

i2connect

INTERACTIVE INNOVATION



Task 1.2

AKIS inventory and the AS database

Deliverable 1.2

Update, web-based AKIS inventory (Report) – Volume II

January 2021

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Preface

At a whole, European Common Agricultural Policies (CAP) aim at supporting the green production sectors, namely agriculture, forestry and horticulture for which recently, a set of regulations has been proposed for the upcoming policy period from 2021 to 2027. The document lists nine specific objectives, which together contribute to the overall goal of sustainable development in farming, food systems and rural areas. One cross-cutting and prominent dimension in this regard is the fostering of knowledge, innovation and digitalisation in agriculture and rural areas. Here, advisory services play an important role, and Member States are called to strategically address the functioning of Agricultural Knowledge and Innovation Systems (AKIS) in order to provide the actors in the sector with the information and support services needed.

In 2014, a first inventory on agricultural knowledge and innovation systems (AKIS) and advisory services (AS) in the EU countries was set up in the context of the PRO AKIS project and systematic knowledge about AKIS infrastructures was compiled (proakis.eu). One recommendation from the project was that the AKIS country reports should be updated regularly as national and CAP policies continuously induce institutional and structural changes. It is within this context that the i2connect project consortium conceived a revision and update of the AKIS inventory. This time, the inventory has not only been updated for the existing AKIS descriptions for the EU member states but also includes four new countries, namely Croatia, Switzerland, Montenegro and Serbia. In addition, forestry advisory service providers were addressed in some countries, although not as comprehensively as the agricultural advisory service. In so doing, the AKIS acronym has thus been expanded to include the forestry sector so that the inventory addresses the needs of both agriculture and forestry advisory service providers.

The 27 country reports compiled in this inventory report give a comprehensive overview of the AKIS infrastructures and of the predominant agricultural and forestry advisory services on national and – if applicable – on regional levels. The intention is that through these reports, essential features of the institutional and infrastructural environment in which advisors in the green sector operate are revealed. This information will then serve as a basis for targeted interventions to support different types of cooperation between AKIS actors in solving problems.

Ultimately, the reports will provide up-to-date information for policy and practice in the respective countries.

Contextual differences among the European countries are inevitable, which makes every country report a unique document. Nevertheless, a common and highly unified approach was applied across the reports in order to allow comparative assessments and to create a cross-cutting baseline for future studies. This was achieved through a general structure that served as terms of reference for consortium partners compiling the country reports as well as a common online survey for advisory service providers that was conducted from October to December, 2020.

This inventory report consists of two volumes. Volume 1 contains the country reports from Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Finland, Germany, Greece, Hungary and Ireland, Volume 2 contains reports from Italy, Latvia, Lithuania, Luxembourg, Malta, Montenegro, Netherlands, Poland, Portugal, Serbia, Slovakia, Slovenia, Spain, Sweden and Switzerland. Denmark is not included in these volumes as a recent update to the previous PRO AKIS report is already available.

Finally, this report is a work in progress and will be updated in the course of the project.

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AKIS and advisory services in *Italy*

Report for the AKIS inventory (Task 1.2) of the i2connect project

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Executive summary

The present report provides a comprehensive overview of the Agricultural Knowledge and Information System (AKIS) in Italy, with a focus on local Farm Advisory Services (FASs). It has been conceived as an update of the report for the AKIS inventory drafted in the framework of the PRO-AKIS project in 2015 (Caggiano, 2014). Relying on the analysis of the recent changes in national and European policies and on direct interviews with stakeholders and advisors, the present report describes the evolution of Italian knowledge system in matter of agriculture and rural development.

Italian AKIS reflects the complexity of both national administrative system and agricultural sector. Whereas the first is highly de-centralized, with the National Government setting general rules that Regions are deemed to adapt and apply to their territory, and the second highly varies according to the manifold environmental and socio-economic features of Italian countryside.

As a matter of fact, the Italian AKIS is a complex multi-actor and multilayered system, characterized by a large number of entities and governance levels, with countless actors and stakeholders that work on overlapping topics but with specific fields of expertise and areas of competency.

The degree of cooperation and integration varies deeply according to the kind of actors involved, the Region they belong and the policy framework within they act but generally speaking, at local level, cooperation measures for innovation introduced by past and present RDPS, as well as local learning and innovation networks, have contributed to the development and/or the strengthening of relations among such different actors and, in particular, between farmers and advisors on the one hand and the research world on the other. On the contrary on a more national or interregional level liaisons seems to be weaker, essentially dependent by formal agreement or institutional cooperation frameworks. Outside Rural Development policies, relationships capable of involving different actors along the knowledge supply chains are mostly project-based, with scarce long-term perspective. There's a lack of coordination that only in recent times has been addressed by national and regional authorities by mean of *ad hoc* coordination plans. With specific reference to FAS, the obligation to establish a farm advisory

system provided by REG EU 1306/2013, has brought to a new regulatory system setting up rules for the acknowledgment of FAS providers.

The survey carried out among services providers describe a FAS that still has scarce connection between research and farmers' knowledge needs (82% of respondents has classified it as medium or low), strongly dependent on support coming from agricultural policies. Also, the topics addressed by advisors are more concerned on traditional themes (access to RDP measures, cross-compliance, and farm management) than innovative ones (use of digital equipment, marketing and logistics). On the other hand, advisors have a strong and variegated background that allow them to deal with a large variety of issues, from a technical and managerial point of view. 60% of the interviewees have access to some kind of skills development program. Professionals are required to undergo regular training organized by the regional professional orders.

The relationships with other AKIS actors vary depending on the type of advisor considered. Freelancers have stronger links with private enterprises, such as other advisory organizations, universities, farmers' organizations and public authorities. Instead, advisory organizations have strongest links with farmer-based organizations. In both cases, there are linkages with Operational Groups, which operate in several Italian regions.

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Abbreviations

ALSIA	Lucanian Agency for Development and Innovation in Agriculture
AGRIS	Agricultural Research Agency of Sardinia
AKIS	Agricultural Knowledge and Innovation System
AIAB	Italia association of organic agriculture
AICS	Agency for Development Cooperation
ARA	Livestock Breeders' Association of Basilicata
ARAS	Regional Breeders Association of Sardinia
AS	Advisory Services
CAI	Agricultural Consortia of Italy – Consorzi Agrari d'Italia
CAP	Common Agricultural Policy
CIDFA	Consortium for Agricultural Dissemination and Training
CIFIV	International Center for Veterinary Training and Information
CNAAL	National Order of Agrotechnicians and Graduate Agrotechnicians
CNR	National Research Council
CONAF	National Council for Agronomists and Professional Foresters Order
CRA	Council for Agricultural Research
CREA	Council for Agricultural Research and Economics
EAFRD	European Agricultural Fund for Rural Development
ENEA	National Agency for new technologies, energy and sustainable economic development
ERDF	European Regional Development Fund
ERSAT	Regional Agricultural Development and Technical Assistance Agency
ESF	European Social Fund
ESI	European Structural and Innovation
EU	European Union
EUTR	European Union Timber Regulation
FAS	Farm Advisory Services
FIRAB	Italian Foundation for Research in Organic and Biodynamic Agriculture
FLEGT	Forest Law Enforcement, Governance and Trade licensing scheme
FNOVI	National Federation of Veterinary Doctors
FONDAGRI	Foundation for agricultural advisory services
GDP	Gross Domestic Product
GDO	Large-Scale Retail Trade
GVA	Gross Value Added
INEA	National Institute of Agricultural Economics
IPA	Italian Partnership Agreement
ISMEA	Institute of Services for the Agricultural and Food Market
ISPRA	Higher Institute for Environmental Research
ISS	Higher Institute of Health
IZS	Experimental Zooprophyllactic Institute

INRAN	National Research Institute on Food and Nutrition
ISTAT	Italian National Institute of Statistics
LAG	Local Action Group
LSU	Livestock units
MA	Managing Authority
MAECI	Ministry of Foreign Affairs
MATTM	Ministry for Environment, Land and Sea Protection
MI	Ministry of Education
MIBACT	Ministry of Cultural Heritage and Tourism
MIPAAF	Ministry of Agricultural, Food and Forestry Policies
MISE	Ministry of Economic Development
MIUR	Ministry of Education, University and Research
MTI	Ministry for the technological Innovation
MUR	Ministry of University and Research
NOP	National Operational Programme
NRN	National Rural Network
ROP	Regional Operational Programme
OG	Operational Group
PO	Producers organization
PNR	National Research Programme
PRIN	National Plan for Research Infrastructures
RADI	Regional Agencies for Development and Innovation in Agriculture
RaF	Report on the state of forests and the forestry sector in Italy
RDP	Rural Development Programme
RI	Research Infrastructures
RIS3	Regional Strategy for Research and Innovation for Smart Specialisation
S3	Smart Specialisation Strategy
SISEF	Society for Silviculture and Forest Ecology
SPIR	Strategic Plan on Innovation and Research for Agriculture, Food and Forestry
UAA	Utilized Agriculture Area
UILA	Italian union of agricultural workers
WWF	World Wide Fund for Nature

1. Main structural characteristics of the agricultural and forestry sector

Italian territory is laid right across the Mediterranean Sea. Its position has provided the Country with unique historical, environmental and geological features that have shaped national social and economic fabric over the centuries and still have effects on modern Italy.

Operating a rough division of the Italian territory in two halves such a difference is highlighted by the composition of land use, with a strong prevalence of agricultural areas (52% vs 39% of total land use) and, on the contrary, a minority of built up areas (8% vs 12% of total land use) in Southern Italy in respect to Centre-North. Also, the distribution of the Gross Value-Added (GVA) stresses significant territorial differences, as in Southern Italy there's a slight prevalence of services in respect of Centre North (79% of total GVA vs 72%) at the detriment of manufactures (22% vs 30% of the total GVA).

Nowadays Italy is an advanced economy, highly oriented toward services, but territorial differences still reverberate in national economic and social assets, at the point that a significant gap in per capita GDP – and in other indicators – between the regions of Centre-North and Southern Italy still persists (Table 1), with performances that move away from the European average according to a north-south gradient.

Table 1. Italy: main social and economic indicators and indexes

	Population	Population density (inhab/Km ²)	GDP (million euro)	Per Capita GDP (euro)	Employment rate (15 - 64)	Unemployment rate (15 - 64)
EU - 27	446,824,564	106	13,483,857.12	30,177	68.4	6.8
Italy	60,359,546	200	1,765,421.00	29,248	59.0	10.2
North-West	16,093,286	278	580,111.24	36,047	67.3	6.6
North-East	11,652,827	187	408,053.96	35,018	68.9	5.6
Center	12,016,009	207	380,983.04	31,706	63.7	8.9
South	13,957,942	189	270,706.50	19,394	45.1	17.5
Islands	6,639,482	133	124,114.90	18,693	44.2	18.9

Source: Eurostat

Information on the agricultural sector

Italian territory is spilt in two eco regions (temperate and Mediterranean) that give rise to 33 ecological subsessions, also as a consequence of the climatic action of

the Apennines, a mountain chains that cross the Country lengthwise. Such a varied environmental context has produced a likewise agriculture, and has contributed to the plethora of products, traditions, uses and techniques that has been characterizing Italian agriculture for centuries now.

