AKIS in European countries:

Cross analysis of AKIS country reports from the i2connect project

Date: April 2022

Authors:
Fanos M Birke
Sangeun Bae
Annkathrin Schober
Susanne Wolf
Maria Gerster-Bentaya
Andrea Knierim
Contact: fanosm.birke@uni-hohenheim.de

Disclaimer: This report presents a cross analysis of 28 AKIS country reports that were produced in the context of the i2connect project in 2020/2021. The views and opinions expressed by the authors of this report do not necessarily reflect those of the authors who wrote the respective AKIS country reports.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 863039

i2connect
INTERACTIVE INNOVATION

Project funded under the Horizon 2020 Research and Innovation Programme under Grant Agreement number 863039.

THIS PROJECT HAS RECEIVED FUNDING FROM
THE **EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME**
UNDER GRANT AGREEMENT N. 863039

Executive summary

This comparative AKIS analysis report is prepared in the frame of the i2connect project. i2connect ('Connecting advisors to boost interactive innovation in agriculture and forestry') is an EU Horizon 2020 funded multi-actor project with the overall aim of empowering advisors and their organisations to engage and support farmers and foresters in interactive innovation processes. The consortium is composed of collaborators from 24 scientific and practitioner organisations, and 18 third party organisations from Western, Central and Eastern European countries. The project is implemented over a 5-year period (2019-2024) and is coordinated by the Federation of Chambers of Agriculture in France.

In order to achieve the overall objective, one of the specific aims of the project is to strengthen and profile the role of advisory service workers in interactive innovation processes at different levels: (i) through a better understanding of the Agricultural Knowledge and Innovation Systems (AKIS) at country level, (ii) through the identification of advisory service providers across Europe, (iii) through the creation of an enabling environment within advisory services, (iv) through better networking and embedding of advisory services within AKIS and (v) through appropriate public policies. In relation to the first aim, project partners and contracted experts conducted an AKIS situation analysis for 28 European countries between January 2020 and January 2021 on which this report basis. Moreover, since AKISs are not fixed systems but continuously evolving ones, the i2connect project plans to produce an updated AKIS inventory reports for the 28 countries in year 2024.

The main aim of this report is to provide a comprehensive overview and selected deeper insights into the situation of the AKIS in i2connect partner countries by presenting comparative results. Specifically, this report will (i) present the diversity of the AKISs in the EU and further selected European countries; (ii) highlight and comparatively assess several key AKIS features that substantially contribute to the systems' functioning and performance; and (iii) particularly give information on advisory services' situation as one key subsystem of the AKIS which recently gained a more prominent position in the EU CAP.

The studied AKISs represent very diverse and frequently complex organisational constellations. The general trend in western European countries demonstrate a profound pluralism within their AKISs. Also, the presence of private economic actors within the AKIS has clearly increased during the past ten years while NGOs are less widely present. Moreover, the analysis showed that despite the pluralism of advisory service providers in many countries, there is still a tendency for public organisations, closely followed by farmer-based organisations, as main providers

of information and advice to farmers. With regard to advisory services provision, it is evident from the results that there are increasingly new demands on advisors and their organisations in not only providing technical advice but on supporting learning processes and facilitating innovation processes. This implies the need for further capacities, infrastructures and supporting policy to meet the challenges.

Table of Contents

i2connect
INTERACTIVE INNOVATION

List of Tables

List of Figures

Abbreviations

AKIS	Agricultural Knowledge and Innovation System
AS	Advisory Services
EAFRD	European Agricultural Fund for Rural Development
EIP Agri	European Innovation Partnership for Agricultural Productivity and Sustainability
EU	European Union
EU CAP	European Union Common Agricultural Policy
EUROSTAT	Statistical office of the European Union
FBO	Farmer-based Organisation
GDP	Growth Domestic Product
ISS	Innovation Support Service
MAA	Multi Actor Approach
NGO	Non-Governmental Organisation
RDP	Rural Development Program
SME	Small and Medium Enterprise
UHOH	University of Hohenheim

1. Introduction

There is a wide consensus among scholars and policy makers that knowledge is a key resource to support European agriculture in meeting new challenges such as international competition, food safety, health, and environmental and climate change issues. Within this context, the central role that advisory services can play has gained wide attention, which consequently implies the need to have precise and up-to-date information on these services.

The new European Union's (EU) Common Agriculture Policy (CAP) reform envisages a strategic strengthening of member states' Agricultural Knowledge and Innovation System (AKIS) and proposes several policy instruments to encourage knowledge exchange and support to innovations in agriculture and rural areas (EU 2021/2115). However, the AKIS concept itself and its working principles are not yet widely known and embraced, and the capacity of policy, sectoral and societal decision makers to use and to contribute to the AKIS governance is underdeveloped (Knierim et al. 2015). In this regard a comparative overview of different countries' AKIS from existing inventories can provide new knowledge about various institutions and networks that support the different AKISs. Additionally, this knowledge will support the design of strategies, practices and instruments for achieving well-functioning AKIS that fits the historical, institutional and socio-economic context of individual countries.

It is in this context that the i2connect ('connecting advisers to boost interactive innovation in agriculture and forestry'; www.i2connect-h2020.eu) project conceived the cross analysis of the different country AKISs based on the inventory reports delivered. As the next sections will show, there is a huge variation among the investigated countries in terms of the type of AKIS, diversity of actors, and governance mechanisms. Specifically, this report aims to (i) present the diversity of the AKISs in the EU and further selected European countries; (ii) highlight and comparatively assess a number of key AKIS features that substantially contribute to the systems' functioning and performance; and (iii) particularly give information on advisory services' situation as one key subsystem of the AKIS which recently gained a more prominent position in the EU CAP.

This report starts with a brief description of the AKIS concept and its components on section two. Then follows section three with the methodology used for collecting and analysing the data. The results are presented in section four where we present the findings of the cross analysis of AKIS country reports using infrastructural perspective and elaborate deeper on the characteristics of advisory

organisations and their services. The final section five highlights key findings and draws conclusions and recommendations with respect to future AKIS studies.

2. The Agricultural Knowledge and Innovation System concept and its components

The AKIS concept has a certain tradition in the field of agricultural extension (Röling 1988, Blum 1991) and it has evolved since the late eighties towards a broader reception and use in agriculture related science and politics (EU SCAR 2012; Knierim et al. 2015; EU 2020/COM381). We understand an AKIS as a system that links people and institutions to promote mutual learning and to generate, share, and utilise agriculture related technology, knowledge, and information.

In this report, we characterise and describe the operational determinants of AKIS in Europe with six concepts: (i) organisation and governance of AKIS, (ii) type and diversity of AKIS actors, (iii) AKIS supporting policy and dedicated resources, (iv) AKIS coordination mechanisms, (v) Linkages among AKIS actors, and (vi) Advisory organisations reaching farmers. Below is a short description of how we operationalise each concept.

(i) **AKIS governance** can be described as the way how various roles and responsibilities within an AKIS are coordinated and fulfilled to ensure knowledge access, flow and use through existing or new structures. How individuals and institutions (public and private) manage knowledge production, exchange and use; accommodate their conflicting or diverse interests and take cooperative action can be explained as AKIS governance. It is a frequent observation that public authorities and third sector organisations take a prominent role in the AKIS governance by establishing and supporting AKIS coordination infrastructures.

(ii) The corporate actors that are purposefully engaged in knowledge development, exchange and use in agriculture and rural development form the 'knowledge infrastructure' of the AKIS system. Making use of the infrastructural frame of the AKIS concept, puts the organisations, lasting features of actors into the centre of attention. As described by Knierim et al (2017), **the diversity of actors** in the AKIS can be broadly categorised into: Public authorities, research and education bodies, farmer-based organisations, NGOs and private companies.

(iii) Knowledge exchange, learning and innovation are crucial aspects of current EU policy and funding for rural development (e.g., EU 2021/2115).

An **AKIS supporting policy** addresses multiple AKIS actors through the programs, strategy and funding mechanisms. Resources allocated for agricultural knowledge production and exchange signal such a policy direction, for instance, the availability of public investment to enhance advisory services, knowledge production and exchange by research, education and other institutions. Some practical examples of AKIS supporting policy in the EU include funds for demo farms, incentive mechanisms for researchers to work with farmers, and the implementation of EIP-Operational groups.

(iv) **Coordination mechanisms for AKIS** are methods and processes that facilitate cooperation and collaboration among AKIS actors for inclusive decision making and intervention. In doing so, the mechanisms are meant to encourage, ensure and institutionalise vertical and/or horizontal cooperation between AKIS actor groups.

(v) The degree of **linkages between AKIS actors** and their capacities to exchange knowledge and innovation signals the AKIS integration level. Evidence on the presence or absence of linkages among knowledge subsystems can be drawn from the AKIS diagrams and the characterisation of the AKIS actors. In general, two types of linkages can be observed in an AKIS: (a) vertical linkages among the same categories of actors but from various levels: local, regional and national levels, and (b) horizontal linkages among various actors across the AKIS.

(vi) **Advisory organisations interacting with farmers** refer to those actors in AKIS focusing on providing support to clients or beneficiaries for problem-solving through sharing information, advising and co-creation of knowledge. Communicative services are offered to enable clients to gain greater insights into problems and their causes, resulting in new motivation and orientation to act and thus capacitate clients to solve the problem.

3. Methodology

This cross-analysis report was prepared on the basis of 28 AKIS country reports that were elaborated in 2019 and 2020 in the frame of the i2connect project. In this report, findings from the national reports were synthesised and systematically analysed in a comparative manner based on the concepts (e.g., AKIS, AS) elaborated in the i2connect deliverable 1.1 (Knierim et al. 2020). However, not in all aspects, the information in the reports was sufficiently conclusive so that there were cases where analyses were made on a reduced number of reports. Altogether, 28 national reports were produced by i2connect partners and subcontractors, plus the AKIS report from Denmark that SEGES independently updated in 2019. All reports are available on the i2connect project website https://i2connect-h2020.eu/resources.

AKIS evolve in a socio-cultural and institutional context which has developed over decades, if not centuries. Thus, we start the report with a very brief overview of the structural characteristics of the agricultural and forest sector in partner countries, whereby we rely heavily on the EUROSTAT[1] database and extracted statistics on agriculture and forestry. We analysed the quantitative data using descriptive statics and made comparison among partner countries.

For the overview on AKIS actors' type and diversity, combinations as well as key AKIS features in the respective countries we relied on the information provided in the respective country reports. In each country report, information about the AKIS situation was gathered using a semi-structured interview method that involved a set of guiding questions and a presentation of a draft AKIS diagram. Respective country report authors identified AKIS experts from public authorities, research, education, farmer-based organisations, private companies and conducted interviews. The use of the semi-structured interview method allowed us to conduct a comparative analysis in characterising the AKIS in partner countries. While the AKIS diagrams facilitated the discussions between the authors and the AKIS experts to identify main actors and their linkages for knowledge flow, the final diagrams helped us to better analyse the diversity and their linkages for this synthesis report.

The data from the AKIS country reports were qualitatively analysed using content analysis. However, due to the methodological limitations of the empirical work (a restricted number of expert interviews, no or few overview studies and grey documents etc.), the assessment of some aspects, for instance, the quality of the interactions among the AKIS actors, in terms of formal and informal linkages and cooperation tends to be subjectively coined. This may have taken the form of an

[1] https://ec.europa.eu/eurostat

organisational bias of the author(s), and secondly, the results are highly context specific.

For characterising the agricultural and forestry advisory service providers and describe their features, we used data from the online survey that was conducted across the partner European countries. The questions in the survey were largely based on earlier work from the PRO AKIS project (see Knierim et al., 2017) that explored the types of advisory service providers, their main clients, advisory topics and methods, human resources, funding, and linkages with other AKIS actors etc. The online survey was translated into the local languages and administered through the online platform "EUSurvey" between October and December 2020. The national AKIS experts, who were either members of the project or subcontracted, were responsible for distributing the survey in their respective countries, according to the availability of and access to advisory service providers. The use of a common online survey platform allowed all data to be collected centrally by the University of Hohenheim (UHOH) team. The quantitative data were analysed using descriptive statistics

4. Results

4.1. Structural characteristics of the agricultural and forestry sectors

The countries in Europe show a high diversity regarding their territory, population size, GDP, socio-economic status and their agricultural and forestry structures such as utilised agriculture/forest area, the output of agricultural/forestry products etc. In this report, we compare the structural characteristics of the agricultural and forestry sectors for the countries covered by i2connect AKIS reports, mainly based on data from EUROSTAT. This information matters as it gives a context for the readers to better understand the respective AKIS environments.

According to the AKIS country reports, Germany has the highest population (83 million) followed by France (67 million) and Italy (60.4 million). Countries with the smallest populations are Malta (493,6 thousand), Luxembourg (613,9 thousand) and Cyprus (875, 9 thousand) (EUROSTAT, 2020b) This broad range of population sizes together with the countries' climatic and bio-physical conditions' variations do affect sectoral economic performances and in particular, do matter with respect to agricultural production and food consumption.

Gross domestic product (GDP) at current market prices per inhabitant (pi) was on average 32,030 Euro for EU-28 and is 31,160 Euro since 2020, after UK leaving the European Union (EU-27). Amongst the European countries, Luxembourg has by far the highest value (102,200 Euro/pi), followed by Switzerland (76,200 Euro), in 2019. Among the i2connect countries studied, Denmark has the third highest level (53,760 Euro) followed by the Netherlands (46,710 Euro) and Sweden (46,160 Euro) (EUROSTAT, 2021) Agriculture, however, contributed only 1.3% on average to the EU-28's GDP in 2019 (EUROSTAT, 2019a) Forestry and logging accounted for only 0.2% in 2018 (EUROSTAT, 2020a).

