restricted mandate** for offering ISS and/or limited budget resources
  
  One example is the Tuscany Region (Italy), or the Basque Region (Spain). These providers according to their mandate focus their activities on a selection of ISS (e.g., access to knowledge, networking). Their capacity in supporting innovations strongly depends on whether they manage to connect with other service providers and especially those with other mandates (e.g., from the private sector).

2) Farmer-based organisations

They have a specific profile and patterns of ISS due to their relation with their members (Nagel 1997). We have to distinguish:

- **Holistic farmer-based organisations** seeking to increase the range of ISS through networking with other providers in the AKIS. The most prominent example in this
regard is the Dutch ZLTO, who supports various innovation processes by initiating and coordinating ISS provided by other public or private actors

- **Specialised farmer based organizations** focusing on a limited activities (value chain, input provision, etc.), providing specialized services to their members.

3) **Non-governmental organizations**
They cope with specific challenges and often operate under short-term funding conditions. Due to their value or mandate, they may innovate when providing ISS. One example is the AIAB in Campania (Italia), who provides advisory services and networking at territorial level to promote organic agriculture.

4) **Private organizations**
They provide specialized services (mainly consultancy or advisory services possibly included in trading activities regarding inputs or machinery) based on a client relationship. Their capacity to be part of the innovation network is key for them to be able to provide relevant and articulated services. ProAgria (Finland) is one example.

While these service providers do formally provide ISS, some individuals (e.g. family members, friends, peers) often invisible and less recognised, do play important albeit informal roles in the support for innovation processes, especially at the early phases.

Regarding the articulation of services among ISS providers, one characteristic is are crucial: the degree of concentration vs fragmentation of the service system. We identified several situations:

1) **A “concentrated” service system** (limited number of service providers). It facilitates a strong coordination between actors but with a risk to have less opportunity to generate innovative ideas from outsiders. We identified two cases:
   - Case with one dominant service provider providing a large range of ISS based on an in-depth knowledge of the farmers’ needs (e.g. Teagas in Ireland). Other service providers may complement on a “spot basis” the range of services. However the internal coordination of the dominant service provider is an issue and there is a need to promote managerial innovation to both align the services and identify new ideas.
   - Case with a dominant provider (e.g Danish and Netherlands cases) well integrated to the innovation process and some other smaller service providers more or less integrated. Beside demand articulation, networking facilitation, capacity building, these dominant service providers offer specific services with a capacity to co-construct the service to better meet farmers’ needs.

2) **A “fragmented” service system** (large number of service providers, each of them offering a limited number of services). Even if such situations may provide space for emerging innovations there is a strong need for coordination between service providers and other actors to fully support innovation. In some cases, this coordination may effectively exist (e.g. in Tuscany region and in the Biodistrict example, both Italy) and in others not.

In conclusion, our results show that the type of service system interact with the phase of innovation and should be taken into account when elaborating recommendations for improving ISS.

5 **Discussion**
In the discussion part, we will discuss a framework to analyse the diversity of ISS by taking into account the diversity of innovation. We will also discuss “networking, facilitation, and brokerage” function which is key for innovation process.
5.1 Framework to analyse the diversity of ISS with regards to the diversity of innovation

Our findings confirm that ISS also vary according to the types of innovations. However, there are many ways to describe the diversity of innovation. We suggest to use a generic classification of innovation that better addresses the diversity of ISS needed to support innovation with regards to the complexity of innovation. We propose to take into account two dimensions of the innovation:

- the level of technological change required to achieved desired changes (at farm level, value chain level, territory level). This dimension mainly refers to the “hardware” dimension
- the level of changes for new coordination among actors (including service providers) required to achieved to the desired changes. This dimension mainly refers to the “orgware” dimension.

This analysis could lead to four groups of innovations with distinctive characteristics, and which attract corresponding ISS as illustrated in figure 2.

Figure 2: Typology of case studies depending on technological change and coordination

- **Group D**: innovation with low level of technological change and low level of coordination change among stakeholders. The innovation is incremental because both technological and organizational changes are light. Here, ISS largely relate to traditional individual advisory services and consultancy at farm level or other firm level. One example is the innovation in the grazing system for livestock in Ireland based on already well-known agricultural practices and promoted by one advisory organization.

- **Group B**: innovations with a low level of technological change and a high level of coordination change among stakeholders. Here, ISS may emphasise demand articulation, networking, capacity building. Such innovation may occur for promoting new management practices for farmers based on new advisory services, new value chain based on new marketing practices of existing products.