The conjunct action between climate and morphological features, therefore, has produced a manifold agriculture that cannot be fitted in a single model, either from a business or technical perspective.

Side by side with the intensive, market oriented agriculture of the main plains and valley bottoms there are countless little farms, devoted to small or quality productions, mostly scattered in mountain or internal areas whose function as providers of environmental services is far more important than their economic outputs. These two main types of agriculture deal with completely different sets of issues, since intensive agriculture struggle in a much more competitive market, strongly oriented to the long (often international) value chain, while facing sustainability issues, mostly tied to water consumption, pesticide usage and soil pollution. For its part quality agriculture is essentially valorised in short, alternative value chains, where positive externalities are more promptly acknowledged than in traditional markets. It is generally highly dependent on public support, payments to areas facing natural or other specific constraints above all, because the lack of basic services, secure outlets and the exposure to climate change constantly imperils the prosecution of their activities.

Although the “twofold speed” of Italian agriculture is a common feature all across the country, from a macro perspective the agricultural sector shows some relevant structural and economic differences between North, Centre and South that are a direct consequence of the different economic and social framework (Table 2). In southern Italy agriculture is far less profitable than in the rest of the Country as the amount of value added per hectare is 2,756 €/ha versus 3,627 €/ha. Generally speaking, the agricultural sector of the Northern districts appears to be much more competitive and intensive, with greater holdings and higher values of GVA per workers. On the other hand, in southern Italy there’s a clear prevalence of more sustainable agriculture, with a greater quota of organic farming and a prevalence of small farmers.

Also the distribution of the standard output across the main productions reveals a certain difference between Northern, Centre and Southern Italy, with a stronger contribution of permanent crops (grapes and wine above all) in the North, where

they sum up to the 51% of the total crop output, also thanks to a relevant contribution of viticulture (37%).

Table 2: Structural and economic indicators of Italian Agriculture

	Italy				EU 27
	North	Centre	South	Total	
UAA (ha)	4,441,170	2,088,310	6,068,670	12,598,150	156,662,970
Whereof: organic	339,837	420,606	1,197,597	1,958,040	11,445,112
Holdings	280,360	178,850	686,470	1,145,680	10,282,790
UAA/Holding	15.8	11.7	8.8	11.0	15.24
Livestock units (LSU) (thousand)	6,490	717	2,262	9,468	118,089
Whereof: Bovine	2,896	363	1,295	4,554	57,457
Swine	1,840	89	108	2,036	31,917
Sheeps and Goats	64	128	609	801	7,471
Workers in Agriculture, forestry and fishery (thousand)	288.1	125.6	430	843.7	7,903
% on total workers	2.43	2.60	7.16	3.72	4.06
Gross Value Added (million €)	16,110	5,686	12,931	34,727	220,725
% on Total GVA	1.74	1.60	3.48	2.10	1.83

Source: Eurostat National Accounts (2019), Farm structure survey (2016); Sistema di Informazione Nazionale sull'Agricoltura Biologica – SINAB (2019)

There's a prevalence of horticultural productions in central Italy (52% of the total crop output), while in Southern Italy, where permanent crops are responsible of the 48% of vegetal productions output, fruits alone contribute for the 20% of the output generated by cropland. As for arable land, it is of some economic importance in the North, as its contribution is equal to the 29% of the total crop output (20% in central Italy and 115 in southern Italy).

Information on the forestry sector

According to FAO, woodland cover 31.5% of the Country (EU-27 average 37.8). But some regions are much more forested than other (Liguria, above all: 70% of its territory is occupied by woods). Despite such an importance in territorial terms, forestry has a marginal meaning in the framework of Italian economy, as it contributes to the National GVA one of the lowest values in the Alpine area but Germany. In Italy a solid and nationwide timber industry has never developed: fuelwood accounts for the 63% of the total metric cubes retrieved in forests (In 2017 EU 27 average was 23%, according to Eurostat). Consequently, sectorial contribution to the National workforce is very limited. Only 5.9 out of 100 workers in agriculture is employed in forestry and logging; taking in consideration wood-

related industry in respect to the total NACE activities, such a percentage goes down to 2.7%.

Italian forestry sector suffers from the extreme fragmentation of wooded land, traditionally managed as coppice maintained as a reservoir of fuelwood or small work timber at the service of the farm, so that today a proper timber industry exists only along the alpine arch.

As a consequence of the mutated socio-economic condition of the countryside, today Italian forests are therefore largely under-managed, at the expenses of their ecological stability.

In more recent years a new vision of forest management, aimed at conjugate their environmental functions with their economic values, brought to the valorisation of the woodland in alternative and more efficient ways. Small wood-energy supply chains, for the heating of public buildings, for instance, are multiplying all along the Apennines, while the simultaneous conversion of old coppices to high forests, in order to enhance their recreational value for the benefit of local tourism has become a widespread practice as well. On the other hand, as the demand of non-wooded products (berries, mushrooms...) is growing, alternative forms of management are gaining room alongside traditional ones.

2. Characteristics of AKIS

2.1. AKIS description

The Italian AKIS is a complex multi-actor and multilevel system, characterized by a large number of entities and governance levels. This is mainly due to the division of roles between the State and the Regions and Autonomous Provinces (Trento and Bolzano), which have the jurisdiction over agriculture. This institutional arrangement has led to the raising of 21 regional AKISs, that differ from each other by organizational models, contents, procedures.

As a matter of fact, this specific administrative configuration implies different levels of definition of the AKISs and their coordination structures, which also reflect the cultural and relational specificities of the regional territories as well as the policy and administrative approaches of the regions. From a national perspective, the Italian AKIS, as a whole, is strongly interconnected with the regional ones and permeated by actors and knowledge flows that only in some cases are restricted to the national or regional/territorial level. In fact, in general, several organisations, both in the research (e.g. CREA, CNR) and in the productive world (i.e. farmers' unions), are actors, indiscriminately and actively, of the national and the regional AKISs. It is also worth to note that the relational dynamics of the different actors are not always shaped by common approaches applied to different levels and territories. In general, it can be said, in fact, that farmers' unions follow common logics within the different AKISs. While, relations of research institutes and universities are more often shaped by the individual behaviours of the respective researchers.

An in-depth description of the Italia AKIS is provided in the following sections.

2.1.1. AKIS actors and knowledge flows

In general, Research is under the responsibility of both the State and the Regions, Education is under the National authority, Extension and vocational training fall within the responsibility of the Regions.

Research, for instance, is carried out by different subjects, both private and public, with the first being very active on the territory and often at the service of specific sectors of primary importance at local level. Public research, on the other hand,

beside Universities it is based on the action of a consistent number of bodies that are connected to or directly supervised by Ministries or Regions.

Likewise, education and vocational training is mainly a public State competence. However, private subjects and public bodies can establish their own education institutions. Vocational training is under Regions' jurisdiction since 1978 and training activities are carried out by specific training agencies that can have both public or private nature.

Agricultural research

Agricultural research in Italy is spread among a high number of actors, including institutions of promotion and funding and implementation organisms.

Among the first ones, the Ministry of Agricultural, Food and Forestry Policies (**MIPAAF**) is the main responsible for agricultural research, through the provision of specific funding, coordination of R&D policies and supervision over the most important agricultural research organism in Italy (Council for Agricultural Research and Economics -CREA). However, other Ministries are involved in the field of agri-food and forestry, including the Ministry of Education, University and Research (**MIUR**), which is responsible for the whole national research policy and the NOP "Research and Innovation", the **Ministry of Health**, the Ministry for Environment, Land and Sea Protection (**MATTM**) and the Ministry of Economic Development (**MISE**) that is responsible for the NOP "Enterprises and Competitiveness".

The Regions and Autonomous Provinces are responsible for the management of European programmes (RDPs and ROPs), but they also allocate their own resources to regional projects and/or to their own instrumental research institutes.

Among the *public implementing organizations*, in addition to the regional instrumental institutions, there is a consistent number of bodies connected to or supervised by Ministries, such as:

- Universities, with their departments and schools, operating under the MIUR responsibility who is in charge of coordinating and financing them;
- the National Research Council (CNR), with its 7 Departments and 91 Institutes distributed throughout the country, is funded and supervised by the MIUR. The agricultural research is mainly, but not exclusively, concentrated in the Department of Biology, Agriculture and Food Science;

- CREA, that is the leading Italian research organization dedicated to the agri-food and forestry supply chains, funded and supervised by the MIPAAF. It was established in 2015, from the merging of CRA (Council for Agricultural Research), INEA (National Institute of Agricultural Economics) and INRAN (the National Research Institute for Food and Nutrition) and It is articulated in 12 research centres throughout the country.
- the Institute of Food Services for the Agricultural Market (ISMEA) and the Institute L. Spallanzani (animal science), funded and supervised by the MIPAAF;
- the National Agency for new technologies, energy and sustainable economic development (ENEA), funded and supervised by the MISE;
- the Higher Institute for Environmental Research (ISPRA), funded and supervised by the Ministry of Environment;
- the Higher Institute of Health (ISS) and the Experimental Zooprophyllactic Institutes (IZS), spread throughout the whole national territory, funded and supervised by the Ministry of Health;
- the Italian Agency for Development Cooperation (AICS), funded and supervised by the Ministry of Foreign Affairs, that implements measures to enhance environmental impacts and mitigate the effects of climate change, focusing particularly on water, soil, climate and biodiversity;
- other public institutions, depending on different Ministries, deal (but not in exclusive way) with issues related to agriculture such as the National Statistics Institute, The Study Center of the Chambers of Commerce Guglielmo Tagliacarne srl and others.

The Regions and Autonomous Provinces can regulate and fund agricultural research programmes tailored to local needs and territorial specificities. They can manage research projects directly, carrying out the research through their institutions, centres or Regional Agencies for Innovation in Agriculture (RADIs) (e.g. Piedmont, Autonomous Provinces of Bolzano and Trento, Sardinia, Sicily), participating in a research consortium, or through public and private institutes selected through competitive bids. Some of the regional research centres are also an excellence at national level (e.g. the Agricultural Institute in San Michele all'Adige in Trento Province, the Research Centre for Fruit and Vegetable production in Emilia Romagna Region, etc.) and, in some cases, they also work as extension services, such as the Laimburg Research Centre for agriculture and forestry in the Bolzano Province.

Private agricultural research is very dynamic, especially at territorial level, and is carried out mainly by a variety of actors, including:

- private research institutes (e.g. FIRAB – the Italian Foundation for Research in Organic and Biodynamic Agriculture, www.firab.it (see BOX 1), EURAC (<http://www.eurac.edu/en/Pages/default.aspx>)),
- university spin-offs (e.g., HORTA srl, <https://www.horta-srl.it/>),
- food industries or other sectors enterprises (chemical, mechanical, etc..) that provide productive inputs,
- agricultural enterprises with high added value (e.g. large farms in the wine sector), agri-food cooperatives, farmers networks (e.g. Rete dei Semi Rurali, <https://www.semirurali.net/>)
- Producers Organisations (PO), farmers cooperatives, consortia,
- polyvalent analytical laboratories (e.g. ISVEA, <http://www.isvea.it/>), Applied Research Institutes and Technology centres,
- Foundations, associations, scientific societies and others (e.g. SISEF - Society for Silviculture and Forest Ecology).