The i2connect partner countries show a wide range in their total area. France being the largest (549 thousand square kilometres), followed by Spain (498,5 thousand square kilometres) and Sweden (449,9 thousand square kilometres) (EUROSTAT, 2015).

In terms of agricultural land, Figure 2 shows that the utilised agricultural area is highest for France (27,8 thousand hectares), followed by Spain (23,2 thousand hectares) and Germany (16,7 thousand hectares) (EUROSTAT, 2016b) However, the countries with the highest levels of utilised agricultural area do not necessarily count high numbers of farm holdings, as shown in Figure 1 (EUROSTAT, 2016b)

This can be partly explained by differences in the physical farm size structure. Figure 3 shows for example that Ireland had a high share of medium-sized farms, while Greece had high shares of very small and small farm holdings in 2013 (EUROSTAT, 2016a).

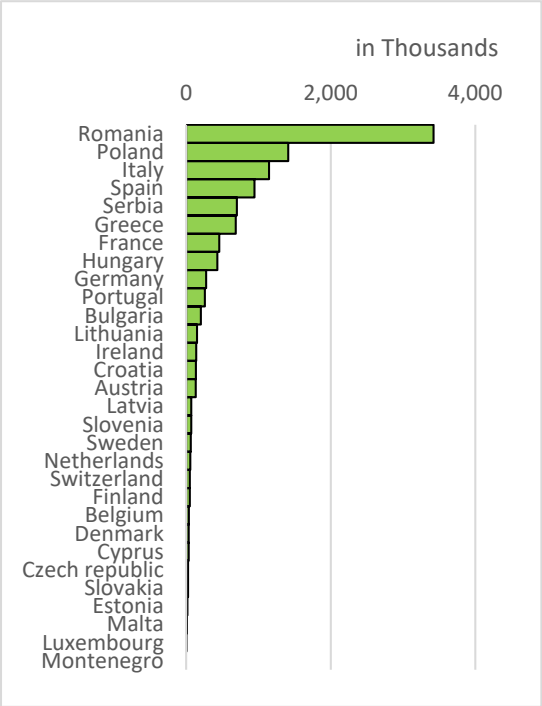


Figure 2 Number of Farm Holdings (Source: Eurostat, 2016)

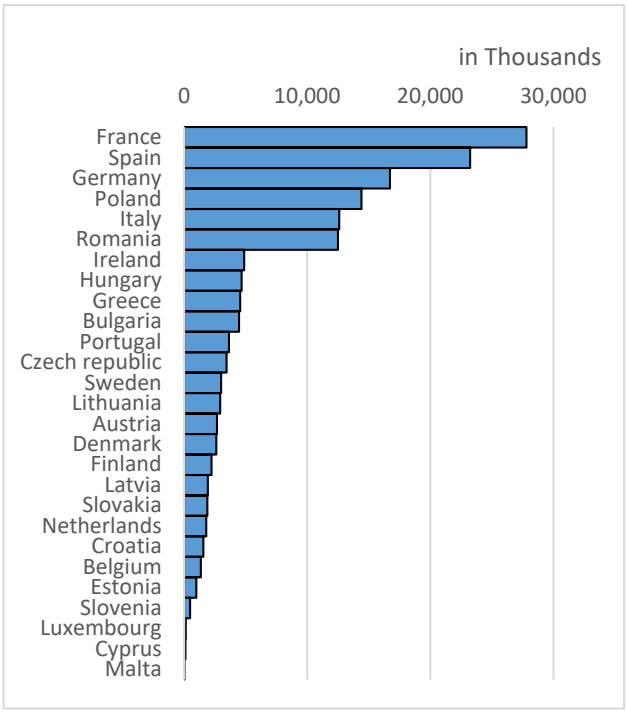


Figure 1 Utilsed Agricultural Area (Source: Eurostat, 2015)

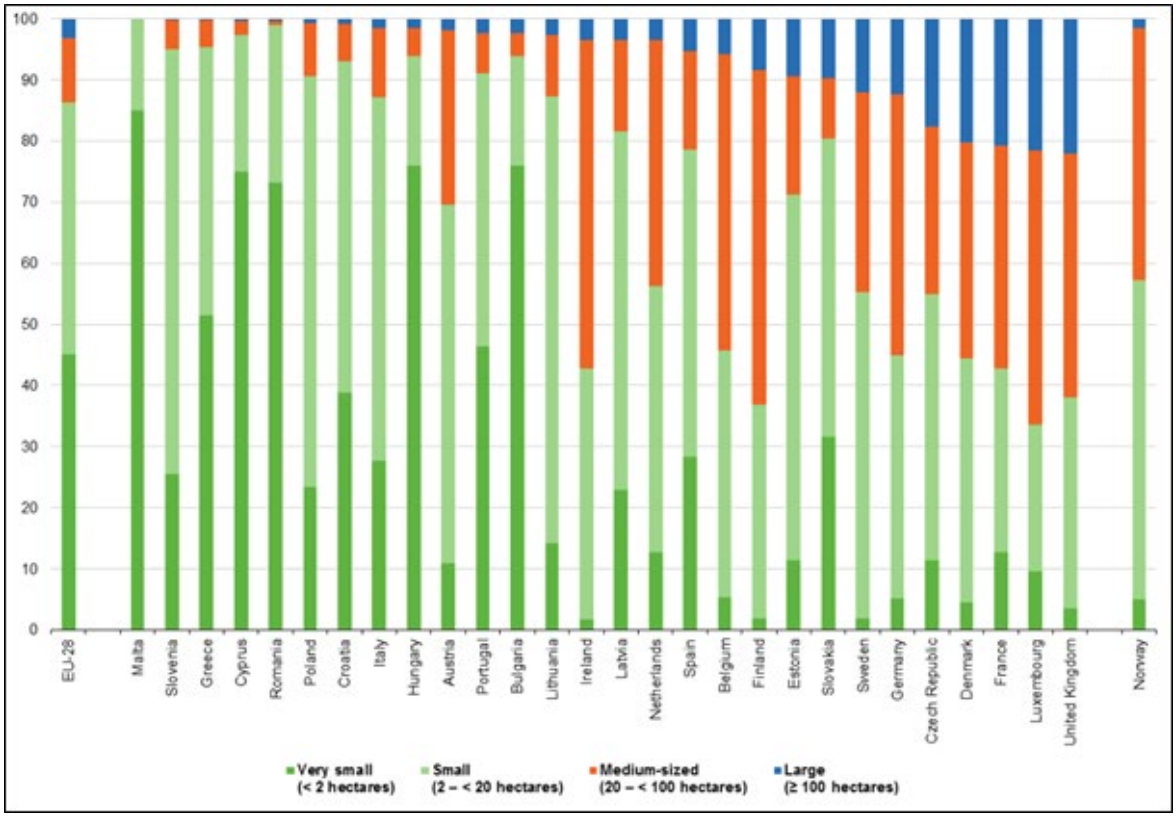


Figure 3 Share of total farm holdings, by physical farm size (Source: Eurostat, 2016)

In the year 2019, the absolute area used for organic farming was highest in Spain (2.3 million hectares), France (2.2 million hectares) and Italy (1.9 million hectares). However, the share of utilised agricultural area for organic farming was highest in Austria (25.3%), followed by Estonia (22.3%) and Switzerland (16.3%) and lowest for Malta (0.5%), Ireland (1.6%) and Bulgaria (2.3%) (EUROSTAT, 2019c).
The output of the EU-28's agricultural production in 2018 was composed mainly of crops (51.8%), comprising vegetables and horticulture (13%), cereals (11%) and fruits (6.8%), and livestock products (39.6%), meaning milk (13.2%), pigs (8.3%) and cattle (7.7%) (EUROSTAT, 2019a) as shown in Figure 4.

Amongst the i2connect partner countries, France and Germany were the largest cereal, sugar beet and oilseed producers in 2015 (EUROSTAT, 2019b) Germany as well showed the highest production volume for potatoes (making up 19.5% of EU-28 total), followed by Poland, the Netherlands and France. Poland was found to be the leading producer of apples. Total cereal production was highest in France, followed by Germany in 2015 (EUROSTAT, 2019b) In 2018 the most common livestock within the EU was pigs, followed by bovine animals, sheep and goats. France kept the largest population of bovine animals, whereas the highest numbers of pigs were found in Spain and Germany. Spain was also found to have the largest sheep populations and goats were mainly kept in Greece, Spain and Romania (EUROSTAT, 2019a)

Regarding the forestry sector, Finland has the largest area covered by forest amongst the i2connect partner countries, followed by Sweden and Slovenia (Figure 5). Data on ownership from 2010 showed that forests in Portugal were almost completely private owned (97%). Sweden had the second highest share of private forests (75.7%), followed by France (75.3%) and Spain (70.8%). Sweden reported 319,649 private forest owners for 2017. According to Eurostat, the lowest shares were reported for Bulgaria (12.1%), Switzerland (13.9%) and Greece (22.5%) (EUROSTAT, 2016c).

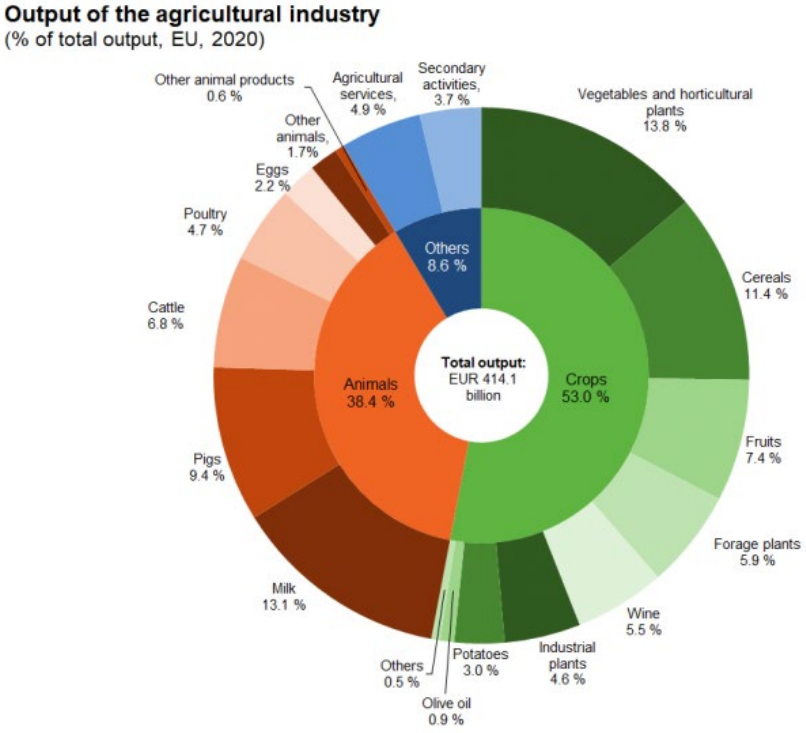


Figure 4 EU-28's Agricultural Output, 2018 (Source: Eurostat, 2020)

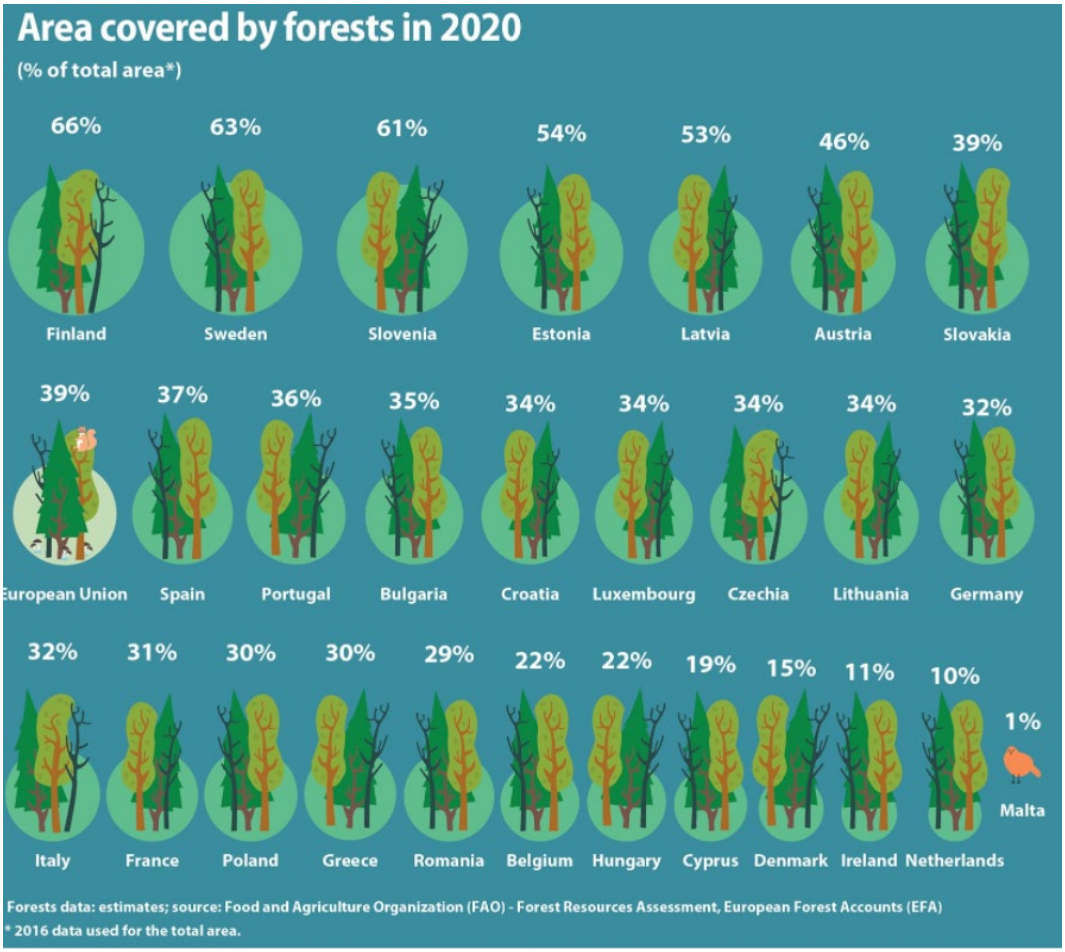


Figure 5 Forest area coverage in the EU (Source: Eurostat, 2021)

Summary: The very brief excerpt of statistical data reveals the broad diversity of the European countries in terms of the number and size of agricultural holdings, the importance that agricultural and forestry land use has in the territorial dimension and thus the huge variation of their societal and political roles that the green sector plays. It is in this context, that the national AKIS have developed along country specific pathways that are shaped not only by the bio-physical potentials but also by socio-cultural particularities, laws and institutions as well as socio-economic conditions over decades and, in some cases even since more than hundred years.