- **Group A**: innovations with a high level of technological change and low level of coordination change among stakeholders. Such innovations are more likely to occur with radical changes at farm level or among small processors but with secured access to market. There is no need for strong coordination among actors to stimulate the innovation. Here, ISS may be focused on technology transfer, advisory, consultancy and capacity building. One example is the development of new cheese based on the same value chain organization.
- **Group C**: innovations with high levels of technological change and high level of coordination change among stakeholders. Such innovations are really challenging and are more likely to be radical. For this group, a large range of ISS is needed. One example is the promotion of organic farming for all the farmers in one part of an Italian region.

5 2 Networking, facilitation, and brokerage function

As seen above, the function “networking, facilitation, and brokerage” appears as being crucial across all phases of the innovation process. This highlights the gradual shift from the previous expert and top-down model for innovation into a model accounting for more complex processes that require intensified interactions between actors and rely on pluralistic ISS provider settings. Nevertheless, ‘networking, facilitation and brokerage’ is a complex function. Four issues require attention as a way of providing practical guidance to ISS providers:

First, the articulation of services and alignment of ISS remain a challenge because all the service providers act in various ways: cooperation, competition or coopetition. Thus, brokering and facilitation function are critical to form and maintain a network of service providers with complementary ISS able to efficiently support innovations at the territorial or value chain scale.

Second, the “networking, facilitation, and brokerage” ISS depends both on the scale and on the type of innovation. The intensity of intermediation needs differs according to the type of innovation (see figure 2) and its scale. While adapted coordination and knowledge sharing mechanisms are required at local level for innovation, intense intermediation and institutional dialogue are required for addressing scaling issues at value-chain or territorial level.

Third, according to our empirical findings, there is no reason to argue that only a specific type of service provider may be responsible for this ISS. On the contrary several types of service providers may be responsible for this ISS. It can of course be provided by a specialized service provider (Klerkx and Leeuwis 2008). It can also be provided by another type of organization (e.g. farmers’ organization, private firms) interested in pushing forward the innovation process, or by different coordinated organizations sharing this function or acting at different phases of the innovation process or finally, by a multi-stakeholder innovation platform with a dedicated facilitator.

Fourth and not least, this ISS requires specific skills and human capacities. Besides the now well recognized skills such as good communication, ability to listen and to value farmer’s insights, combined with technical capacities and interactional expertise (Ingram 2008), such individuals have to collaborate with different kind of actors (private, public sectors advisors relates), and develop adequate practices (Nettle et al., 2017). Granovetter (1985) argues that personal relationships forge trust in the social and economic life. This has been particularly true in various AgriSpin cases. However, brokering functions remain a challenging issues and implies new roles and to a large degree unexplored skills for thechnage agent (Koutsouris, 2014).

6 Conclusion

Our results highlight that ISS play critical roles in innovation processes in various ways. We showed that during the first phases of a given innovation process (initial idea, inspiration and planning), the actors willing to support innovation mainly need to provide space and resources for key actors to innovate. During the final phases of the innovation process (development, realization, dissemination and embedding), the service provision is more standardized and many services are oriented to farmers to ensure the scaling and institionalization of the innovation. However, the ISS needs in terms of diversity and intensity seem to depend on two
dimensions: the level of technological change required to enhance the innovation process and the level of changes for new coordination among actors (including service providers). The results also show that ISS are provided by large range of service providers and depend on the characteristics of the service providers (mandate and resources). The mechanisms to align the ISS, and thus to fully support the innovation, is largely depending on the degree of concentration vs. fragmentation of the service providers system. Finally, we confirm that “networking, facilitation, and brokerage” functions are crucial across all the phases of the innovation process actors. But we show that this ISS vary depending on the phases of the innovation. Furthermore there is a diversity of mechanisms to operationalize this ISS and a diversity of organizations which may fulfill this role.

Even if we attempted to draw generic lessons based on our analysis, the case studies show that the ISS remain case specific and no ‘silver bullet’ can be provided to support innovation in agriculture. Birner et al. (2009) describe such a situation with the expression “from best practice to best-fit” when analysing extension and advisory services to provide recommendations to improve them. The cross-cutting recommendation for innovation support practitioners and policy makers is hence, that targeted diagnoses with regard to innovation phases, types and the characteristics of the support systems may precede proposals for improving the innovation support services. With our results, we hope to lay the bases for such diagnoses.

7 References