Among these actors there are also Technological Parks and clusters (e.g., Puglia Food Technological District, <https://www.darepuglia.it/>) that are *public-private partnerships* involving local authorities, universities, public research institutes and private research organisations.

Box 1 FIRAB - Italian Foundation for Research in Organic and Biodynamic Agriculture

The Italian Foundation for Research in Organic and Biodynamic Agriculture (FIRAB) was established in 2007 thanks to the initiative of its founding members: AIAB (Italia association of organic agriculture), UILA (Italian union of agricultural workers), Legambiente (ONG) and the Italian Biodynamic Association. It promotes farming experimentation and research-action, while encouraging farmer-to-farmer exchanges of knowledge to disseminate practical, technical and scientific experiences, also through strengthening the network of demonstrative farms in Italy and Europe.

It is also one of the most relevant points of reference for the political and cultural debate on organic farming and bio-dynamic agriculture, particularly by promoting the democratization of research and socialization of farming practices and knowledge.

Over the years, FIRAB gained a lot of experience in multi-actor projects at both EU (H2020, 7FP and LIFE projects), national and regional (EIP-Agri OGs) level, by covering a vary of roles in conducting from scientific research to dissemination and practical experimentation of farming methods.

In fact, FIRAB promotes, supports, carries out and disseminates innovations in the field of organic and biodynamic agriculture, from production to consumption, directly and/or collaborating with both public and private bodies or institutions.

In this scenario FIRAB works to carry out research and innovation activities capable of expanding the knowledge base for organic and biodynamic agriculture, through the integration of scientific and local knowledge, between researchers, technicians and farmers, between research, training and technical assistance, promoting a participatory research model.

This transdisciplinary and wide activity makes FIRAB very well embedded within the different AKIS across the Italy, and well connected with actors which range from policy makers, to researchers and farmers.

Private research organisations are in general connected or work synergistically with the main public research institutes.

Global expenditure in Research and development (GERD) in the agricultural sector is interested by an increasing trend, considered the five years span 2014-2018. Anyway, a closer look to the figures in table 3 shows that such an increment is solely produced by the expenditure in the Higher education system, while governmental and private non-profit sectors has reduced their disbursements. The trend in overall employees' number follows spending capacity: the number workers in Higher Education sector have increased of an overall 68%, while Governmental research bodies have reduced their employees by a 10%.

Table 3: Total expenditure on R&D on Agricultural science by sector

Sector	2014		2018		Variation 2014 to 2018	
	GERD	Employment	GERD	Employment	GERD	Employment
Government Sector (GOV)	301,902	5,894	270,478	4,948	-10%	-16%
Business Enterprise Sector (BES)	NA	NA	NA	NA	NA	NA
Higher Education Sector (HES)	228,637	4,962	329,068	7,861	44%	58%
Private non-profit sector	28,263	476	9,017	NA	-68%	NA
Total	558,802	11,332	608,563	12,809	9%	18%*
% of GDP	0.03		0.03			

* Private non profit sector excluded.

Source: Eurostat

Education and vocational training

The Italian education system is mainly a public State system and it is coordinated by the Ministry of Education, University and Research (MIUR), which is in charge of all education, from elementary school to university level.

However, private subjects and public bodies can establish education institutions. Such non-state schools can be either equal to State schools (called *scuole paritarie*) or merely private schools. These latter cannot issue qualifications. The Government directly finances State schools. *Scuole paritarie* receive state contributions according to criteria set annually by the MIUR.

The Italian education system includes early childhood education and care (0-3 and 3-6), primary, secondary, post-secondary and higher education. It is organised according to the principles of subsidiarity and of autonomy of institutions, with different competencies share between the MIUR, the Regions and local authorities. Both schools and universities have a high degree of autonomy: they define curricula, widen the educational offer, organise teaching. Particularly, at higher education level, universities have statutory, regulatory, teaching and organisational autonomy.

Education in agricultural and veterinary fields is provided by:

- secondary schools, namely professional institutes (focused on Agriculture and Rural development) and technological institutes (focused on Agriculture, agro-food and agro-industry). In Italy there are 153 Agricultural Institutes, 9 of which are oenological ones. Forestry is not central in the curricula of these schools, but there are some relevant exceptions, usually established by direct intervention of local administrations (e.g: the “forestry school in Ormea (CN). For instance, the “forestry school” in Ormea (CN) is an upper secondary school devoted to the training of forestry workers.
- Higher Technical Education-Training, addressed to under-graduate and implemented through the cooperation of secondary school, University, enterprises, professional training services/extension. The initiative is defined and funded by the MIUR, in collaboration with the Ministry of Labour, Health and Social Policies and the Ministry for Economic Development, and is within the jurisdiction of Regional Administrations. Agrofood is one of the five fields of activity;

- University.

Access to university is solely for students with an upper secondary school leaving certificate. The Ministry of education and individual institutions establish the specific conditions for admission.

Currently, throughout Italy, there are 24 Departments of Agricultural Sciences, 1 University School of Experimental Agricultural Sciences, 13 Departments of Veterinary Medical Sciences, but many other Faculties (for example, biotechnology, environmental science, economics, etc.) contribute to agricultural education.

In addition to these institutes there is also a small number of other organizations (agro-food firms, local institutions and associations) which promote post-graduate courses regarding specific issues. They still represent a marginal activity if compared to that of the Italian Universities but are assuming a considerable role for their capacity to catch the rising needs of the sector (Brunori et al. 2011).

Vocational training is under Regions' jurisdiction since 1978 and it is financed through different sources of funding that increase the occurrence of overlapping:

- European Funds (ESF, EFRD, EAFRD);
- NOPs (National Operational Plans) and ROPs (Regional Operational Programmes);
- Regional funds (co-financed by Provinces and Municipalities).

Training activities are carried out by specific agencies that can have both public and private nature (private agencies engaged in agricultural training are often under the control of farmers' unions). In some cases, RADIs (e.g. *Veneto Agricoltura*, that is the Veneto Region's Agency for Innovation in the Primary Sector) or public-private participated societies (e.g. *Dinamica* society in Emilia Romagna) provide training both to farmers and other people interested in agricultural and rural activities, advisors and Region's staff.

At *public level*, Experimental Zooprophyllactic Institutes provide internal training through the **International Center for Veterinary Training and Information (CIFIV)**, with the aim of strengthening internal skills and generating, disseminating and sharing technical-scientific knowledge on food safety, animal health and welfare, environmental and biodiversity protection.

At *private level*, there are three professional orders of agronomists, veterinarians and agrotechnicians. These are:

- the **National Council for Agronomists and Professional Foresters Order (CONAF)**, established in 1929 and currently representing about 20,000 professional members with the aim of promoting the development and defence of the profession with a strategy based on knowledge and innovation through continuous professional training.
- the **National Federation of Veterinary Doctors (FNOVI)**, established in 1946 and currently representing about 33,000 vets operating on six main areas of expertise (beekeeping, animal behaviour, exotic animals, telenarcosis, farm vet and traditional Chinese medicine).
- the **National Order of Agrotechnicians and Graduate Agrotechnicians (CNAAL)**, established in 1946 and currently representing almost 13,000 professionals.

Access to the professional orders is regulated by national laws and it is subject to a specific examination; while the orders are responsible for setting up and maintaining the respective codes of conduct and lifelong learning programs.

Extension and advisory

The regions can provide *public* extension services directly (e.g. Valle D'Aosta, Campania and Sicily), or through their own technical structures or supervised private entities, such as the **Regional Agencies for Development and Innovation in Agriculture (RADI)**. However, in the last 10 years, the provision of these services has been significantly reduced or stopped due to substantial cuts in public funds, and some of these structures were also suppressed.

Among the public actors Research Institutions supervised by the Ministries (e.g. CREA, CNR) and the Universities provide advice that are complementary to an applied research, although they are not officially in charge for providing support services.

However, in the last 15 years, there has been an increasing role of the private sector due to: 1) the privatization of advisory services started in early 2000; 2) the development of new support functions to provide within the multi-actor projects implemented under Measure 124 (RDPS 2007-2013) and Measure 16 (RDPS 2014-2020). Private advisory services providers are mainly **freelance** agronomists, veterinarians and agrotechnicians and their associations, as well as farmer-based organisations, which include **producers' associations, farmers cooperatives,**

consortia, farmers networks (e.g. Rete dei Semi Rurali), the **Farmers' Unions** (Coldiretti, CIA, Confagricoltura, COPAGRI).

Technical advice and training are also provided by **upstream industries**, as well as by **agro-food industries** and **GDO**, whose services supply is linked to the contract farming. Beside the actors who have always been part of the agricultural and rural sector, there is a growth of **organisms from other sectors** providing a variety of services mainly related to the management of innovation projects.

A more in-depth description of advisory suppliers is provided in chapter 4

Other actors and networks shaping the AKIS

The Italian AKIS is shaped by a plurality of actors that, beyond its traditional components, play a fundamental role, influencing the system or some parts of it, shifting relational balances, interacting with farmers and consumers, developing collective planning skills, lobbying the decision-making process.

In the first place there are the **farmers and forest workers**, a very heterogeneous group of actors in terms of age (young/old), gender (men/women), socio-economic aspects (large/medium/small farms), cultural values and territorial identity (local inhabitants/newcomers), type of farming system (modern/traditional, intensive/extensive, full time/part time, conventional/organic) and geographical aspects (north/south, lowland/hill/mountain). Farmers' behaviour, their role and capability to shape the AKIS vary depending on these keys to the reading and their combinations.

Other key actors are represented by **farmer-based organizations and networks** and other bodies engaged in the promotion of local and typical food products (e.g. producer associations and cooperatives, *DOP and IGP consortia, Slow Food, etc.*), as well as networks promoting biodiversity (e.g. *Rete dei Semi Rurali*) or particular social issues related to agriculture (e.g. networks of educational/social farms), land protection (e.g. *Agricoltori custodi*) or the sustainable management and use of forests and forest landscapes (e.g. *Foresta Modello*). These actors are often drivers of innovation, inspiring farmers and foresters to interact and identify common problems and possible solutions to solve them. These processes have led to significant changes in the behaviours and strategies of farmers and forest operators (Brunori et al., 2011). **Operational groups (OGs)** themselves can be identified as key players within the AKIS, because they stimulate reflection on mutual problems and the search for possible solutions, as well as contribute to the

development of a relational network between farmers/foresters, advisors and researchers, which goes beyond the boundaries of project lifetime.

Among these actors are also the associative, research and network structures that have been operating in **organic farming** for several years that (e.g. *AIAB, FIRAB, FederBio, etc.*), sharing practical and scientific expertise, have fostered the consolidation of relationships and collaborative approaches among organic operators. These actors have been real drivers in stimulating the transition of agriculture and, more generally, of rural areas, towards models for sustainable development, of which **bio districts** (meaning geographical areas where producers, farmers, public associations and administrations work together for the sustainable management of local resources) represent one of the most significant expressions, positioning themselves as new interlocutors within the AKIS.