4.2. Characterising the AKIS in partner countries

The characterisation of the AKIS from the i2connect country reports aimed at the national level situation and particularly addressed organisations and institutions engaged in the creation, dissemination and the application of agriculture and forestry related knowledge. A first overview reveals that in many of the i2connct partner countries, the AKIS are composed of diverse and heterogeneous (corporate) actors, who are classically grouped into subsystems such as 'education', 'advisory services', 'research', 'supporting services', 'administrative bodies' etc. (Rivera et al. 2005).

As a first common feature and in line with the level of analysis, we differentiate the studied European countries into two groups according to whether or not their AKIS are (mostly) determined and governed from a national or a sub-national (regional) level. The former type is thus considered as a 'centralised' AKIS, while the latter is called a 'decentralised' one (cf. section 3.1). Further key features to describe an AKIS and to assess its functionality and performance are the diversity of the (corporate) actors (section 3.2), the prevalence of AKIS related policies and resources (section 3.3), existing coordination mechanisms and (section 3.4), the quality of linkages among the various actors (section 3.5). Finally, a closer look at advisory organisations gives insights into how and how well farmers are reached and served (section 3.6).

4.2.1. Organisation and governance of the AKIS

As presented in Figure 6, within the country reports analysed, a majority of the countries have a centralised national level AKIS, while four countries, namely: Italy, Spain, Germany and Belgium have decentralised regional AKISs, where coordinating the knowledge system is within the jurisdiction of the regional authorities. Similarly, Austria and Switzerland reveal a certain tendency of decentralised AKIS governance. On the other hand, in many countries, the national AKIS is further differentiated by regional or provincial actors who have gained autonomy to design and strengthen a particular AKIS of restrained geographical or thematic scope. For instance, in Denmark, regional actors independently organise their regional AKIS and have little interaction with the national bodies. Also, the Swedish report emphasises the key role regional clusters and private platform organisations play in governing knowledge generation and development activities in the green sector while not mentioning national coordination mechanisms or policies in place. In countries like Greece, AKIS actors appear mainly at national structures, with little influence at the ground level.

Figure 6 The AKIS governance levels in the studied i2connect countries

4.2.2. Type and diversity of AKIS actors

The diversity of AKIS actors refers to the aggregated set of actors by category at a national level. Here, we discuss the diversity of AKIS actors by comparing the various AKIS actors between countries.

According to the actor categories presented in section 2, our analysis shows a strong **presence of public authorities, research and education bodies and farmer-based organisations** in almost all countries' AKISs (Fig 7), which confirms the perceived trends of the PRO AKIS analysis. In addition, while the results show a relatively broad variation in the participation of the third sector (NGOs) in the AKISs, considerable visibility of private companies is reported in many of the analysed reports.

Looking more closely at the actor category constellations at a country level, we can observe that for several western European countries (Belgium, France, Germany, Ireland, Italy, the Netherlands, and Switzerland) all five categories of AKIS actors are well represented and they even reveal **a remarkable diversity of**

organisations within each of the categories. Roughly half of the studied countries have reported **a moderate diversity** with a considerable range of organisations in at least three categories (public authorities, research and education and farmer-based organisations) and a moderate variation in at least one other category (Austria, Spain, Hungary, Malta, Latvia, Bulgaria, Denmark, Finland, Poland, Portugal, Luxembourg, Estonia, Slovenia, Slovakia, Sweden). In contrast, a few country reports highlight actors from only one or two actor categories as important in the AKIS and other categories are rarely mentioned (Greece, Cyprus, Czech Republic, Croatia, and Serbia (Figure 7).

Figure 7 Frequency of mentions of the AKIS actor categories

In summary: The diversity of the AKIS organisation across the European countries in terms of the multitude of actors and categorical constellations is quite broad. While in almost all countries, public authorities and public research and education actors as well as farmer-based organisations are present and well recognisable, it is much less of the case for private companies and even worse for non-governmental organisations (Figure 7).

4.2.3. AKIS supporting policy and dedicated resources

The importance of political support and the need for a coordinated effort to engage with all the AKIS actors is reiterated in the AKIS country reports. And this is a process which requires funding. AKIS actors, in particular policy makers, influence the AKIS functioning through projects and programmes, which are instruments for a limited time frame. Accordingly, in many of the reports (except Switzerland, Serbia) the EAFRD funding through rural development programs (RDPs) from EU is described as the most prominent policy support for (part of) the AKIS at the national or regional level. While the European Commission approves and monitors RDPs, decisions regarding the selection of projects and the granting of payments are handled by national and regional managing authorities. Accordingly, there is a considerable variation among the countries on the amount of funding for knowledge transfer and information, cooperation and advisory services. For instance, in **Bulgaria, Lithuania, Latvia, and Cyprus**, the AKIS is exclusively supported by the RPD. Some other countries are challenged to overcome the administrative burdens to benefit from the EU RDP funds (e.g.in **Greece** the RDP measures are not yet in place).

In contrast, other countries, particularly those in western Europe, have multiple national policies and funds to support AKIS including their own national/regional funds, EARDF funds and some funds from private foundations. In **Denmark**, agricultural funds (particularly production levies and tax reimbursements) are utilised on the part of research and development that is closest to practice. These funds have enabled the collaboration between the universities and SEGES, the Danish knowledge centre for agriculture. The universities address the needs for basic and strategic research in the areas of agriculture and food, while SEGES contributes with research and practice related trial development, advice and implementation. In Denmark, there are no public policies for funding agricultural advisory services. In **France**, the state provides financial support to AKIS actors and guides their activities through multi-annual programmes and thematic policies.

In general, many country reports indicate that the national policies are mainly oriented toward research and innovations or focus on one AKIS sub system in

particular (e.g., in **Latvia** on the advisory sub system, in **Germany** at the national level on the research sub system, etc.). However, we also assume that the information on AKIS policies provided in the country reports may not be exhaustive in all cases for several reasons, including difficulty to obtain completed overview of a country's spending on research programmes and education measures. Another reason is that the AKIS concept has only recently become prominent in agricultural policies. Therefore, former policies may be framed differently and their relevance for knowledge and innovation management may not be easily recognisable. Finally, there may also be considerable funds spent in the private sector for agricultural research, further education and training measures which may not be officially known.

In conclusion, most countries have some sort of AKIS-related national policy or plan, but not all have developed a strategy for its implementation. However, in many countries, since the 2014 report, the general understanding of the AKIS and its prominence in policy documents has advanced and it is now envisaged that the AKIS of the future will be funded and supported in a more planned approach than it has been up to now. Secondly, the funding from RDPs is deemed important for supporting the AKIS in many countries.

4.2.4. AKIS coordination mechanisms

AKIS coordination mechanisms aim at facilitating, ensuring and institutionalising collaboration of AKIS actors from research, policy, private, and non-profit organisations. In general, we identified AKIS coordination mechanisms which can be broadly grouped into two:

- Coordination mechanisms established in relation to the EU level policy, e.g., national networks for rural development to facilitate cooperation and knowledge dissemination.
- Coordination mechanisms established in response to the national policy programs, which include councils, platforms, alliances, and working groups

(i) Rural networks

The countries benefiting from the EU rural development support fund have set up national rural networks (NRNs) that support exchange and learning between all the partners involved in the implementation of Rural Development policy: public authorities, economic and social partners and the relevant bodies representing civil society (ENRD, 2016) [2]. The role and strength of the NRNs' varies among the countries. However, one clear communality is their main objective: coordinating

[2] https://enrd.ec.europa.eu/about/brief_en

the cooperation and linkage of heterogeneous AKIS actors through knowledge sharing events and by disseminating knowledge using various platforms.

The Italian National Rural Network has been established according to the rural development program approved for years 2014-2020. The network aims to support policies for agricultural development through the exchange of experience and knowledge between rural territories, as well as better implementation and management of Italian rural development programmes. The network also aims at enhancing the visibility of rural development policy, actions and achievements whilst bringing together all actors involved in rural development throughout the entire territory of Italy. The **German** Networking Agency for Rural Areas (DVS) facilitates knowledge exchange and dissemination among EIP-OGs programmes. In **Estonia**, the National Rural Network Support Unit (NSU) activities involve the collection, aggregation and dissemination of best practices and innovative approaches, organising various events related to rural development. The NSU actively promotes the exchange experiences at local, national and EU levels and organises seminars for advisors and innovation brokers. In **Poland**, the Network for Innovation in Agriculture (SIR) within Agricultural Advisory Centre in Brwinów, is an internal unit responsible for: (i)facilitating the creation and operation of a network of contacts between farmers, advisory entities, research units, entrepreneurs from the agri-food sector and other entities supporting the implementation of innovations in agriculture and rural areas; (ii) facilitating the exchange of expertise and good practice in the field of innovation in agriculture and rural areas; and (iii) assistance in the establishment of EIP Operational Groups and in the development of projects by Operational Groups and Innovation Partnerships. Additionally, SIR manages the network of regional innovative brokers supporting the delivery of the Cooperation measure in Poland. In **Latvia**, since 2008, LRATC (Latvian Rural Advisory and Training Centre) was delegated to act also as a Latvian Rural Network Support Unit, which since 2018 includes EIP Support Unit, and the Latvian Fisheries Network Support Unit since 2010. In **Spain**, in order to encourage the flow of knowledge, several networks have been stablished at the national level. The major network is National Rural Development Network (RRN), which is a part of the National Rural Development Program. Similarly, the national rural network in **Hungary** coordinates knowledge exchange by organising information events to share good practices.

(ii) Strategic bodies, councils, and working groups

Many countries have set up collaborative working groups, platforms and councils to facilitate priority settings and knowledge exchange. These include constellations of diverse AKIS actors who meet regularly (annual, biannual, quarterly) with the aim to exchange knowledge and identify needs, challenges and

opportunities for the agriculture sector. In several of the studied countries, there are even multiple collaborative working groups within the AKIS.

In **Switzerland** and **Austria**, there are several thematic platforms (at national and regional levels) which play a major role in the exchange of knowledge, experience, networking and solving current problems. The platforms integrate actors, including advisory experts, researchers, decision-makers, multipliers and farmers. In **Germany**, thematic working panels (*Bund-Länder Arbeitsgruppen*) coordinate exchange between the national and the multiple state ministries. Similarly, the DAFA (The German Agricultural Research Alliance) is a platform that aims to support AKIS functioning by setting strategic agendas for agricultural research. To meet its objective, DAFA coordinates exchanges with various publicly funded research institutions and other value chain actors so that they can collectively identify future trends and needs for agricultural research in Germany.

In **Portugal**, the national Social and Economic Council – Permanent Commission for Social Dialogue provides a platform for several farmer-based organisations and other actors to identify the needs and problems of national agriculture through regular meetings. Although, there has been an effort to develop specific, sectoral or thematic research and innovation agendas by the Foundation for Science and Technologies (FCT) in Portugal, synergies between national, regional and sectoral strategies remain to be created and integrated into the various support programmes in a coordinated manner. In **Sweden**, there are two platforms for researchers and advisers, Partnership Alnarp and the Royal Swedish Academy of Agriculture and Forestry. The Alnarp is a partnership between SLU, the business actors and the society focusing on agriculture and the green sector. The Royal Swedish Academy of Agriculture and Forestry is a network organisation and think tank working with issues relating to the green sector, and is economically independent of the authorities, business and interest groups.

In **Hungary,** under the leadership of the NAK (Hungarian Chamber of Agriculture), a working group is established where AKIS participants consult and share ideas and experiences. In this working group, researchers, educators, consultants, advisers, and government actors assemble to develop strategies for better information flows and efficient AKIS. Also, the National Research, Development and Innovation Office (NKFIH) is intended to ensure the coordination of domestic research and development and innovation at the governmental level and a stable institutional system for its predictable financing. Moreover, NKFIH prepares Hungary's scientific research, development and innovation strategy and manages the resources of the National Research, Development and Innovation Fund. In **Finland**, the platform for agricultural research, founded in 2004, brings together representatives of relevant research actors (universities, the Institute for

Agricultural and Fisheries Research, university colleges, experimental stations), farmers' organisations, ministerial cabinets, and government departments and a funding agency. The platform serves as a sounding board for policy development and a contact point with the agricultural research field, and it is the forum for consultation and agreement. In **Spain**, a similar body is the Agricultural Research Coordinating Committee, chaired by INIA (National Institute for Agricultural and Food Research and Technology) and involving several ministries as well as representatives of the seventeen regional institutes with competences in agricultural research; this committee promotes cooperation among the regional structures.

In the **Netherlands**, the Netherlands Organisation for Scientific Research (NWO) funds and steers research by means of subsidy programmes, while the Royal Netherlands Academy of Arts and Sciences (KNAW) acts as a management body for specific research institutes and advises the Dutch Government on matters related to science. In **Ireland**, TEAGASC provides a natural fulcrum for actors and knowledge flows within the Irish AKIS as well as contributing to the AKIS policy framework at the national level and providing networking and coordination structures. For instance, TEAGASC initiated a strategic partnership for innovative extension activities among farmers, the private sector, and the media which is fostered by targeted programs such as the BETTER (Business, Environment, Technology, Training, Extension and Research) farm programme.

In **Italy**, the Inter-Regional Network for Agricultural, Forestry, Aquaculture and Fisheries Research, established in 1998, has been playing an increasingly crucial role in coordinating the design and implementation of European, national and regional legislation, policies and programmes regarding agricultural R&I and advisory services. Over the years, the network has effectively carried out a meaningful work of coordination, promotion and direction of public research, through the articulation of the demand, to better target the needs of the different territories, the definition of objectives and priority actions for research and experimentation, and its delivery (guidelines, procedures and types of funding).

While distinct mechanisms for coordinating the agricultural advisory services or coordinating the AKIS at the national and/or regional level is observed in many countries, for a few (e.g., Greece, Malta, Cyprus), transparency on coordination mechanisms is lacking. Also, from the Dutch report, we observe the absence of coordination mechanisms in the national AKIS. On the other hand, in countries such as **Croatian**, **Slovenian**, **Bulgarian** and **Estonian**, the ongoing effort to set up coordination mechanism(s) that facilitate cooperation among AKIS actors is underlined. For instance, in **Slovenia**, there is a plan to set up an "Agriculture and Rural Development Council" that is envisaged to identify and monitor the AKIS

situation and coordinate activities in this field is in process. Similarly, in **Estonia**, a working group on AKIS is preparing the set-up of a coordination body.

In sum**,** working groups and platforms as coordination mechanisms can be powerful tools for facilitating knowledge exchange and negotiation in the priority setting process and are already widely represented. The evident strength is their institutionalised character, while the extent to which these actors influence the policy may vary from one country to the other based on the context and the actor composition.

4.2.5. Linkages among AKIS actors

As part of the AKIS appraisal, estimations of the degree of linkages and cooperation among AKIS actors were given in the reports. Assessing cooperation among AKIS actors indicates the level of integration for knowledge production, exchange and use. Therefore, we highlight below some features that are commonly perceived in several countries and may merit more thorough and systematic studies, as well as obvious differences and distinct specificities.

Overall, the AKIS reports analysed indicate relatively strong linkages between farmers and/or farmer organisations and advisory service providers for many countries (e.g., **Austria, Croatia, Cyprus, Estonia, Germany, Ireland, Luxembourg, Sweden and Denmark**). These close linkages are sometimes complemented by the mention of a similarly close third actor like vocational education bodies (Austria, Germany, Sweden) or development agencies (Croatia, Cyprus). Generally, good linkages among all AKIS actors are only reported from Belgium, Czech Republic, Denmark, and France. Singularly highlighted are strong linkages between farmer-based organisations and public authorities (**Poland**), or private up- and downstream industries (**Portugal**). Finally, in some cases, few key actors are identified for playing a vital role in creating strong linkages (e.g., **Finland, Ireland, Denmark**).

On the other hand, there are also a few countries that reported a general weakness of linkages within the AKIS, e.g., the **Netherlands** and **Slovenia**, while for **Hungary** and **Slovak Republic** the reports do not allow for qualification of linkages. A particularly frequently mentioned weakness is the connection between science and practice, i.e., between farmers and research, or more generally between research and other AKIS actors (Bulgaria, Croatia, Estonia, Germany, Ireland, Poland, Portugal, Slovenia, Sweden and Switzerland). Equally, private

advisory services in several countries only have weak linkages with other AKIS actors (Bulgaria, Croatia, Malta, Spain).

Furthermore, from the reports, it is observable that for some countries, strong horizontal linkages are reported, e.g., among public actors (Bulgaria, Malta), while in others, the degree of vertical linkages appears stronger (Latvia). In decentralised countries, a gap between the national and the regional level can be observed (Germany, Italy), and the degree of cooperation depends on the region. For instance, in Veneto, Italy, there are strong linkages between farmers and agricultural institutes, whereas in Campania, there are strong linkages between farmers and training institutes.

Table 1 below summarises the strong and/ or weak linkages among AKIS actors in each of the countries investigated. This overview, however, is rather a collection of key features than a comprehensive picture and frequently reflects the perspective of the respective AKIS report authors. Nevertheless, as in many cases, the AKIS diagrams have revealed useful and stimulating for a nation-level appraisal. We propose this aggregated view as a similar input for discussion.

Table 1 Summary on the degree of linkages and cooperation among AKIS actors in respective countries

Country	Degree of linkage and cooperation assessment
Austria	Strong- between vocational training and education, farmer/farmer-based organisations and advisory organisations Weak - among other AKIS actors; no regular, institutionalised exchange among diverse actors
Belgium	Strong – between the AKIS actors in general, with a certain exception of linkages between farmers and AS in Wallonia
Bulgaria	Strong- horizontal linkages among the ministries; NAAS have established lasting and strong links with universities and research institutes Weak - between farmers and universities, private sectors, and NGOs
Croatia	Strong - between the extension service and producer groups, farmers' unions and development agencies. Weak - among private consultants, private companies and universities as well as between science and practice
Cyprus	Strong - between farmers and farmer-based organisations, advisory services and development agencies Weak - between Farmer and private companies, consultancies and universities
Czech Republic	Strong - among many of the AKIS actors. The IAEI plays a strong facilitation and coordination role among AKIS actors
Estonia	Strong - between farmers and other AKIS actors Weak - between Research and AS, as well as other non-farmer actors
Finland	Strong - between ProAgria and other AKIS actors Weak - among various categories of actors unless through ProAgria

France	Strong- Especially between the technical institutes which have close collaborations with other AKIS actors. There are also many institutional arrangements to foster networking.
Germany	Strong- between farmer organisations, chambers and vocational education Weak - between universities, research, and ministries at the national and state levels with other AKIS actors
Greece	Strong - between private upstream companies and farmers Weak – among the various AKIS actors. All operate in parallel with almost non-existent integration
Hungary	Weak – among the various AKIS actors Strong – between the Hungarian Chamber of Agriculture and the various AKIS actors
Ireland	Strong - among the public, education, research and farmer organisations and Teagasc advisors Weak - between external research and other stakeholders and TEAGASC advisors with external advisors.
Italy	Strong – between AKIS actors at the macro level, more institutionalised relationships are more easily recognisable Weak- between AKIS actors at the micro level, networks are operating and are less visible
Latvia	Strong- between ministry and LRATC as well as between universities, FBOs and research Weak- among Advisory service providers
Lithuania	In general, a medium degree of linkages among all AKIS actors
Luxembourg	Strong - between farmers and other AKIS actors Weak – among non-farmer AKIS actors
Malta	Strong- among AKIS actors that are public bodies Weak -between private companies and private advisory organisations
Netherlands	Weak- linkages among all the AKIS actors.
Poland	Strong to medium degree of linkages between farmer-based organisations, public authorities and Weak – between universities and the rest of AKIS actors
Portugal	Strong - between farmers and farmer-based organisations and upstream and downstream industries Weak- between national and regional public bodies as well as research and practice, NGOs
Serbia	Strong- between the ministries and educational research institutes through ISAA. Linkages between other AKIS actors and farmers or among other AKIS actors is not explicitly described in the report
Slovakia	Linkages among AKIS actors is not explicitly described in the report
Slovenia	Weak – between practice and research. Cooperation between institutions relies on good relations between the individuals.
Spain	Linkages among the AKIS actors vary greatly among the regions. Strong- between heterogonous actors both vertical and horizontal Weak- between farmers and the private companies
Sweden	Strong- between farmers and Advisory services Weak- between research and farmers.
Switzerland	Strong- among heterogeneous AKIS actors Weak- between universities and Advisory services

Denmark	Strong- between farmers and their representatives and with universities, public ministries and agencies, agricultural knowledge centres, agricultural colleges and vocational schools, advisory companies,

4.2.6. Advisory organisations interacting with farmers

Well established structures mandated to respond to farmers' knowledge needs are crucial for a well-functioning AKIS. Actors such as public advisory organisations and farmer-based organisations (e.g., cooperatives, unions, associations and chambers of agriculture) have demonstrated their indispensable role in knowledge provision. The type or mix of organisations directly interacting with farmers varies across the countries (Table 2). Partially, this can be associated with (i) the size of the country (smaller countries have less diverse actors reaching farmers, e.g., Luxembourg, Serbia), (ii) the historical development of services and (iii) with the influence of EU policies in the respective countries. In recent years, due to the proliferation of private companies and pluralism in knowledge production and provision, multiple actors are directly interacting with farmers. Nevertheless, public organisations at various capacities are still the key organisations to reach farmers in many countries. In **Serbia** and **Croatia**, the ministry of agriculture with its subordinated advisory agencies, is the sole structure interacting with farmers. In the later the capacity to meet future challenges is a huge concern. In **Ireland**, the public organisation, *Teagasc*, has a predominance in the irish AKIS, and facilitate knowledge exchange between research, advice and education. Moreover, there are many private consultants who engage with farmers for a variety of adviosry services, some of which are public funded. Similarly, in **Lithuania**, **Serbia**, **Bulgaria**, and **Cyprus** the providers of agricultural advice are predominantly public. In almost all EU countries, except for the **Netherlands**, **Greece**, **Portugal**, **Luxemburg** and **Sweden**, at least some advice is still provided by public actors – yet to a decreasing extent in most of the countries.

Farmer-based organisations, including chambers of agriculture, are also prime structures to reach farmers (e.g., **Denmark**, **Finland**, **Portugal**, **Austria**, **France**, **Hungary**, **Poland**, **Belgium-Flanders**, **Sweden**, **Slovenia** and **Luxembourg**). In Austria, the chambers are designated as the backbones of the Austrian AKIS the same as in some states of Germany. In countries such as **Spain**, **Italy** and **Slovakia** multiple structures, including public organisations, farmer unions, farmer cooperatives, chambers, and private advisory services interact with farmers at comparable degrees. Another common pattern observed in these countries is the

rise of private actors interacting with farmers. For instance, In **Poland,** the number of private agricultural advisory companies has increased; the inventory of advisors from CDR contains around 1,000 private advisers who provide services to farmers, particularly about the use of the EU funds. Reports from Greece and Poland also indicated the prominent role of private agricultural input providers in providing technological and economic consulting services to farmers. In general, the changing policies and the EU legislative framework encourage private advisory organisations to flourish in many countries, although not always coordinated. The question thus remains, if and to what extent farmers are reached.

In countries like **Germany**, due to the federal system, there is huge diversity among the states as well as in the number and type of organisations directly interacting with farmers. Also, in **Belgium**, specifically in Wallonia region, research bodies along with other actors such as farmer-based organisations, NGOs and private actors are the main actors interacting with farmers.

The role of public and private agencies is changing, leaving the coordination and regulatory role to public bodies, and private companies are actively interacting with farmers. For instance, in **Portugal** and in some states of **Germany**, although the state/regional public advisory organisations are closer to farmers, their service is limited to implementing regulatory actions, coordination, and policy implementation. On the other hand, specific technical advisory roles are taken up primarily by private advisory organisations and farmer-based organisations. In Estonia, the Rural Development Foundation (RDF) was founded by the state to operate as a third sector, not-for-profit organisation that provides advisory services with funding from the state.

Table 2 Dominant actors interacting with farmers

	Countries
Public organisation	Bulgaria, Cyprus, Ireland, Latvia, Lithuania, Croatia, Serbia, Montenegro, Switzerland
Farmer-based organisation (FBO*)	Austria, Denmark, Finland, France, Portugal, Sweden, Poland, Slovenia, Belgium-Flanders
Private advisory organisations	The Netherlands, Greece
Public and FBO	Luxembourg, Malta, Hungary
Public and private advisory org.	Belgium-Wallonia, Czech Republic, Estonia
Public, FBO and private advisory org.	Germany, Italy, Spain, Slovakia

*Farmer-based organisations, including Chambers of agriculture

In summary: In 21 out of 28 countries, there is a visible dominance of one actor (category) providing information to farmers and supporting problem-solving and innovation processes in the agricultural sector. We frequently see public organisations in this position, with farmer-based ones closely following. However, there is also a range of countries with other constellations, a fact that suggests case-by-case studies and focused analyses rather than the aggregation of findings and conclusions.

4.3. Characterisation of advisory organisations and their services

The results presented in the following subsections give an overview of the different features of the advisory service providers. Where appropriate, comparisons between the different categories of service providers are made to highlight distinct organisational characteristics. However, in this analysis, country wise comparisons are not made.

The results presented are based on the online survey responses (cf. Section 3). There was a total of 534 responses to the survey from 27 countries: with the number of responses to the survey varying greatly, from 107 in Italy to 2 in Croatia. For the purpose of this analysis, only those countries with at least eight responses were considered. This led to the exclusion of Serbia (6), Ireland (5), Austria (3), Malta (3), the Netherlands (3) and Croatia (2). The resulting total of 511 responses from 21 countries were thus considered for this analysis. The distribution of the number of survey responses from the partner countries are shown in Figure 8.