An emerging role is played by organizations that represent new societal needs. These include consumer organizations/movements (e.g. Solidarity Purchasing Groups - GAS) or multi-actor networks (e.g. Food communities) engaged in the development of new approaches about food and learning processes between producers and consumers.

There are also **Environmental organizations** (*WWF, Legambiente, etc.*) which, in addition to contributing to the development of new awareness about environmental issues and the spread of "good practices" among farmers and forestry operators, in some cases also act as pressure groups at the political-decision-making level (more generally on the various components of the AKIS), stimulating reflection on topics such as bio-economy, circular economy and green chemistry.

At the local level, other organizations interact with farmers and forest operators, as well as with other AKIS actors, including public administrations. These are institutional or informal organizations variously engaged in initiatives promoting local socio-economic development (e.g. *LAGs*, local associations aimed at the enhancement of specific territorial resources) or in the protection of environment and landscape (e.g. *Forestry, environmental and agri-food units of the Carabinieri*).

The knowledge flows between Italian AKIS actors vary according to the dimensional scale under consideration (national, regional and local) and the reference regional AKIS.

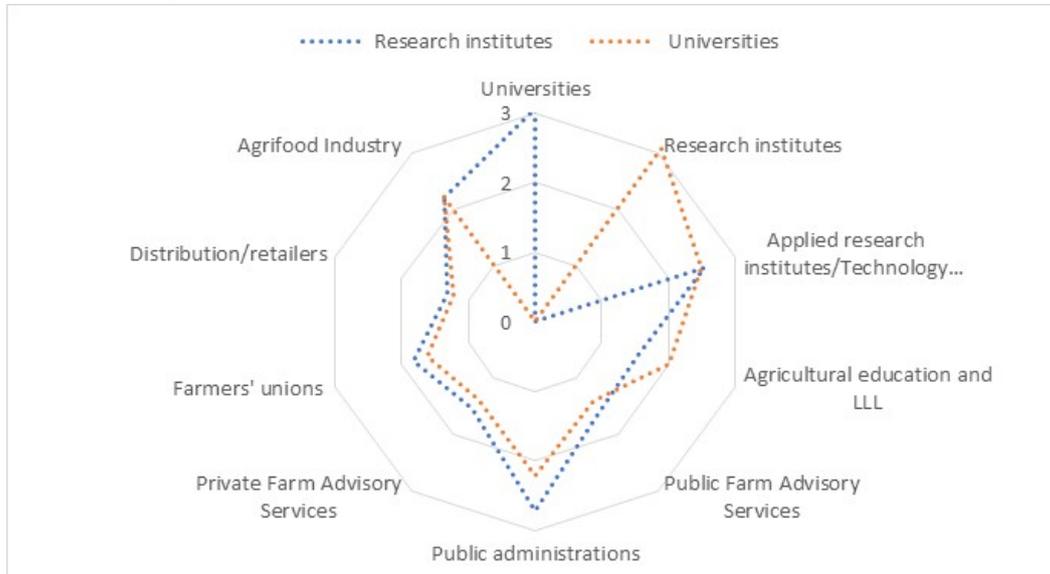
In general, at local level, the recent cooperation measures for innovation introduced by the RDPs 2007-2013 (Meas. 124) and 2014-2020 (Meas.16), as well

as local learning and innovation networks for sustainable agriculture (e.g. Food Communities, local organic networks, etc.), have contributed to the development and/or strengthening of relations between the different actors of rural development and, in particular, between farmers and advisors on the one hand and the research world on the other, as confirmed by interviewees. In the case of cooperation projects, these relationships are in general not formally structured beyond the project timeline, since they develop between the persons involved in the project partnership (not between institutions). However, they have given rise to networks with permanent and consolidated relationships, thus providing the basis for new project partnerships, as demonstrated by the project continuity of several partnerships from Meas.124 to Meas.16. In many cases, the actors of these networks also include small local enterprises (agribusinesses, input suppliers, etc.), local administrations, consumers. Therefore, they can be considered as micro-AKIS where an interactive innovation transfer model is implemented. Beyond the local dimension knowledge flows become more formal and are characterized by a low degree of system-perspective (64% of interviewees).

In all macrosystem relations, those observed at local level (e.g. group of farmers-advisor-group of researchers = strong relation) become more blurred (total of farmers-universities or research institutes = weak relation), while institutionalized relationships are more easily recognizable, in which representative institutions are more involved. This means that there are strong relationships between universities and research institutions, because formally agreements exist between institutions or they belong to the same platforms or clusters (Fig. 1).

Similarly the relationships between administrations involved in knowledge and innovation and research (Research institutes, Applied research institutes/ Technology centres) and farmers' unions (which historically are the formally recognized representative bodies of farmers), which have a relevant role in the definition and implementation of R&I policies, are equally strong, while the relationships with advisors are more occasional and informal and mostly refer to administrative and project-related issues.

Figure 1. Relationships between Research Institutes / Universities and other AKIS actors in Italy



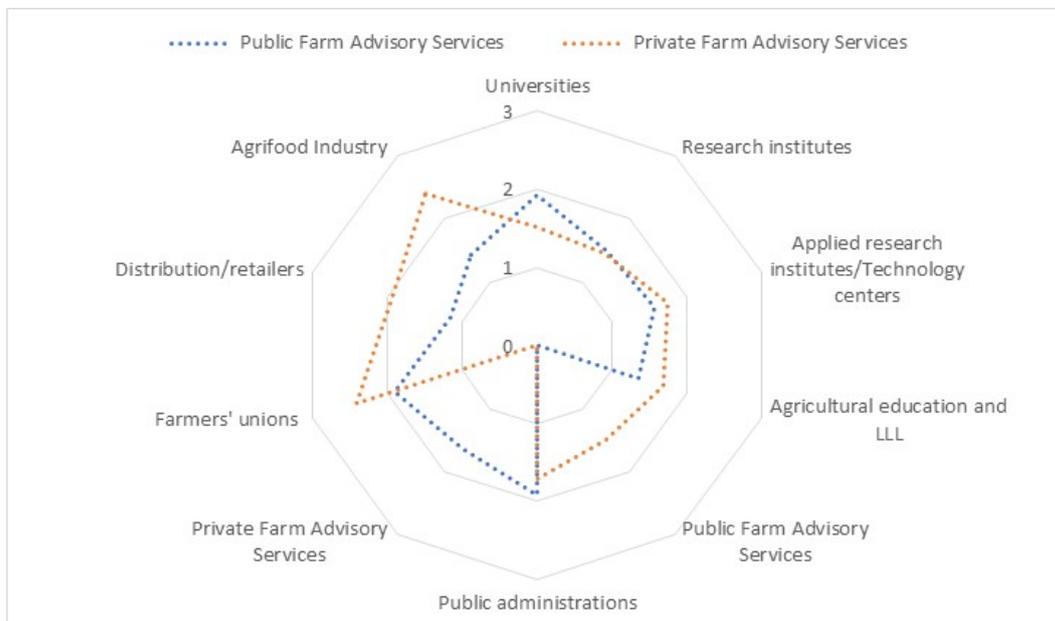
Source: Our elaborations based on interviews

On average, interviewees report that the flows between all other subjects are weak or based on random/project relationships, with the exception of those between companies for the provision of agricultural inputs and Agrifood Industry (processors, etc.) on the one hand and private advisory services, farmers' unions, farmers' cooperatives and Producers Organization on the other, which assume a rather stable structure.

Concerning advisory, the public services show relatively stronger knowledge flows with the public administration and universities, while private services show more intense flows with the agri-food industry and the farmers' unions (Fig. 2). This last finding is mostly motivated by the use of external staff (private advisors) by the farmers' union for the provision of advisory services.

Some knowledge flows strongly differ depending on the region: in Veneto or in the Autonomous Provinces of Trento and Bolzano, for example, there is a very strong link between farmers and agricultural institutes, which provide training, specialized services and applied research, differently from other regions. In Campania, on the other hand, there is a strong link between farmers and training institutes, which assess the needs and develop training interventions.

Figure 2. Relationships between public / private advisory services and other AKIS actors in Italy



Source: Our elaborations based on interviews

Interviewees fairly agreed that the traditional model of knowledge transfer is still very rooted in the Italian AKIS, although in recent years there has been a certain development towards forms of interactive transfer, which are beginning to become more and more popular at the local level. However, in highly dynamic sectors (e.g. viticulture, but also others that may be different depending on the specific characteristic of the region) interactive and circular models are more frequently applied.

It is also widely accepted that the capability of advisory services to bridge research and knowledge needs of farmers is medium (46% of respondents) or low (36%). It is interesting to notice that advisors claim that the problem is not intercepting the needs of farmers or the research, but rather to find the funds to involve researchers: often the needs (e.g. those related to climate change, new pests, etc.) have very different timeframes compared to the timing of calls for proposals and selection.

2.1.2. Policy framework at national level

At national level the main programming tools are:

The 2014-2020 **National Research Programme** (PNR), managed by the MUR and based on the interministerial concertation on research needs and expectations, outlines the framework and defines innovative actions aimed at supporting the transition of the system to a knowledge-based economy. Accordingly to the Smart Specialisation Strategy, the PNR identifies twelve areas of expertise of the Italian research system, including Agrifood, on which effective national and regional governance policies and instruments have to be structured to ensure a significant impact on the socio-economic development of the country.

The 2014-2020 **National Plan for Research Infrastructures** (PRIN) identifies investment priorities in terms of Research Infrastructures (RI), with the aim of supporting the organization of a high-quality national network of RIs of international level, whilst ensuring their long-term sustainability. The PNIR is part of the PNR program and is managed by MUR .

The **2014-2020 Partnership Agreement** (IPA), between the European Commission and Italy, defines country's priorities and arrangements for the effective and efficient use of European Structural and Innovation (ESI), including research and innovation funding.

The **2014-2020 National Smart Specialisation Strategy** (RIS3) identifies five national thematic areas (among which Health, nutrition and life quality and Smart and sustainable manufacturing, energy and environment) and twelve regional thematic areas of specialisation. A governing body of RIS3 in Italy (Cabina di regia) and the working groups for each of the five areas of RIS3, based on a model of multilevel governance, plays the role of coordination.

The **2012-2020 Strategic Plan on Innovation and Research for Agriculture, Food and Forestry** (SPIR), outlines the strategy, defined through a broadly participatory process between the Ministry of Agriculture, Food and Forestry (MiPAAF), the Regions, enterprises, productive sectors and researchers, for national and regional policies and programmes on R&I. It does not provide financial resources, but rather aims to coniugate the priorities of the European policies and, on the other hand, of national and regional administrations.

It defines six priority areas of innovations and research needs within which R&I and sectoral policies are planned at different levels.

The **National Forestry Strategy**. Still in a draft form, it is going to update the “*Framework Program for the forestry sector*” still in force. It will be effective for twenty years and provide a new vision of the forestry sector based on the sustainable management of the resources, also by mean of multidisciplinary scientific research, technical assistance and training.