The survey was targeted at two main categories of advisory service providers – freelance advisors and advisory organisations with either full or partial dedication to the provision of advice. Among the participants in the survey, there is a certain imbalance between independent advisors and advisory organisations: in a few countries, the number of freelance advisors far outweighs the number of organisations (Italy, Hungary, Czech Republic and Poland), while with the exception of Finland, advisory organisations clearly outnumber independent advisors. However, we are not in the position to assess whether these figures indicate national actor constellations or have occurred by chance and as a result of arbitrary sampling. Survey participants identifying themselves as representing an advisory organisation were further asked to choose from the five categories of advisory service providers as developed by Knierim et al. (2017) – government or ministry based advisory organisation; third-sector farmer-based organisation; private/commercial advisory organisation; third-sector non-governmental organisation; University/Research-based organisation.

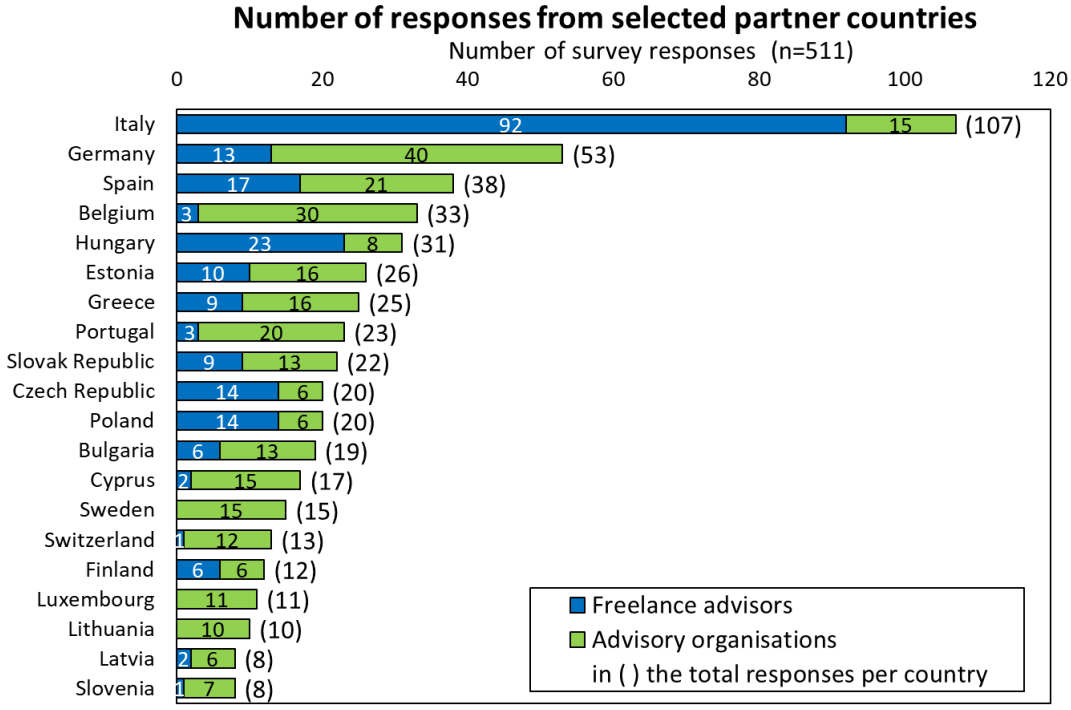


Figure 8 Number of survey respondents from the 21 partner countries

4.3.1. Overview of advisory service providers

A total of 225 freelance advisors and 286 advisory organisations responded to the survey. Of the latter, 41% were advisory organisations, i.e., those organisations whose primary mandate is the provision of advisory services, and 59% organisations with an advisory component.

Survey results showed that all types of advisory service providers could be found (Figure 9). Respondents most frequently identified themselves as private/commercial bodies (96), followed by government/ministry-based type (58) and farmer-based organisations (55). The others were university/research bodies (33) and non-governmental organisations (25). Some 19 organisations did not identify themselves within any of the five categories and chose rather to identify as “others”.

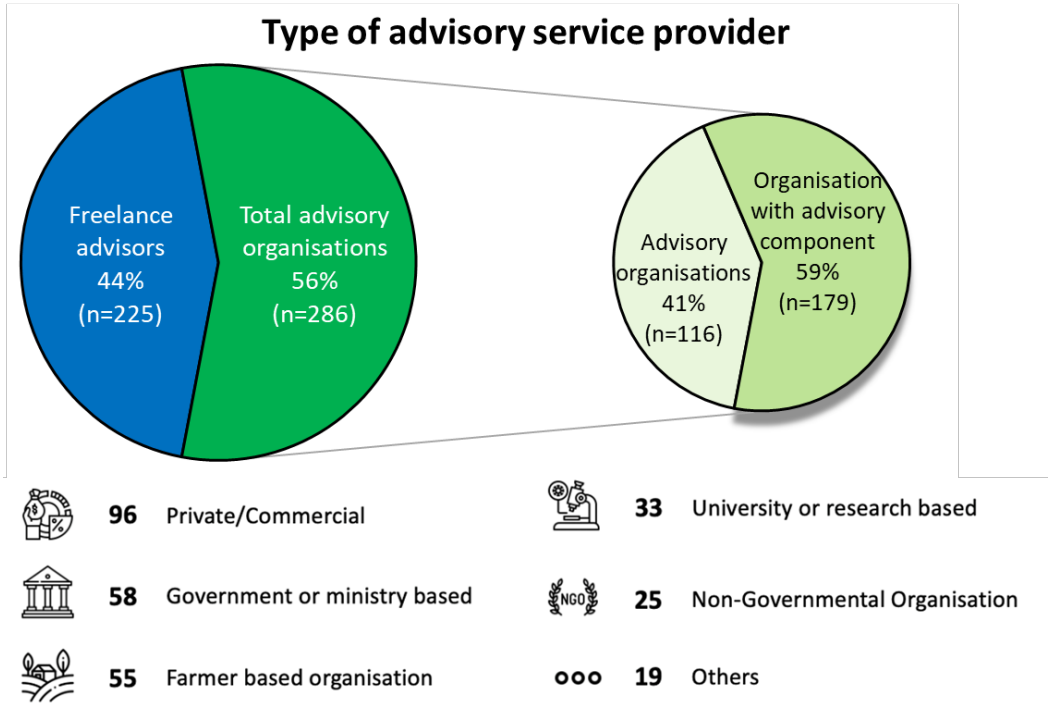


Figure 9 Overview of survey respondents

In terms of the scale of operation, the activities of most of the advisory service providers were at sub-regional and regional levels. On the other hand, private/commercial based actors clearly stand out with 20% of their activities at the international level, and NGOs and university/research-based advisory service providers follow with only 12% approximatively. In contrast, university and research bodies are unique in their dominant national focus. Finally, public actors, farmer-based organisations and freelance advisors reveal a similar pattern of a dominant regional focus with equally important shares at a local level. Thus, these differences highlight institutionally shaped variations of interest and focus of the advisory service providers (Figure 10).

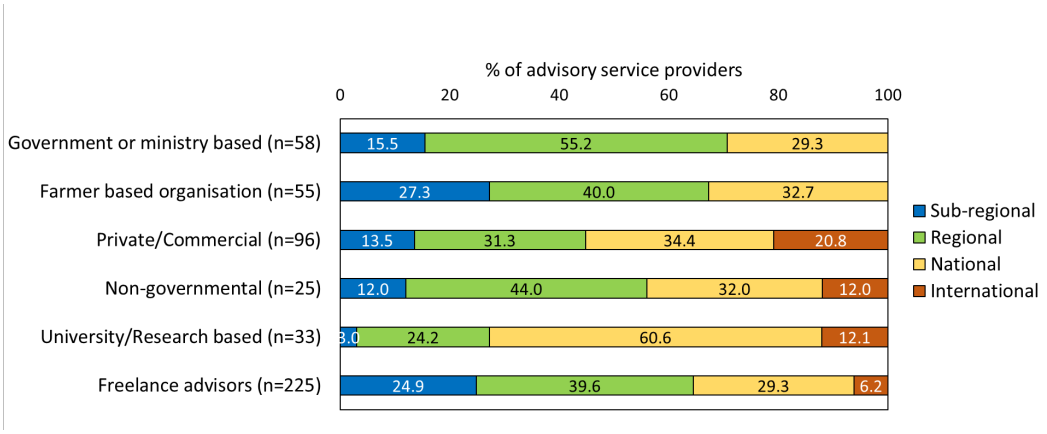


Figure 10 Scale of operation of various advisory service providers

To further explore the main advisory activities of the different providers, we used the typology of innovation support services (ISS) as conceptualised by Knierim et al. (2018) and Faure et al. (2019). The typology includes: (1) creating awareness and facilitating knowledge exchange; (2) consultancy and backstopping; (3) networking, facilitation and brokerage; (4) demand articulation; (5) enhancing access to resources; (6) training and capacity building; and (7) providing support for the design and enforcement of laws and regulations.

Survey results showed that advisory service providers were involved in a wide range of activities. Slight differences could be observed among the different advisory service provider groups, but in general, the most frequently mentioned advisory activities were consultancy and backstopping (41.3% out of 511), followed by creating awareness and facilitating the exchange of knowledge (38.2%) and training and capacity building (33.1%). Networking/Facilitation/Brokerage, providing support for the design and enforcement of law and regulation and enhancing access to resources were mentioned 29.4%, 22.1% and 21.1%, respectively. The least often mentioned activity in all the advisory service provider categories was demand articulation (11.5%).

4.3.2. Clients, topics, and methods

Clients

The profile of the clients served by the advisory service providers were diverse. Survey results show that the most frequently mentioned client groups by all categories of advisory service providers were farmers with small/medium-scaled farms (80.8%). In general, however, survey results confirm the diversity of clients

addressed by advisory service providers. Among the different categories of advisory service providers, very slight differences could be seen but not significant enough to warrant further analysis (Figure 11)

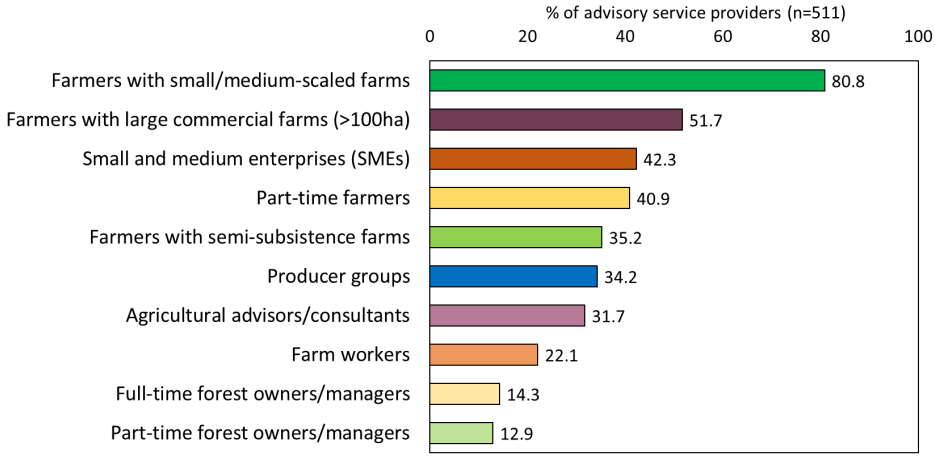


Figure 11 11 Profile of clients served by advisory service providers

Advisory topics

Survey results for the cross-cutting advisory topics that are in most demand by clients (Figure 12) showed high popularity for five main topics, namely, entrepreneurship and farm management (57.3%); rural development support and diversification (55.6%); support with grant application and compliance with regulation and standards (54.0%); agri-environmental stewardship measures and nature conservation (52.6%); and production technologies (47.7%). These topics reflect the current social trends and the larger EU policy measures for sustainable farming and rural development.

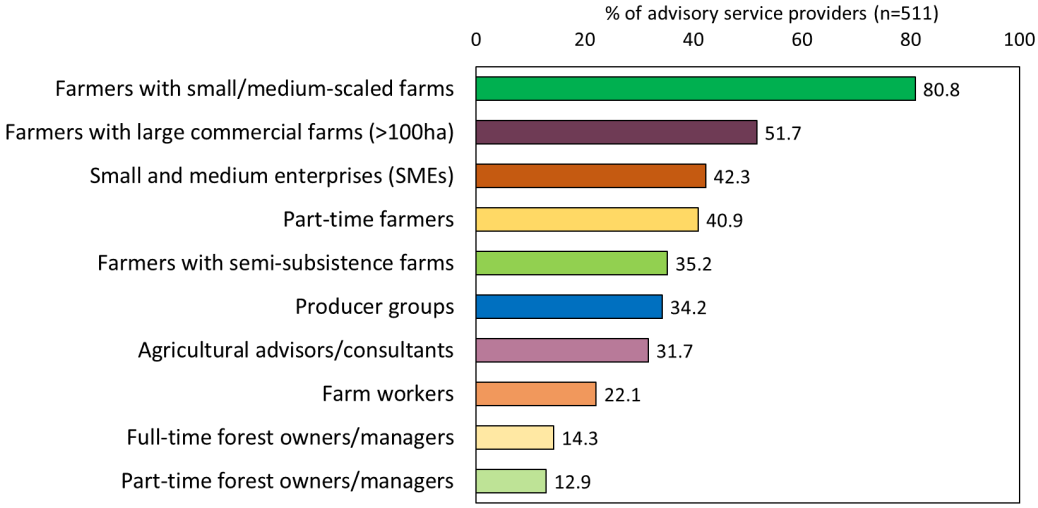


Figure 12 12 Cross-cutting advisory topics most demanded by clients

In terms of main production sectors in which advisory services are provided, crop production was the highest (68%), followed by livestock production (51%) and a similar frequency of mentions of fruits and vines (41%) and vegetables (39%).

Methods

Figure 13 shows the reported percentage of the three advisory methods (individual and group advisory, and mass media information spread) among the freelance advisors and advisory organisations. In general, individual advice was the most frequently used method in both groups. Differences, however, could be observed among the three methods; whereas the use of individual advice was higher among the individual advisors (81.6% compared to 58.6%), group advisory and mass media were more frequently used among the advisory organisations than individual advisors.

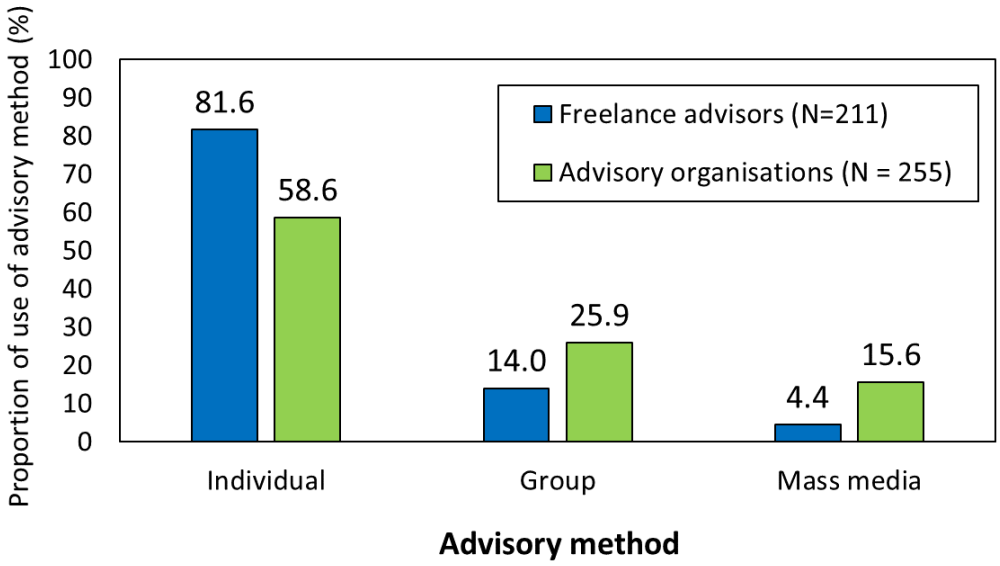


Figure 13 13 Proportion of use of advisory methods

4.3.3. Human resources

Table 3 shows the average % of advisors and female advisors across the diverse types of advisory service providers. In general, government/ministry-based- and university/research based bodies had the highest number of employees. In terms of the share of advisors, however, the numbers were highest with NGOs (67%) and private/commercial advisory service providers (61.7%), probably due to the more targeted services these organisations offer. Representation of women among the share of advisors were high in all the organisation types, the highest observed in NGOs and government or ministry based advisory organisations.

Table *3* Average number of advisors in the diverse types of advisory service providers surveyed

Category	(Average) No. of employees	(Average) % of advisors	(Average) % of female advisors
Government/ministry based	168 (1-2700)	50.6%	54.6%
FBO	101 (1 - 2000)	55.3%	48.4%
Private/Commercial	56 (1 - 2000)	61.7%	44.3%
University/Research	175 (1 - 900)	33.2%	49.7%
NGO	33 (1 - 250)	67.0%	57.9%

When asked whether there had been changes in the number of advisors in the past three years (2018-2020), 68% of the 312 organisations reported no change, whereas 26% and 12% reported a significant increase or decrease respectively. NGOs, FBOs and private/commercial advisory service providers reported more increase than decrease for reasons such as

- increase in advisory demand due to more complex legislations and higher bureaucracy levels,
- increase in specific advisory topics such as organic farming,
- increase in subsidies for advisory activities, and
- increase in support programs.

For those that reported on decrease, reasons given included a decline in funding and grants due to debt brake in the country, reduction in the number of farms, low salaries, poor educational system for advisors, retirement without replacements, etc.

Educational levels and qualifications of advisors

In terms of education level, the majority of the advisors in the advisory organisations had an engineer or higher degree (Masters or Ph.D. degree) (Figure 14). In comparison, a slightly higher proportion of freelance advisors had engineer's degree (40.9%).

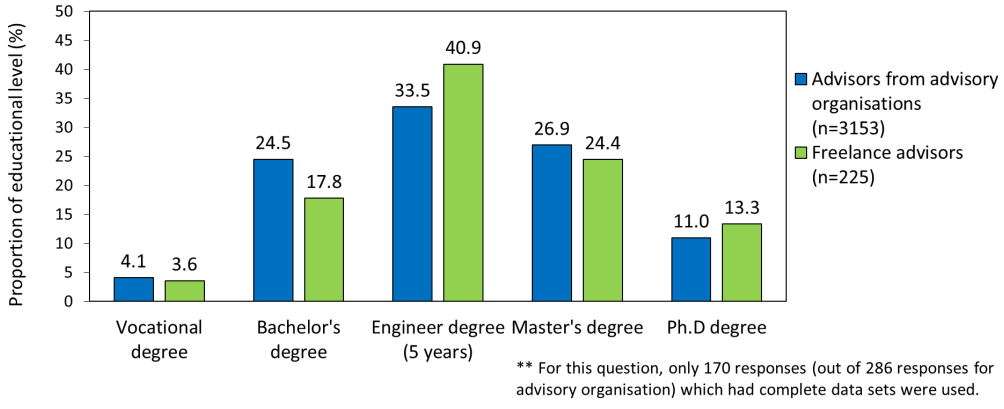


Figure 14 Comparison of education level of freelance advisors vs. advisors in organisations

Table 4 shows the distribution of advisors in terms of the different years of professional experience. In general, most advisors surveyed had more than 10 years of professional experience. This was particularly the case for freelance advisors, which is not surprising given that advisors become freelancers usually after gaining some experience on the field.

Table *4* Distribution of advisors in terms of professional experience

Aggregated years of professional experience	**0 - 3**	**3 - 10**	**> 10**
Advisors in organisations (n=682)	15.1%	33.9%	51%
Freelance advisors (n=195)	6.2%	17.9%	75.9%

To the question whether advisors in the organisations had advisory certificates, 64.7% out of 272 organisations responded no. In comparison, 52% of freelance advisors out of 225 individuals had certificates in topics such as bio/organic

farming, phytosanitary, forestry, soil case, integrated pest management, ecology, etc.

Additionally, advisors in the different advisory organisations received training as part of staff development plan, either through in-house training units or through other means. For those that did receive training, advisors spent an average of 9.6 days in training; the numbers varying greatly from as little as 0.5 days to as much as 80 days.

Time allocation by advisors

We further asked the representatives who filled in the survey for their organisations about the average proportion of time spent by advisors in their organisation on various activities, as listed in Figure 15.

Results showed that advisors from private/commercial based organisations and FBOs spent a great proportion of their time on targeted consultation services. For universities/research bodies and government/ministry-based organisations, teaching and training activities, as well as information dissemination were also primary activities. All types of advisory service providers were involved in innovation support activities such as facilitation, networking and brokerage, albeit to a varying degree; advisors from NGOs spent a relatively higher proportion of time in innovation support service activities. In general, advisors from all the advisory service provider categories, spent the least time on the further development of one's knowledge and skills.

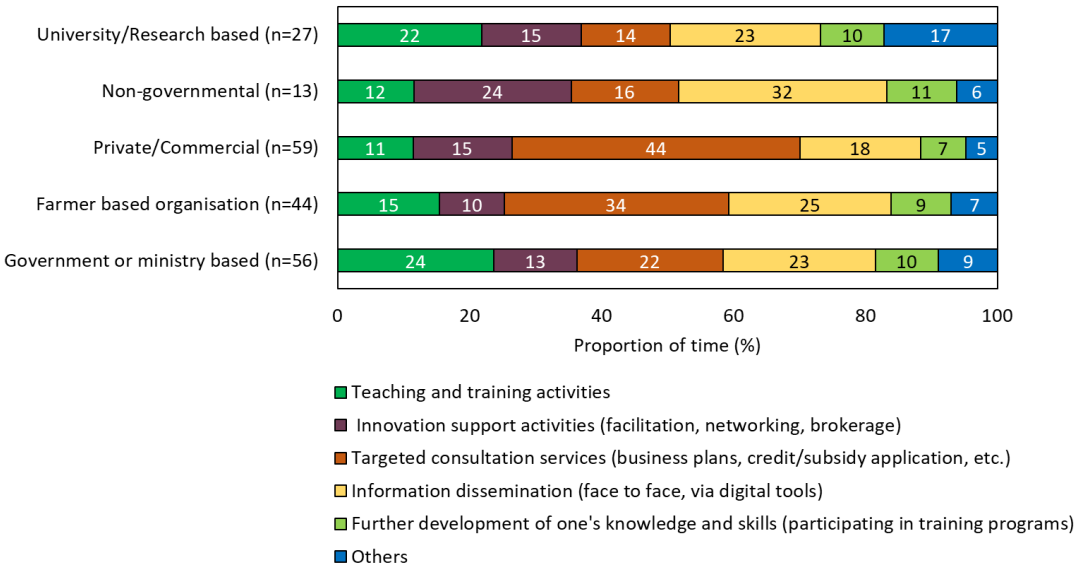


Figure 15 Proportion of time spent on various advisory activities

4.3.4. Funding schemes, financing mechanisms

In the survey, respondents were asked for their organisation's sources of income. As can be seen from Figure 16, government or ministry based and university/research based advisory service providers most frequently mentioned public funds as their sources of income. For the private/commercial advisory service providers, the most frequently mentioned was cost-recovery from farmers (68.8%%). FBOs on the other hand seem to have a broader mix of income sources as can be seen from the relatively equal mentions of public funds (56,4%), membership fee (56,4%) and cost-recovery from farmers (54,5%).

When asked whether there were any changes (increase/decrease) in the budget over the last three years, 47% (n=126) out of 268 organisations who responded to this question reported a change (Table 5). For those that reported an increase in budget, reasons included increase in subsidies/funding, new activities or projects, increase in demand, etc. Reasons for decrease on the other hand included economic crisis, COVID 19, reduced funding, rising cost and unsuccessful projects.

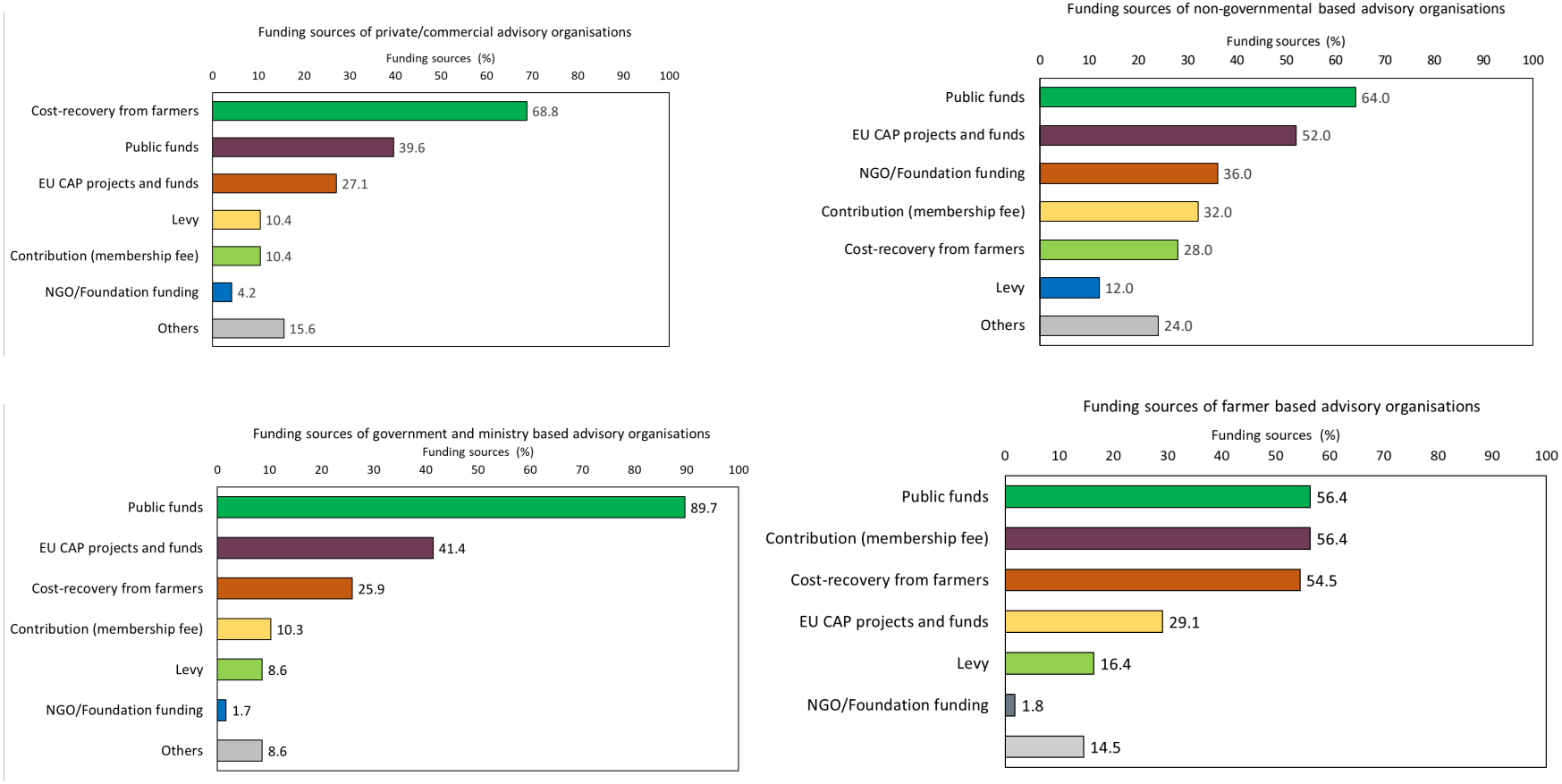


Figure 16 Funding sources of different advisory service providers

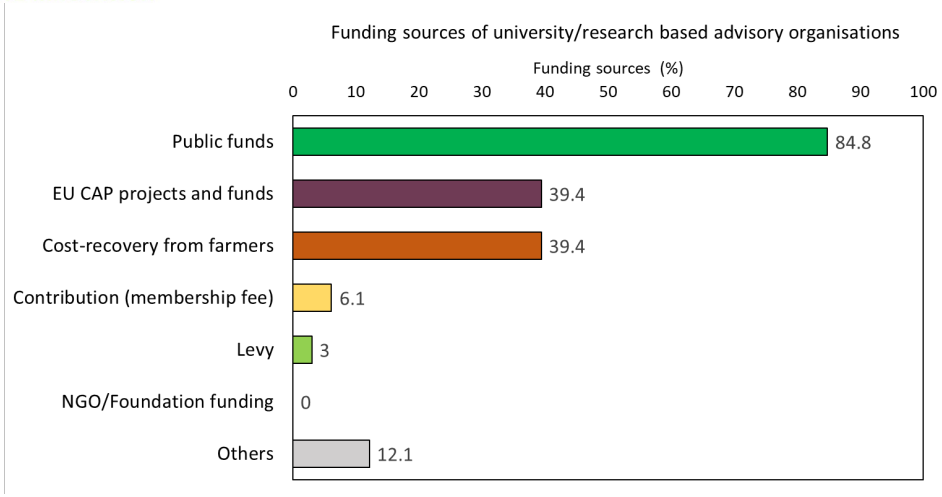


Figure 17 Funding sources of different advisory service providers

Table 5 Percentage of advisory service providers who reported a change in annual budget over the past three years (2018-2020)