The **Regional implementation tools of interventions** in the field of agricultural research and innovation, advisory and vocational training mainly rely on European Funds: the European Regional Development Fund (ERDF) and European Social Fund (ESF) Operational Programs (OP) and the European Agricultural Fund for Rural Development Programme (EAFRD). In fact, in the last few years, many regions have repealed the regional legislation, or, in any case, they do not apply it because of the significant reduction of dedicated funds. Currently, 11 regions and the autonomous province of Bolzano dispose of a regional law concerning the R&I and/or advisory services.

In 2016, each region released a **Regional Smart Specialization Strategy**, usually, with attention also to other innovation policies, such as the Start-up law and innovative financing tools. Each region has adopted a different policy mix, with tools usually targeted to support public-private partnerships; innovative projects of SMEs; networks and innovative clusters; and the implementation of pre-commercial public procurement. Research and Innovation Strategy for Smart Specialisation (RIS3) areas have been included in NOP and ROPs for the use of ESI Funds.

Whithin the **Rural Development Regulation** n.1305/2013, Priority 1 “Fostering knowledge transfer and innovation” includes the following Meseasures:

Table 4: Planned public expenditure by RDP Measure

RDP Meseasures	Public expenditure (planned)
Measure 1 “Knowledge transfer and information actions”	231,3 million euros
Measure 2 “Advisory services, farm management and farm relief services”	147 million euros

Submeasure 16.1 “Establishing and managing the European Innovation Partnership (EIP) Operational Groups (OGs)”	185,5 million euros
Submeasure 16.2 “Support for pilot projects and the development of new products, practices, processes and technologies”	156.2 million euros
Total	720 Meuros

Source: NRN (www.reterurale.it)

The EIP-Agri is applied by different models across the RDPs which, basically, reflect the specific approaches and the roles attributed to local research and innovation agencies, as well as different funding schemes. Measures 16.1 and 16.2 are applied indifferently to implement the EIP Operational Groups (OG).

Finally, with reference to the obligation to set up FAS, introduced by the 2007-2013 CAP reform and further enlarged by the 2014-2020 CAP Reg. 1306/2013 (articles 12-14), this is regulated in Italy through a decree of MIPAAF (2016), which provides a national framework for the regional implementation of FAS, by including:

- principles governing the distinction between advisory and administrative activities concerning the management and inspection of applications for public funds;
- minimum requirements for the training and skills of advisors and the need for lifelong learning;
- accreditation rules for advisory providers accessing european funds; while the accreditation procedures are under the responsibility of the Regions and Autonomous Province;
- establishment of a national register of advisory providers;
- establishment of a quality certification system at national level.

The ministerial decree was agreed with the Regions and Ministry of Health.

2.1.3. Coordination Structures

The overall governance of the AKIS in Italy is multi-level, due to the institutional organization of the Republic, so that the coordination structures are articulated by area of knowledge (R&I, Education and advisory/extension services) and at national and regional levels.

In this context, coordination arrangements (bodies and procedures) have been set up primarily to address inter-institutional collaboration and dialogued aimed at ensuring a certain consistency of policy, programmes and projects design and implementation and at avoiding to the possible extent overlaps and double funding.

All in all, we distinguish three levels of coordination with respective entitled bodies, as follows.

National level

- the **Ministry of Agricultural, Food and Forestry Policies (MIPAAF)**, which is in charge of the development and coordination of agricultural, forestry, agri-food and fishing policies;
- the **Ministry of Education, University and Research (MIUR)**, which at the time of this study is internally shared between two ministries, the Ministry of Education (MI) and the Ministry University and Research (MUR), that is responsible for the whole national research policy, for the National Operational Programme (NOP) "Research and Innovation" and for the general administration of education at national level;
- the **Ministry of Health**, which deals with food safety and veterinary public health and operates on a territorial level through the Experimental Zooprohylactic Institutes (I.Z.S.);
- the **Ministry for the Environment (MATTM)**, which deals in general with the environment and biodiversity protection, including Natura 2000 areas, protected areas and agricultural sustainability);
- the **Ministry for the technological Innovation (MTI)**, which deals with technological innovation and digitalization;
- the **Ministry of Economic Development (MISE)**, that is responsible for the NOP "Enterprises and Competitiveness".
- The **Ministry of Cultural Heritage and Tourism (MIBACT)**, has specific competences on the protection of landscape and natural heritage.

Research is mainly under the responsibility of the MIUR and some research is also channelled through the other ministries according to their specific demand.

Regional Level

In general, the distribution of competencies within the Regional and provincial administrations is specular to the ones of the Ministries, with few exceptions.

Inter-regional and trans-regional level

The coordination bodies at interregional and transregional level are aimed at defining common vision and support for implementation, mediating different positions and articulating demand about R&I policies and programmes. The two main coordination bodies are the Interregional Network for Agricultural, Forestry, Aquaculture and Fisheries Research (box 2) and the national rural development network (box 3).

Box 2: The Interregional Network for Agricultural, Forestry, Aquaculture and Fisheries Research

The network was established in 1998 and since then it's been playing an increasing crucial role in coordinating the design and implementation of European, national and regional legislation, policies and programmes regarding R&I and advisory services.

It is composed by the representatives of the administrations who are responsible for the design and implementation of R&I and advisory policies at regional/A.P. level., it is organized by thematic groups (themes/value chains) and its secretariat is held of Region Tuscany. The activities are ensured by regular meetings, the organization of discussion events, frequently by involving other experts and representatives from the MIPAAF, and the redaction of notes and qualified opinions.

Since 2001, the Network has been officially recognised by the Conference of Presidents of the Regions and Autonomous Provinces as an instrument of institutional liaison of the Regions and Autonomous Provinces with the Ministries (MIPAAF and MIUR), with the aim to guarantee operational synergies and cost-effectiveness, and stimulating the competitiveness, of the national research system at all levels of its implementation.

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 of its delivery (guidelines, procedures and types of funding).

Among the others, the activities carried out by the Network regard:

- the realisation of some interregional innovation and research projects aimed at addressing agricultural issues common to several regions and PAs;
- preliminary documents concerning the transversal objective of “Agricultural Knowledge and Innovation System” (AKIS) for the CAP reform post 2020;
- formulation of qualified opinions on research plans of the national research bodies (i.e. CREA);
- technical support to the Standing Committee on Biodiversity of Agricultural and Food Interest, chaired by MIPAAF, for the definition of the new National Plan on biodiversity of agricultural interest;
- drafting the strategy for innovation and research, within the Strategic Plan for Innovation and Research in Agriculture, Food and Forestry 2014-2020;
- member of the Editorial Committee of the Portal of Knowledge and Innovation in the agro-food system (www.innovarurale.it).

Mammuccini M.G. et al. (2010)

Vagnozzi (2008b)

The National Rural Network plays a different function relating more, particularly since 2007, to networking in view on connecting operators across the rural areas and promoting their effective participation in rural development (NRN in box 3). This role implies a wide range of target groups (Institutions engaged in rural development as responsible authorities and implementing bodies; socio-economic partners; wide society) and of activities, which range from networking to technical and methodological support to the managing authorities, until the organization of territorial events targeted to rural operators.

BOX 3: The Italian National Rural Network (NRN)

Italian Rural Network have been implementing according to the specific National Programme approved by EC for the period 2014-2020 and supports 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 programme also aims at ensuring better visibility of rural development policy, actions and achievements whilst bringing together all actors involved in rural development throughout the entire territory of Italy. The promotion of innovation in agriculture, food, forestry and rural areas is one put of four main priorities of the NRN.

This is strongly related to policy interventions for OGS-EIP, a better linkage among research, knowledge exchange and advisory in agriculture and agri-food sector, and finally for adoption of innovation at farm level.

In practice, NRN has been carrying out four types of activities in these fields:

- Dissemination of innovations cases and best practices, through the setting up of a national inventory of applied innovations and the promotion of communities of practices. The website www.innovarurale.it is devoted to the dissemination information on research and innovation in agriculture.
- Networking related to OGs in Italy through communication and knowledge exchange among main actors of EIP system. This implies also the participation of NRN representatives to SCAR meetings and other European and national activities/groups concerning EIP;
- Specific methodological and practical support activities concerning measures 16.1 and 16.2 for Managing Authorities, OGs, and other concerned actors in order to facilitate and improve quality of projects. This includes advisory and information activities addressed to groups or in one-to-one mode, and also the provision of an open access data base concerning Italian OGs and their characteristics. Advisory and information activities are fed by analysis of innovation needs and processes at national and regional level;
- Analysis of demand and supply of innovation in Italy within the national and regional AKISs.

Other activities of the NRN regard vocational training targeted to different types of rural actors (farmers, young farmers, organic operators, public administrations) and provide by digital platforms. The web platform <http://www.rural4learning.it/site/> was created to support Rural4Learning. and it aims to transfer experiences, knowledge and good practices in rural development to students of agricultural institutes and universities of Italy. The web platform includes learning courses, videos, database of the farms participating to the projects and of the study visits. The modules include Rural4Kids, Rural4School, Rural4University and FarmLab.

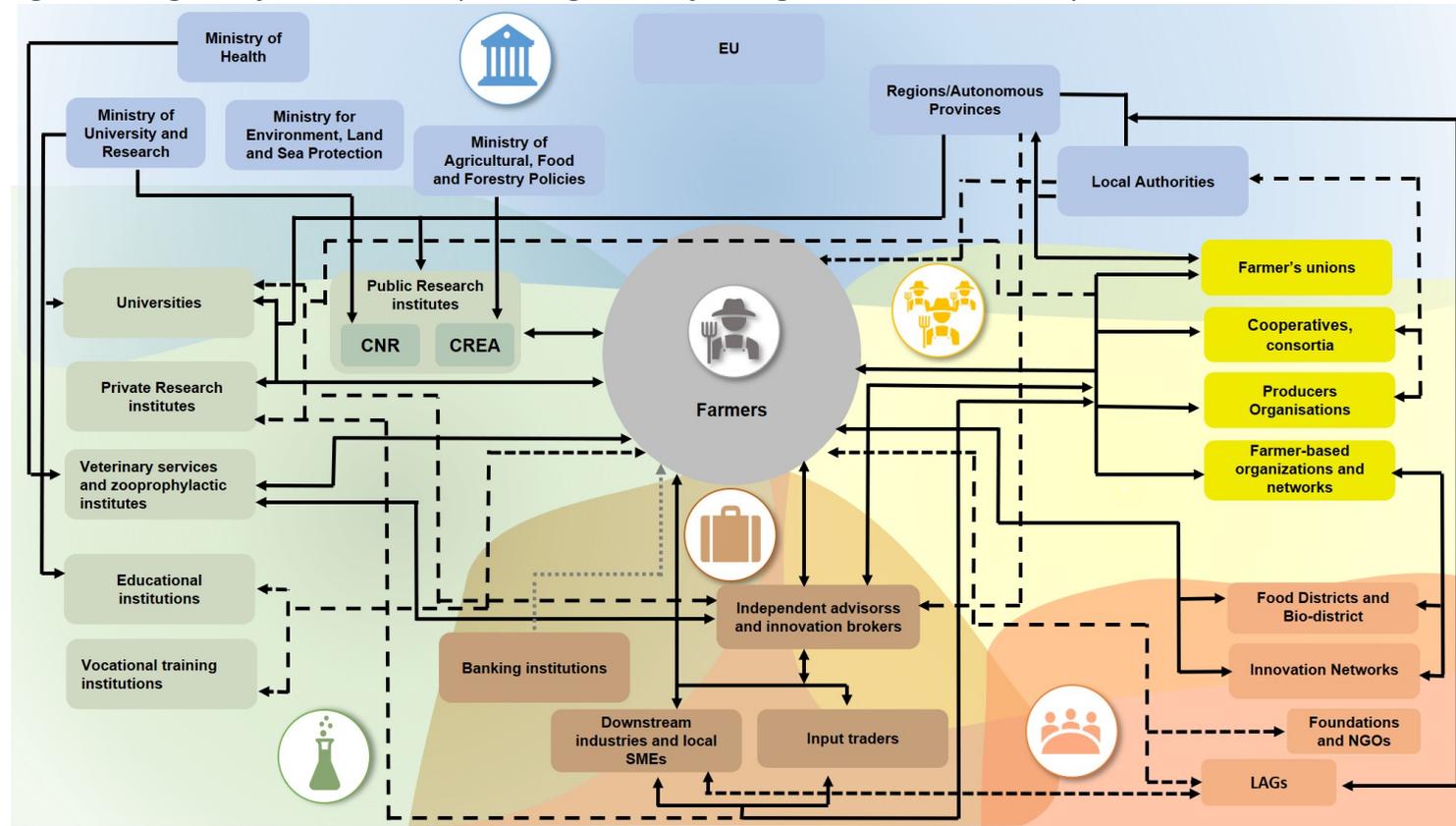
The general website of the RRN is www.reterurale.it.