	% of organisations reporting change
Government or ministry based	32,8% (n=20)
FBO	45,6% (n=26)
Private/Commercial	40,0% (n=36)
NGO	54,2% (n=13)
Universities/Research	47,2% (n=17)
Others	42,4% (n=14)

4.3.5. Linkages with other AKIS actors

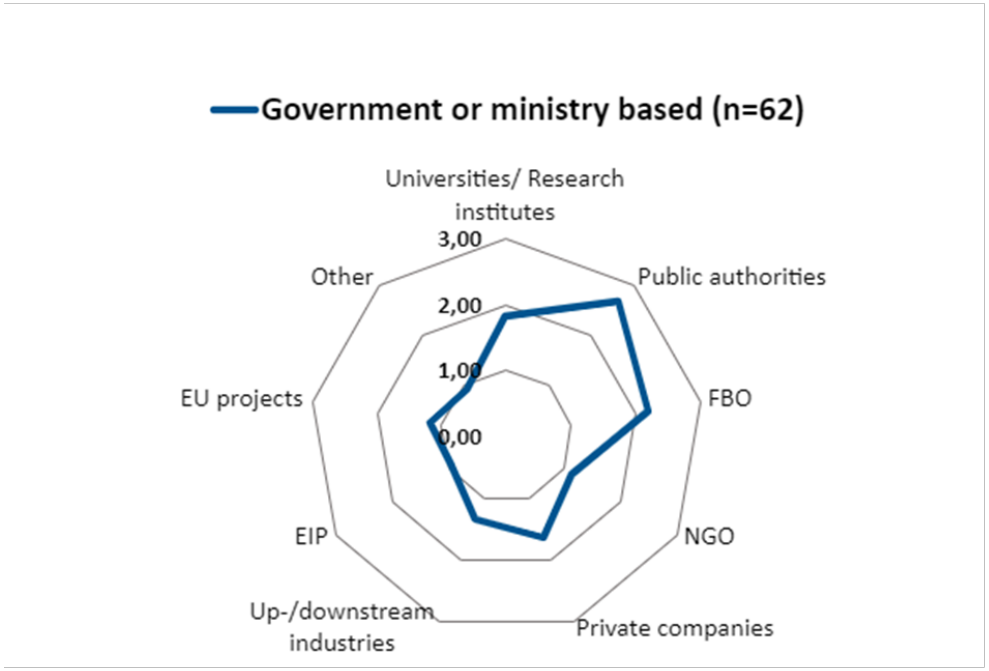
In the current CAP agenda, there is growing emphasis towards a comprehensive innovation system approach that systematically interlinks AKIS actors. To explore the extent to which advisory service providers cooperate with other AKIS actors, we asked survey respondents to rate the cooperation on a scale from 'no' and 'weak', over 'medium' to 'strong'.

Overall, all categories of advisory service providers had a strong cooperation with the public authorities and FBOs. The strong link to public authorities in general could be attributed to the need to stay up to date with regulations, guidelines, and funding opportunities. Strong linkages to FBOs reflect the key role that FBOs play in many of the partner countries, not only in terms of providing advisory services but as key players in the AKIS. In many of the partner countries where FBOs were prominently featured, they were often represented in advisory committees and board of directors at the national levels. FBOs thus play important roles in orienting and setting policy and institutional conditions that can support the needs of their members and facilitate innovation.

In contrast, the different categories of advisory service providers perceived their cooperation with universities/research as rather weak to medium, which confirms similar observations in many of the partner countries (Figure 17). Similarly, cooperation with up-/downstream industries were weak-medium. Given the current policy support for multi-actor approaches through EU projects and EIPs, we also asked advisory service providers to rate the degree of cooperation with

these projects. Here, no, or weak cooperation were reported among the surveyed advisory service providers which reflects the limited outreach of these interventions.

From a descriptive analysis only, specific organisational characteristics in term of cooperation with other AKIS actors could not be observed. The only noticeable difference was that between advisory organisations and freelance advisors whereby the latter in comparison had only weak to medium cooperation with all the other AKIS actors.



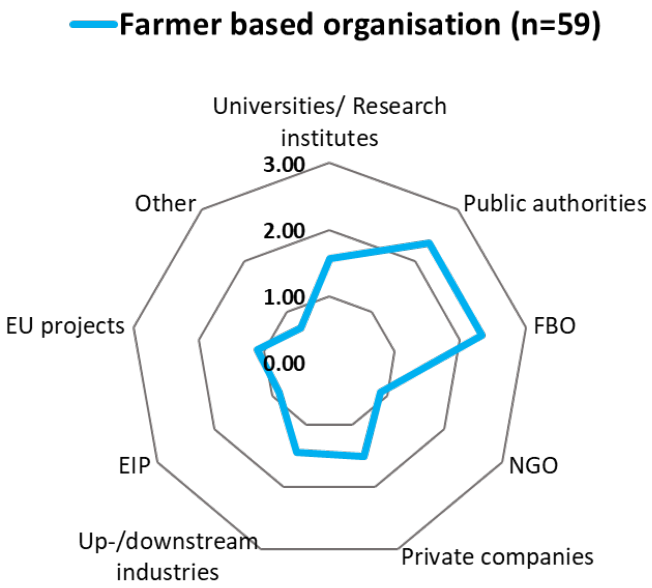


Figure 18 Linkages of advisory service providers with different AKIS actors

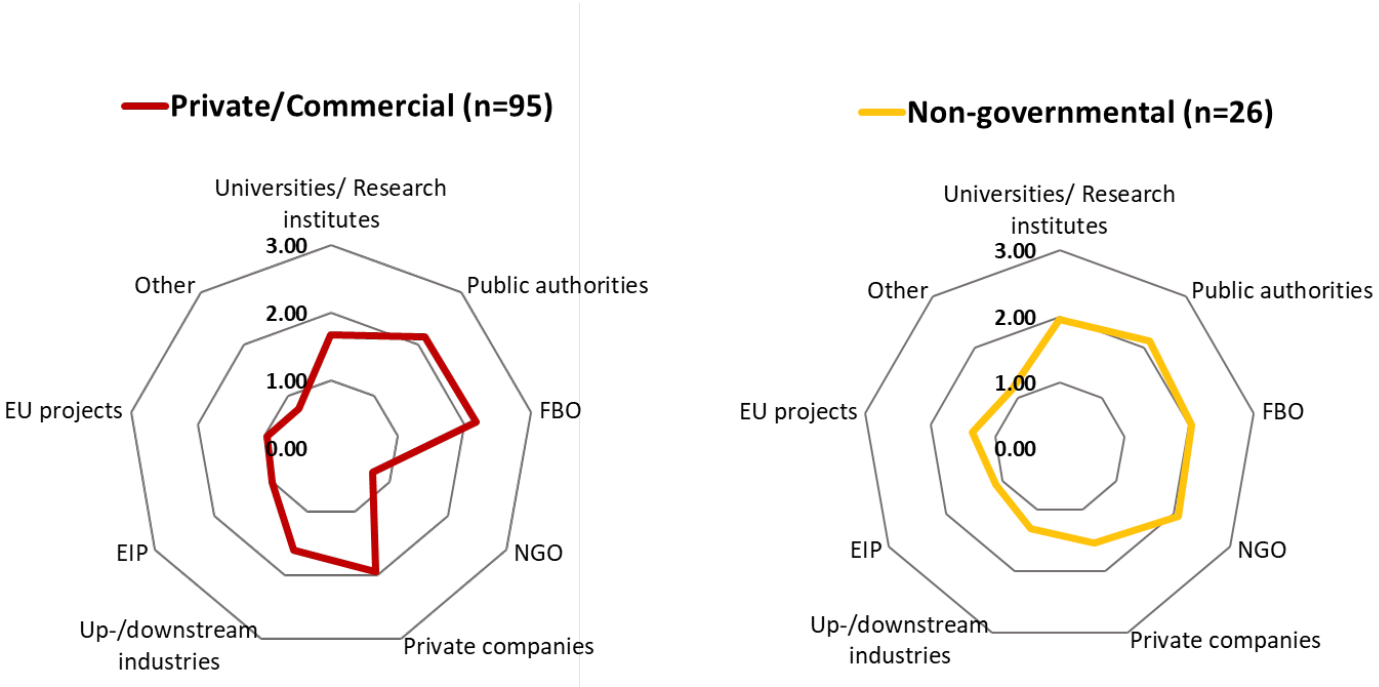


Figure 19 Linkages of advisory service providers with different AKIS actors

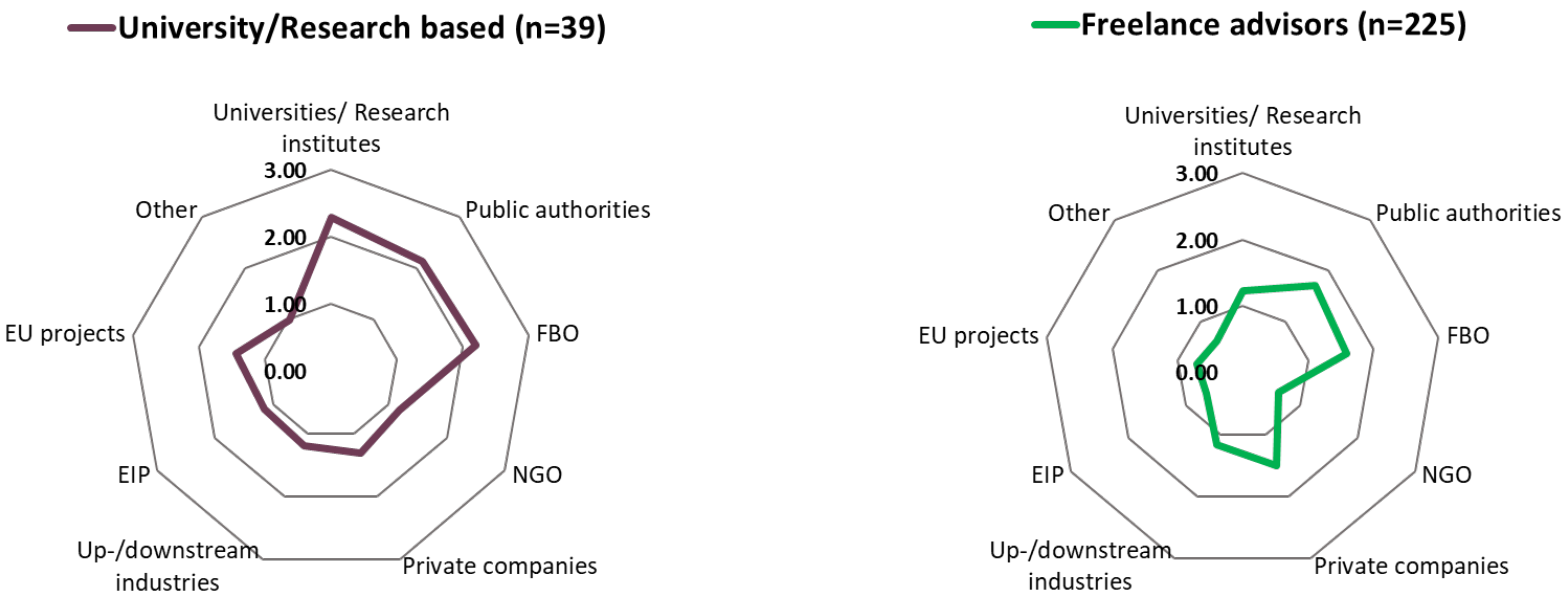


Figure 20 Linkages of advisory service providers with different AKIS actors

5. Discussion and conclusions

The AKIS concept

In Europe, nowadays, the AKIS concept is used as a guiding principle for modernising the agriculture sector and for ensuring a sustainable management and use of natural resources in the farming and forestry sectors. The concept guides researchers, politicians and practitioners at EU, national, regional and local levels to improve and exploit actors' capacities, to leverage resources at individual, organisational and systems levels, and to create or improve linkages and relationships by building bridges and/or strengthening cooperation in the broader agriculture sector.

The diversity of AKIS actors and institutions

Farmers and other professional land users in Europe operate in a huge variety of natural, sectoral, socio-cultural and institutional conditions (cf. section 4.1). These manifold contexts create particular environments that historically have shaped and will continue to influence the development and the performance of the respective AKIS services at national and subordinated levels.

In most of the (studied) European countries, a certain diversity of AKIS actors is recognisable at the national level, and for many Western European countries, we find evidence of pluralism within their AKISs. Secondly, the presence of private economic actors within the AKIS has clearly increased during the past ten years while NGOs are less widely present. With respect to actor categories, the dominant constellation is composed of public administration, public research and education bodies and farmer-based organisation, with only a few countries deviating from this. Thirdly, it is possible to distinguish between countries with a few mentioned organisations per category and considerable to many mentioned organisations, a differentiation that can be used as an indicator to qualify the degree of an AKIS pluralism.

Regarding the AKIS governance situation, our analysis showed that although centralised AKIS is apparent in many countries, a decentralised AKIS governance system is increasingly adopted at regional and local levels. Meaning, actors operating at varying administrative levels implement agriculture policies for their specific geographic or political settings.

AKIS related policy and funds

The national policy environment that is largely set by government plays a substantial role in strengthening AKIS. In other words, for an AKIS to thrive, a clear public policy that supports AKIS by allocating public investment for knowledge production and giving attention to maximising returns on investment in knowledge is crucial.

All the countries studied have some sort of AKIS related national policy or plan. In particular, the resources from EAFRD fuel many of the AKIS related programs and instruments in many EU member states. Also, the policy support through the EIP-AGRI program for innovation in the agriculture sector appears evident in many countries. While in some member states in East Europe, these funds are the only ones mobilised, some Western European countries have in parallel established a second strand of policies and instruments with resources from the national level, often dedicated to research and development activities.

Moreover, the newly formulated CAP framework, which will be fully operational in 2023, binds all member states in Europe to develop a clear plan for strengthening their linkages and collaboration with the various AKIS actors. In view of that, the respective member states are elaborating how advisors, researchers and CAP networks will work together within the framework of AKIS and how advice and innovation supports are provided. In this regard, the emphasis on AKIS will affect the long-term knowledge infrastructure in member states and the resulting innovation and knowledge exchange.

Coordination mechanisms and linkages within the AKIS

AKIS coordination mechanisms exist to a varying degree: in many countries, the CAP related rural development networks (RDN) fulfil this function, although it is not their main objectives. In other countries, various forms of coordinating structures such as platforms, councils and formalised networks exist for this purpose. The results show that the structural diversity and the range of attributed aims and tasks of coordination mechanisms are immense. However, the available information does not allow for a consistent aggregation of the data to make conclusions on how effectively the AKIS coordination mechanisms are facilitating the collaboration of AKIS actors.

In terms of formal linkages among AKIS actors, an attempt was made to produce a comprehensive picture of the quality of linkages and indirectly knowledge flows among the AKIS actors using the AKIS diagrams and subjective appraisals of the respective AKIS report authors. The resulting insights, however, are rather a collection of key features than a comprehensive picture, which showed relatively

closer linkages among farmers and advisory organisations and a widely confirmed gap between research and practice actors. Still, for many countries, the appraisal reflects the perspectives of the respective AKIS report authors. Moreover, as in many cases, the AKIS diagrams have proved useful and stimulating for initiating a nation level AKIS appraisal. Therefore, we propose this aggregated view of representing AKIS actors and their linkages as a valuable input for future AKIS related discussions with even more unifying features.

Advisory services interacting with farmers – features and trends

Despite the pluralism of advisory service providers in many countries, there is still a tendency for public organisations, closely followed by farmer-based organisations, as main providers of information and advice to farmers. This could be mainly due to the public funds allocated to the service, which are historically managed by public organisations. Moreover, our analysis showed that in cases where FBOs are strongly present within the AKIS, the role of NGOs is rather minimal. However, to substantiate this observation further, it is worth investigating the underlying reasons that limit these two actor categories to co-exist in a context.

In terms of cross-cutting advisory topics in most demand, the survey data shows the popularity of topics such as entrepreneurship and farm management, rural development and diversification, grant application and agri-environmental stewardship, all reflect current social trends and the larger EU policy measures for sustainable farming and rural development. In addition, these topics also show the increased complexity of the agricultural landscape in which farmers find themselves, which require different strategies for agricultural businesses. This places great new demands on advisors and their organisations in not only supplying technical advice but on supporting learning processes

Survey results also reveal some patterns that may show structure-related differences among the various categories of providers. For example, we found higher shares of advisors on the total staff within private and non-governmental organisations, which points to a relatively lower institutional and administrative support (weak back-office) that advisors may get for the front office work. A limitation on back-office support compromises access to knowledge and networking opportunities that allow knowledge sharing and collaboration with multiple knowledge sources. Comparably, there were noticeable differences with respect to the time allocated for several types of activities: while in private advisory organisations almost 50% of the time is spent for targeted consultations, it is NGOs who provide with 24% the highest share of innovation support services.

With respect to the intervention level, farmer-based and public advisory service organisation, as well as freelance advisors reveal a higher share of local and regional-level activities compared to others.

Lastly, from the analysis of the linkages, two findings are particularly remarkable: despite what actor type, all had low to even no linkages with EU projects and EIP operational groups – a result that may surprise political decision makers. Secondly, freelance advisors are distinctively less well connected to all other actor types than any other of them.

In general, compared to the last decade, there is currently a profound understanding of the AKIS topic across many European ministries and subordinate authorities as well as related (public) institutions, research and education institutions, civil societies, and other organisations in the agriculture sector. Still the degree of linkages, particularly horizontal linkages appear weak and there is a lack of clarity on the attributes of the various AKIS coordination mechanisms in place. Furthermore, we see that the transition from FAS to AKIS has been well taken up by decision makers at the EU and national levels for improving and learning from best practices of other member states. In this regard, the importance of such AKIS analysis on a regular basis and its support for strategising agriculture development is indispensable.

Overall conclusions

- There is a need for a consistent framework to capture the types and diversity of AKIS actors. To compare the various types of AKIS in Europe, we found six key features comprehensive, namely: (i) AKIS governance, (ii) AKIS actors' diversity, (iii) AKIS supporting policy, (iv)coordination mechanisms for AKIS, (v) Degree of linkages between AKIS actors, and (vi) type and diversity of advisory organisations interacting with farmers. These key features allow to identify strengths and weaknesses of knowledge flows and interactions at the local, regional, and national level.
- A well-functioning AKIS, where the actors can meet in innovation projects and programs to discuss the main challenges and be fed with innovative solutions, requires well-organised coordination mechanisms at multiple levels.
- The efficiency and effectiveness of advisory services can best be upgraded by strengthening their connections within the AKIS and sharing knowledge and innovative solutions more intensively with diverse actors.
- For all countries, there is a need for updating and revising the agricultural research policy so that researchers are incentivised or even obliged to

create a positive impact for practice by interacting with practitioners and initiating opportunities for other AKIS actors to collaborate. In this regard, experiences from MAA projects of Horizon 2020/Europe and from organisations such as Teagasc in Ireland and SEGES in Denmark can be exploited.

- Strengthening the linkage of AS providers with other AKIS actors through facilitating diverse networking opportunities, reinforcing structures for back-office support and incentivising research practice interactions in which advisory providers have stronger involvement is crucial.
- Although not strongly emphasised in the results, digitalisation is transforming agriculture and rural areas in all European countries. Therefore, advisory service providers need to have sufficient digital knowledge, skills as well as access to data so that they can support minimising the digital divide and smoothly orient farmers in the digital landscape.

Recommended key issues to consider while analysing the AKIS pluralism in Europe

The cross analysis of the 28 AKIS country reports showed some interesting issues that could be used as indicators for assessing an AKIS situation in an individual country and for comparing AKISs within Europe. There is still a need to sufficiently explore whether these identified issues fully reflect what is needed to understand and to improve the AKIS performance in Europe. Nevertheless, they can unquestionably facilitate the diagnosis of the AKIS situation in a country by guiding the process of identifying strengths, weaknesses and gaps within the AKIS system. This exercise, in turn, can prepare actors for further discussion and analysis of innovative solutions and best practices to improve the AKIS performance. Accordingly, below are these potential indicators proposed for an AKIS appraisal.

1. The policy environment for Agriculture development
    - Are there national policies that explicitly support the AKIS? What is their focus?
    - Are the policies solely CAP based or are there independent national AKIS policies?
    - Which policy instruments (both from national policy and CAP) are more present?
    - What are the sources of funding for AKIS?
2. The diversity of actors and their contribution to the AKIS
    - Which organisations and actors are representing the national AKIS?
3. The AKIS governance system

- How is AKIS governance organised: centralised vs decentralised?
- Which organisation(s) are prominently responsible for organising the agricultural knowledge production, exchange and use at the national level (and at the regional and local levels if applicable)

4. The type and role of coordination mechanisms in respective countries
    - Which actor(s) are coordinating the AKIS?
    - What are their goals, funding sources, and roles/tasks in the AKIS?
    - Which actors are targeted in the coordination process?
    - What activities and events are included in the coordination?
    - What is the impact/influence of the coordination mechanisms on AKIS performance?
5. The perceived linkages between AKIS actors (preferably bi-directional) for establishing and maintaining knowledge flows within the AKIS
    - What is the degree of linkage for producing and exchanging knowledge between diverse AKIS actors?
    - What is the mode of interaction for knowledge production and exchange? (MOUs, joint programes and activities, service contracts, formal collagorations, etc.
6. The types of advisory service providers
    - Which advisory providers reach farmers, mainly?
    - What is the capacity (human and financial resources) and scale (national, regional, local) at which the various types of service providers engage in the AKIS?
7. Effectiveness and efficiency of advisory service provision
    - How is the delivery of the advisory service organised?
    - What is the role of advisors?
    - How do advisors work in networks?
    - What abilities do advisors have to contribute/interact in networks?
    - Which cross cutting topics are covered by which provider?
    - Where are gaps in advisory topics offered vs demanded?

References

Blum, A. (1991). What can be learned from a comparison of two agricultural knowledge systems? The case of The Netherlands and Israel, Agriculture, Ecosystems and Environment, Vol 33, pp 325–339.

EU (2021)/. Regulation (EU) 2021/2115 of The European Parliament and the Council https://eur-lex.europa.eu/eli/reg/2021/2115/oj

EUROSTAT (2015). Land cover statistics. https://ec.europa.eu/eurostat/statistics-explained/index.php/Land_cover_statistics#Land_cover_in_the_EU

EUROSTAT (2016a). Archive: Small and large farms in the EU - statistics from the farm structure survey. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Small_and_large_farms_in_the_EU_-_statistics_from_the_farm_structure_survey&oldid=357625

EUROSTAT (2016b). Farm indicators by agricultural area, type of farm, standard output, legal form and NUTS 2 regions. https://ec.europa.eu/eurostat/databrowser/view/EF_M_FARMLEG__custom_463614/default/table?lang=en

EUROSTAT (2016c). Forestry statistics in detail. https://ec.europa.eu/eurostat/statistics-explained/pdfscache/29576.pdf

EUROSTAT (2019a). Agriculture, forestry and fishery statistics: 2019 edition. https://ec.europa.eu/eurostat/documents/3217494/10317767/KS-FK-19-001-EN-N.pdf/742d3fd2-961e-68c1-47d0-11cf30b11489?t=1576657490000

EUROSTAT (2019b). Main annual crop statistics. https://ec.europa.eu/eurostat/statistics-explained/pdfscache/28946.pdf

EUROSTAT (2019c). Organic crop area by agricultural production methods and crops. https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=org_cropar&lang=en

EUROSTAT (2020a). Forests, forestry and logging. https://ec.europa.eu/eurostat/statistics-explained/index.php/Forests,_forestry_and_logging

EUROSTAT (2020b). Population. https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=demo_pjan&lang=en)

EUROSTAT (2021). Bruttoinlandsprodukt zu Marktpreisen. https://ec.europa.eu/eurostat/databrowser/view/tec00001/default/table?lang=de

EUROSTAT (2021). Area covered by forest in 2020. https://ec.europa.eu/eurostat/web/products-eurostat-news/-/edn-20210321-1

EU SCAR (2012). Agricultural Knowledge and Innovation Systems in Transition – A Reflection Paper, EU SCAR, Brussels.

Knierim, A., Boenning, K., Caggiano, M., Cristóvão, A., Dirimanova, V., Koehnen, T., ... & Prager, K. (2015). The AKIS concept and its relevance in selected EU member states. Outlook on AGRICULTURE, 44(1), 29-36.

Knierim, A., Labarthe, P., Laurent, C., Prager, K., Kania, J., Madureira, L., & Ndah, T. H. (2017). Pluralism of agricultural advisory service providers–Facts and insights from Europe. Journal of rural studies, 55, 45-58.

Knierim, A., Gerester-Bentaya, M., Birke,FM., Bae,S., Kelly,T. (2020). Innovation advisors for interactive innovation process: Conceptual grounds and common understandings. I2connect project deliverable 1.1

Rivera, W.M., Qamar, M.K., and Mandemere, H.K. (2005). Enhancing Coordination among AKIS/RD Actors: An Analytical and Comparative Review of Country Studies on Agricultural Knowledge and Information Systems for Rural Development (AKIS/RD), FAO, Rome.

Röling, N.G., and Wagemakers, M.A.E., eds (1998). Facilitating Sustainable Agriculture, Cambridge University Press, Cambridge.