www.reterurale.it

European Commission (2020)

2.2. AKIS diagram

Figure 3. Diagram of the relationships among actors of the Agricultural sector in Italy



Source: Our elaborations based on interviews

Legend

- Public authorities
- Research and education organisations
- Private sector (for profit)
- Third sector farmer/farmer-based organisations
- Third sector NGO (non-profit)
- Strong Linkage
- Weak Linkage

2.2.1. FKIS diagram

Italian Forestry knowledge Innovation System (FKIS) presents a high number of actors operating at different levels, often scarcely connected the one each other. Such a lack of integration is a direct consequence of the historical structure of the forestry sector in Italy traditionally made of countless parcels belonging to as many owners often literally unaware of actually owning a forested parcel. Moreover, outside the alpine arch, the productive functions of Italian woodland have been often neglected or limited to the provision of fuelwood or working material for the farms or farmers' household. As a consequence, with the exclusion of some relevant exceptions, a proper wood supply chain has never established in Italy. However, direct interviews with stakeholders have clearly revealed the presence of some "excellences" both from the point of view of the integration of actors and from a supply chain perspective.

Research institutions, being them private or public, with regional or national jurisdiction, are surely one of those excellences, as they have been working closely with the main timber industries and forestry companies for many years now, at the point that some spin-offs aimed at innovation transfer have arisen from forestry departments in some Italian Universities.

Moreover, some research and extension services are strongly engaged in promoting a new vision of the forest as a provider of environmental services that is reaching forestry community beyond the productive sectors, with the direct involvement of owners and smaller forestry companies. In such a framework good relationship between NGOs and forestry Consortia/Cooperatives have already been established in order to promote a more systemic approach to silviculture and timber industry. Unfortunately, only in a few cases at a Regional level such new liaisons have become formal networks connecting research, advisory services, farmers and forests. Operational Groups have been the privileged mean to obtain such a new collaboration, although still with a marginal role (according to national NRN, just the 6% of the OGs already established in Italy have forestry as a main focus). In a view of a wider involvement of the forestry actors, in some regions, Measure 9 on the setting up of producer groups and organizations has allowed members to get access to support activities on the development of entrepreneurial and commercial skills and the organization of innovative harvesting and working processes.

Given the peculiarities described above, as a matter of fact the whole system of wood industries is not related to primary production, since the 80% of wood processed in Italy is purchased from abroad. As a further consequence, such a state of the art prevents forest owners from taking care of their property, as it has no economic meaning to them. Wood industries and forestry companies are the only recipients of innovation services, as they are more willing to invest in new processes and products, also with the support of advisors.

Therefore, actions at regional level mainly target local timber industries and local forestry companies, also because only few regions, (essentially those in the Alpine space) have their own in-house research and advisory institution that could address the needs of small enterprises or forest owners. The forestry knowledge system is still based on a traditional model of information transfer, mainly based on the direct relationships between advisors and wood industries, but it doesn't get to the vast majority actors (micro forestry enterprises, owners, lumberjacks...), that are targeted by advisory and extension services exclusively on mandatory matters (e.g. work security). According to NRN (2019), only ten regions out of twenty require mandatory training for forestry operators, some of them also provide for special training courses for "forestry instructors", professionals that are called to support training needs of local operators. The education system of secondary schools (technical and vocational institutes) is unfunctional to the forest knowledge system, as its curricula doesn't deal with silviculture and forestry related topics. Again, there are some relevant exception, usually established by direct intervention of local administrations (e.g: the "forestry school" in Ormea (CN)).

At a regional level the forestry sector as a whole is trying to overcome its flaws, by promoting, in the framework of the S3 strategy of the Regional Operational Programmes, regional clusters of wood industries that should gather all the actors involved in the supply chain, including service providers and firms in connected sectors. On the other hand, new actors in the scene of Italian silviculture have adopted a new approach to communication aimed at closing the gap between research and other actors and stakeholders, that are often unaware of the most recent advancement in silviculture and forestry sciences. For instance, the Italian SISEF is particularly active in scientific disclosure, mainly through new media, while "Compagnia delle foreste" a communication enterprise of national relevance, support private and public actors in forest-related communication needs and has

matured a relevant experience in providing extension services and designing demonstration activities.

The Italian NRN already have a role in bringing together actors and stakeholders. For instance, it has been the main promoter of a more participative approach aimed at making available to the forestry community the most recent facts and figures concerning the sector. The output was the first Report on the state of forests and the forestry sector in Italy - RaF-, which has been capable of putting together 161 different actors. NRN is also active in supporting service providers and forest operators by organizing workshops on specific technical subjects (e.g.: on the management of old coppice stands).

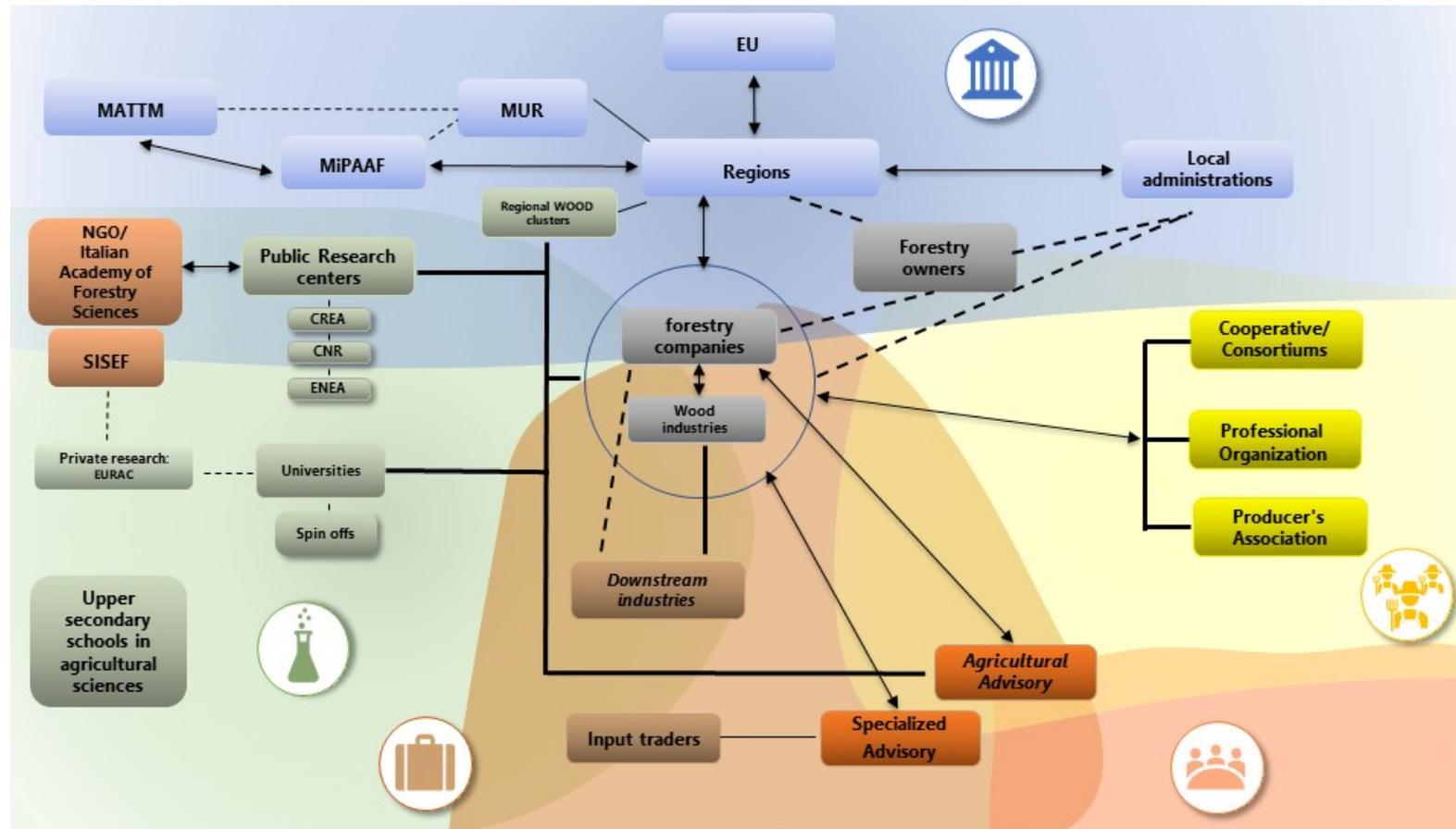
In order to properly address the inherent lack of updated information on Italian forestry, a framework agreement between ISTAT, CREA, ISMEA, MIPAAF has been signed with the aim of establishing a unitary platform for data collection and exchange.

The challenges of the Forestry Knowledge System

The challenges of the knowledge system concern:

- Forest operators, who needs to know about forest management, personal protective equipment but also to understand the implication to their work of the full application of the “due diligence” (Regulation (EU) No 995/2010, laying down the obligations of operators who place timber and timber products on the market (EUTR)).
- Timber traders, who need to comply with the requirements of the “Forest Law Enforcement, Governance and Trade licensing scheme” (FLEGT) licensing scheme (Reg. EU 2173/2005).
- The timber industry, that must be made aware of ground-breaking business opportunities related to wood and design industry, also with a special eye on the use of local timber and on circular economy.
- Upcoming CAP, that also need to address the need for training on agroforestry and related practices.

Figure 4. Diagram of the relationships among actors of the forestry sector in Italy



Source: Our elaborations based on interviews

Legend

- Public authorities
- Research and education organisations
- Private sector (for profit)
- Third sector farmer/farmer-based organisations
- Third sector NGO (non-profit)
- Strong Linkage
- Weak Linkage

3. History of the advisory system

In Italy, the need to disseminate and transfer agronomic knowledge to farmers was first raised during the First Meeting of Italian scientists held in Pisa in 1839. Following this debate, in 1863 the first Itinerant Chair was established. The Itinerant Chairs of Agriculture were for almost a century the most important institution of agricultural education and training, in particular, addressed to small farmers, with the contribution of teachers, graduates in agricultural sciences, from schools and technical institutes. The educational activities were carried out through lectures in public spaces, farm visits and market day advice. In addition, many Chairs published brochures and newspapers. Since the early years of the 20th century, the Chairs had a close link with the Ministry of Agriculture, Industry and Trade. In 1907, a first measure regulated the life of the Chairs and the recruitment of personnel. In 1935 Chairs were transformed into provincial agricultural inspectorates, which had the responsibility for technical education, assistance to farmers, experimentation, improvement of agricultural production organization and the technical inspection of all projects applying for public subsidy. The Agricultural Inspectorates maintained their original structure until the transfer of administrative responsibilities to the Regions concerning agriculture and forests as set by Constitution in 1947 (art. 117).

Since then, agricultural advisory service has been a competence of the Regions and it is a complex operational reality, in terms both of facilities and advisory provision. In fact, the 21 regional services' systems differ, both quantitatively and qualitatively, depending to historical political choices and peculiar structural configurations.

During this period the first laws regulating the **professions of Agronomist** (Law 7 January 1976, n. 3 "New organization of the profession of Agronomic Doctor and Forestry Doctor") and **Veterinary Doctor** (D.Lgs.C.P.S n.233/1946 concerning the reconstruction of the Healthcare Professions Orders and the discipline of their practice) were issued, and they, with later modifications, are still in force today. The first financial, normative and cultural fundamentals of an Italian system for transferring and disseminating innovation in agriculture, were laid by the Council Regulation (EEC) N° 270/79, that co-financed a government initiative aimed to train experts to be hired by public administrations and professional organizations delegated to carry out agricultural advisory services.

Subsequently, the Multiregional Operating Programmes (Reg. EEC 2052/88 and followed 1989-1993, 1994-1999) gave the opportunity to complete the regulatory framework through promoting new advisory services' management's procedures aimed at connecting innovation and knowledge resources with local needs of training and advice.

At the beginning of the 1990s, the Government approved the **National Plan of Services** for agricultural development and began to discuss the second reform of Structural Funds with the European Commission. This National Plan established a "Services' system" and specified the authority of each actor and their coordination. Regions have a wide degree of autonomy: particularly, they hold function of orientation, coordination and control of information and training activities carried out by private organizations; moreover, they promote no patentable research and experimental activities of collective interest.

Normally, regional laws followed a linear approach to innovation and the system was restricted to a few components, such as the **RADIs**, who managed the services' system, the **farmers' unions' technical bodies**, the universities and research organizations located in the regions. In this period, the farmers unions played an important role in training professional advisors and offering extension services at farm level on the basis of projects assigned to them by the regional governments (Brunori et al., 2007).

Despite the financial scale of interventions and a general programming stuck to policy guidelines, rarely the advisory services were used for the implementation of development policies (Vagnozzi, 1998). The search for high structured solutions aimed at facilitating the interconnection between entities (such as formal agreements or negotiating tables), on the one hand, laid the foundation for their governance, on the other, created a strict system which focused more on scientific innovation rather than on the user satisfaction (Vagnozzi, 1998).

Similarly, trained skills employed in the different regional structures did not found a suitable exploitation, so that their cognitive and methodological potential was gradually decreasing. More generally, the lack of monitoring and evaluation led the services system to increasingly pursue self-referential goals aimed at justifying the existence of structures rather than to promote development (Di Santo et al., 2006).

In the early 2000s, the reduction of funding led progressively to stop many public activities which did not find autonomous sources to continue (Vagnozzi, 2008). In

this period, the regional agricultural services' systems experienced a first attempt to restructuring by introducing competitive bids, entitling additional actors to make part of the system, reducing progressively the range of tasks directly performed by the Regional Agencies for Agricultural Development and Innovation, making the farmers pay a part of the cost.

Meanwhile, the reform of the CAP (EC Regulations no. 1782/03 and 1783/03) reaffirmed the importance of advisory and development services, calling for the establishment of voluntary advisory system (Farm Advisory System – FAS) aimed at supporting farmers with the commitments of cross-compliance, which could be funded under measures 114 and 115 of Rural Development (EC Reg. 1698/2005). Particularly, these measures were aimed to support, respectively, the costs for the acquisition of advisory services and the start-up costs of individuals who started a service activity. The establishment of the FAS required on average 2-3 years in all the Regions for its design, setting up and implementation. In spite of everything, the desired reform of advisory services, aimed at increasing their effectiveness as well as their integration in the knowledge system, were not fully implemented. However, it should be noted that the measures related to FAS and the use of advisory services have, to some extent, served to give new nourishment to extension and advisory system, so that some regions redefined the role and the functions of the Agencies for Agricultural Development and Innovation within the local AKIS, at least where they had not already been dismantled.

Besides, during the same 2007-2013 programming period, advisory providers showed very few attempts to support innovation processes that were funded by measure 124 “Cooperation for development of new products, processes and technologies” for the RDPs. In fact, agricultural advisors, especially freelancers, found it hard to re-think their role other than the traditional ones (Cristiano and Proietti, 2014b). While, on the other side, some new entrants were emerging, and farmers' unions started to act as innovation support services (i.e. Vinidea).

As it emerges from this brief historical excursus, the Italian service system suffers from a heavy dependence on European funds, resulting in a lack of continuity without a coherent medium and long-term strategy (Labarthe and Caggiano, 2014).

However, in the last ten years several of these historical suppliers have undergone a re-organisation, involving both the range of provided services and the dedicated staff, due to the economic crisis and the cuts in resources assigned to knowledge system, that affected particularly the agricultural sector (see Appendices 2 and 3).



This has mainly involved the public services, also determining the dismantling of some regional Agencies for Agricultural Development and Innovation.

4. The agricultural and forestry advisory service(s)

4.1. Overview of all service suppliers

The Italian Agricultural advisory services are characterized by the presence of a variety of suppliers with different objectives and organizational patterns.

Since the implementation of the RDPs 2007-2013, due to the EU innovation policy, the agricultural advisory services scenario has undergone two important changes. The first concerns the appearance of new players, mainly acting as innovation support services; on the other hand, there's a reorganization of structures and services to support multi-actor innovation processes by those who already carried out traditional agricultural advisory activities (Cristiano and Proietti, 2018; Cristiano et al., 2019; Cristiano and Proietti, 2014). More recently, the entry of players from the ICT sector specialized in the provision of services related to the use of a variety of digital tools at farm level have further widened the scenario of services' suppliers.

So that, compared to the past, currently, there is a greater participation and proactivity of a plurality of services providers. Besides, some of them are also involved in European research projects, which favours an international exchange of experiences and skills development/diversification, leading to professional improvement.

Currently, services providers in Italy can be clustered as follows:

- *Public providers*

The number of public providers performing advisory services is quite limited. In general, they are restricted to the former **Regional Agencies for Development and Innovation** which provide a wide range of services (e.g. research and innovation, training, extension, information, networking, demonstration farms, etc.) and, in some cases, have been mandated to support the innovation processes funded through measure 16 of the RDPs. In some cases, these organisms have been recently restructured to act as catalyzer of the different partners and playing innovation brokering functions within cooperation measures. Depending on the case/region, they can aggregate the relevant partners around the project idea, assess the market feasibility and the economic sustainability of the innovation, help its implementation across the producers and coordinate the wider dissemination of the project results (farm visits, final congress, press release).

Another relevant actor is represented by the **Experimental Zooprohylactic Institutes** which are reference bodies for veterinarians. They provide research activities, advisory, training information and laboratories of analysis. Due to their roles they are also quite active within OGs, being able to detect problems and to act, in some cases, as catalysts for actors.

Among the public actors we should include **Research Institutions** supervised by the Ministries (e.g. CREA, CNR) and the **Universities**. Although they are not formally services providers, they can provide advisory services that are interdependent to an applied research. Moreover, since the implementation of RDPs cooperation measures, they have become very active in supporting co-innovation processes, often through spin-offs that have been specifically created (Cristiano and Proietti, 2014). These organisms often own **experimental fields**, where demonstration days can be organised for stakeholders of specific research projects.

In some regions (depending on RDP delivery system), also **LAGs** (public-private partnerships) have shown a certain proactivity in supporting co-innovation processes and, to a certain extent, to provide some services in rural areas.

- *Private providers*

Within the private sector, Farmers' Unions and freelance advisors (agronomists, veterinarians and agrotechnicians are registered with a professional order) and their associations and networks play a key role.

Farmers' unions

Historically, farmers' unions have been the main service providers in Italy. In the past, the three main unions (Coldiretti, CIA e Confagricoltura) represented very different typologies of farms and interests, and social and ideological differences, but today their ideological positions have smoothed out and their programs and requests are often very similar. After the crisis of the '80s-'90s, they have gained a formal role as main interlocutors of the Government, at national and regional levels, in the formulation and implementation of the national/regional agricultural policies (often in almost exclusive way). Their organization is generally based on a centralized and hierarchic model of representation, decision and control which, until a few years ago, has given low space to specificities and needs at local levels, strengthening the national leadership and weakening the local management that has been progressively flattened to CAP applications advice and cross-compliance training and advice. The EIP-Agri implementation and the growing demand for

innovation services from the territory is pushing the farmers' unions to take back skills and abilities that have been lost (both in expertise and in number of employees) due to their progressive involvement in bureaucratic tasks. This is happening by means of staff training (e.g. on brokering functions), outsourcing of some activities to expert freelance advisors or specialized advisory bodies, implementation of new tools for coordinating and monitoring services throughout the region(s). The functions recently provided by the Farmers' Unions within the co-operation projects includes needs assessment, partnership organization, dissemination activities, support to the partners in project development and implementation, tailor-made services to solve complex problems, support to access to resources, knowledge exchange and demonstrative farms.

Freelance advisors

Advisors, veterinarians and agrotechnicians, depending on their experience and specialization, may provide:

- core services, generally funded by the public sector;
- highly specialized private services (e.g. oenologists, veterinarians, etc.);
- services on behalf of upstream or downstream enterprises or other providers.

Currently, about 63.000 agronomists, veterinarians and agrotechnicians are registered with a professional order (cfr. **CONAF**, the **FNOVI**, the **National Order of Agrotechnicians and Graduate Agrotechnicians** in § 2.1.1.), even if not all of them work as private professional advisors. Usually, private advisors provide services within larger farms which rely on either continuous or periodical support for specific activities (such as the soil preparation, sowing, fertilising, weed, disease and pest control, etc.).

Frequently, freelance advisors are organized in associations or networks for economic opportunity and the organization of the services provided. Among them, it is worth mentioning **Fondagri (Foundation for agricultural advisory services)**, a national network of freelance advisors working across all Italian regions that was set up in 2007 by the three professional orders, and the **Tuscany Network of Farm Advisory – Rete Tos.ca**, that joins advisors with different areas of expertise and different geographical coverage through a network contract, thus allowing a more flexible coordination mechanisms in comparison to a society. Within this type of providers there are also forestry services, which are mainly offered by **D.R.E.AM. Italia** (60 employees) and **Compagnia delle Foreste** (8

employees) which is specialized in scientific disclosure and also publishes the reference review for the national forestry sector: **Sherwood**.

- *Cooperatives and other farmers-based organisations*

Farmers cooperatives, producers' associations, POs, consortia, farmers networks and other farmers-based organisations, generally represent a solution against the fragmentation of agricultural supply. Many of them, particularly cooperatives, are engaged in collecting, processing and marketing of agricultural products supplied by their members, also establishing quality standards of productions. These organisms provide other activities for the benefit of their members, such as business advice, business management services, technical advice aimed at promoting the dissemination, use of new technologies with low environmental impact (organic and integrated control) or introduction of quality systems and, in case of cooperatives, application for recognition of quality labels. Moreover, in the last years, all these actors have been also involved to a certain extent in providing new services within cooperation projects, particularly through articulating farmers' needs, identifying innovative solutions and spreading innovation between the farmers and across the local supply chains, thus widening their field of service provision. In some cases, this has been possible thanks to a support strategy developed by their associations, such as Confcooperative and Legacoop (Cristiano and Proietti, 2014).

Among them, agricultural consortia were a reference actor in the past, acting as commercial intermediaries between the farmers and input makers (fertilizers and pesticides, machines, feeds), also having special public competencies. Since the '80 their role decreased and in 2006 they definitely lost their residual public competencies to become private cooperatives. Very recently, in July 2020, 21 agrarian consortia founded **Consorzi Agrari d'Italia (CAI)**, a national structure that aims to provide a range of services to its members, first those for spreading digital technologies and precision farming.

The widening of services provided by farmer-based organisations is particularly evident and effective in some productive areas, such as those concerning sustainable and organic farming practices. In fact, the lack of specific services for this farming method has led over time to the raise of bodies from the ground (networks, associations, foundations) to support and sustain organic farming, also providing specialized services to farmers and other actors involved in the different production processes. Among the others, Federbio Servizi is a specialised services provider offering technical advice, business management, financial and legal

assistance, marketing, training, start-up, research/development programs and tools for innovative commercialization.

- *Upstream and downstream industries and GDO*

The **upstream industries**, producing seeds, fertilisers and pesticides, machines, ect., still have a role in providing advice through their own network of technicians working on the ground in direct contact with farmers. In fact, they offer follow up services with the aim of helping farmers in the choice and the use of input factors. In the past these services were very effective in enrolling farmers into the modernization paradigm. However, their activity has been greatly reduced in the last ten years, due to industries' budget cuts following economic crisis. If possible, an emerging role may be played by the robotics and digital systems industries.

As well, the **agro-food industries** and **GDO** may provide services to the farmers under *contract farming*, with the aim of allowing farmers to meet the quality standards and delivery schedule set by the purchaser. Generally, the practice of contract farming, that may be individual or collective (run through farmers' associations and cooperatives), entails the contractor providing farmers with improved seed, technical advice and market services.

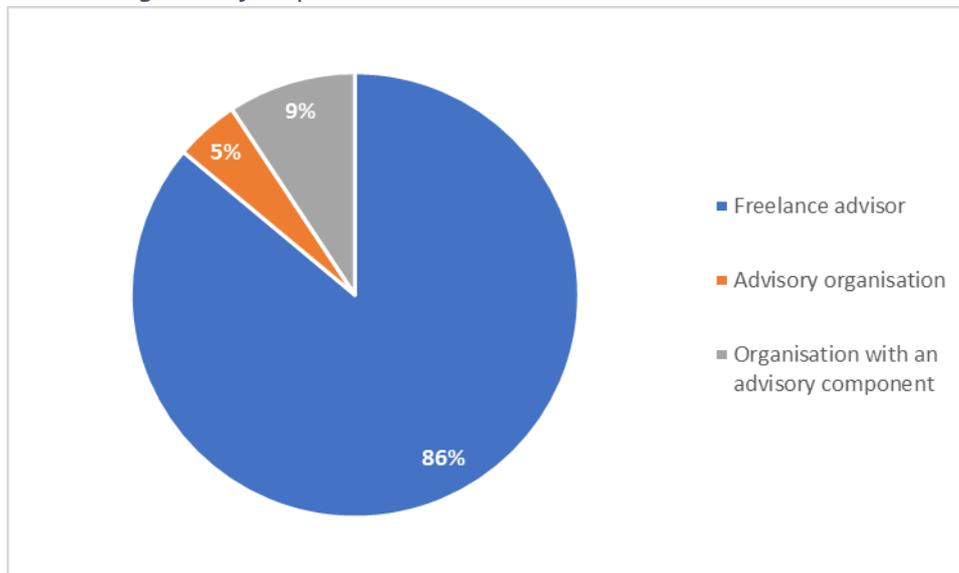
- *Providers from other sectors*

Beside the actors who have always been part of the agricultural and rural sector, there is a growth of organisms from other sector, which generally enter the market to provide innovation support services within innovation projects. In fact, the implementation of RDPs cooperation measures has led to the need for expertise in planning, facilitation, mediation, conflict management, communication, etc. Indeed, until very recently, these skills have been completely unfamiliar in the panorama of agricultural advisory services. These actors generally operate downstream of the agri-food production chain or in other sectors productive sectors, providing intermediation activities, project design and management, administrative services, etc. to the industry. Also, other organisms, that usually provide support services for the management of administrative procedures, are taking ground thanks to the procedural complexity for applying to public fund.

This general overview has been complemented by the results of a survey carried out among private advisory services providers.

The high geographical coverage, with 17 out of 20 the regions, guarantee a satisfactory representation of the Italian diversity. The total number of contributors is 108, mostly freelance advisors (86%). The advisory organizations and the organisation with an advisory member are the 14% overall.

Figure 5: Categories of respondents



Source: Our elaborations based on survey

Particularly, the organizations seem to be mostly represented by private/commercial advisory organizations (40%) and farmer-based organizations (27%). However, all types of advisors currently operating in Italy are represented (fig. 6).

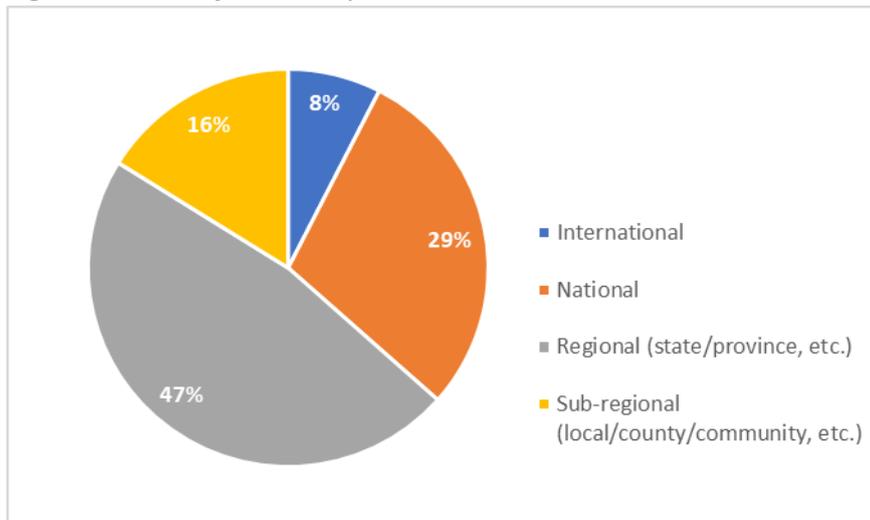
Figure 6: Category of organizations



Source: Our elaborations based on survey

In general, the prevailing scale of service operation is regional (47%) and only few of them have contacts with international clients, sometimes because of the language skills (fig. 7).

Figure 7: Scale of service operation

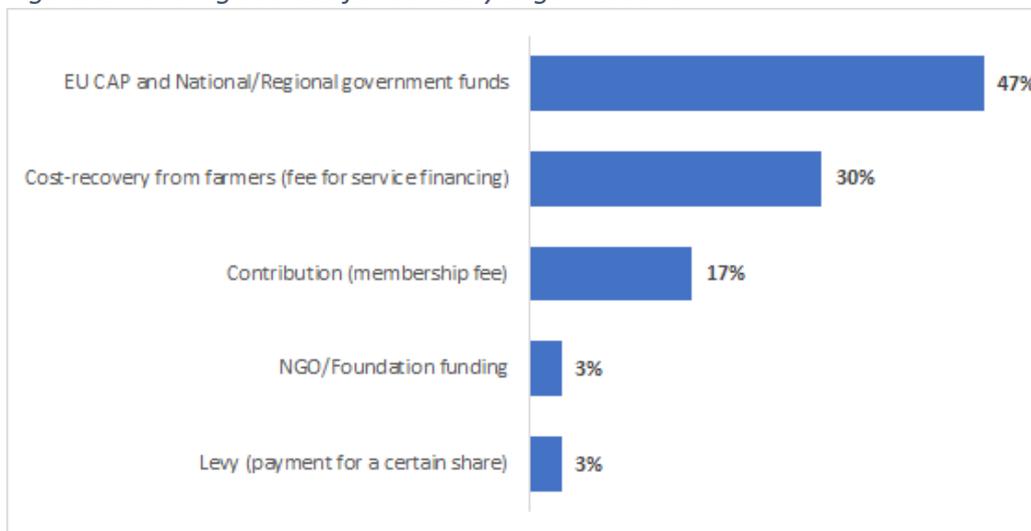


Source: Our elaborations based on survey

4.2. Public policy, funding schemes, financing mechanisms, advisory service providers

During the '90s most regions codified innovation services and funding schemes into regional laws, but currently only 11 regions and the autonomous province of Bolzano have maintained a regional law although, in many cases, it does not provide for funding. Therefore, the main source of public funding of advisory services in Italy is the EAFRD (Measure 2 and Measure 16 of RDPs), as confirmed by the survey (47% EU and other public funds), followed by the cost recovery from farmers (fig. 8).

Figure 8: Funding sources for advisory organizations



Source: Our elaborations based on survey

Measure 2 is currently planned in 17 out of the 21 Italian RDPs, since the Autonomous Provinces of Bolzano and Trento and Aosta Valley and Friuli Venezia Giulia regions did not activate it. All 17 RDPs planned sub-measure 2.1 (advisory services) (2.1), while 13 included also the support for training of advisors (Meas.2.3).

4.3. Clients and topics and methods

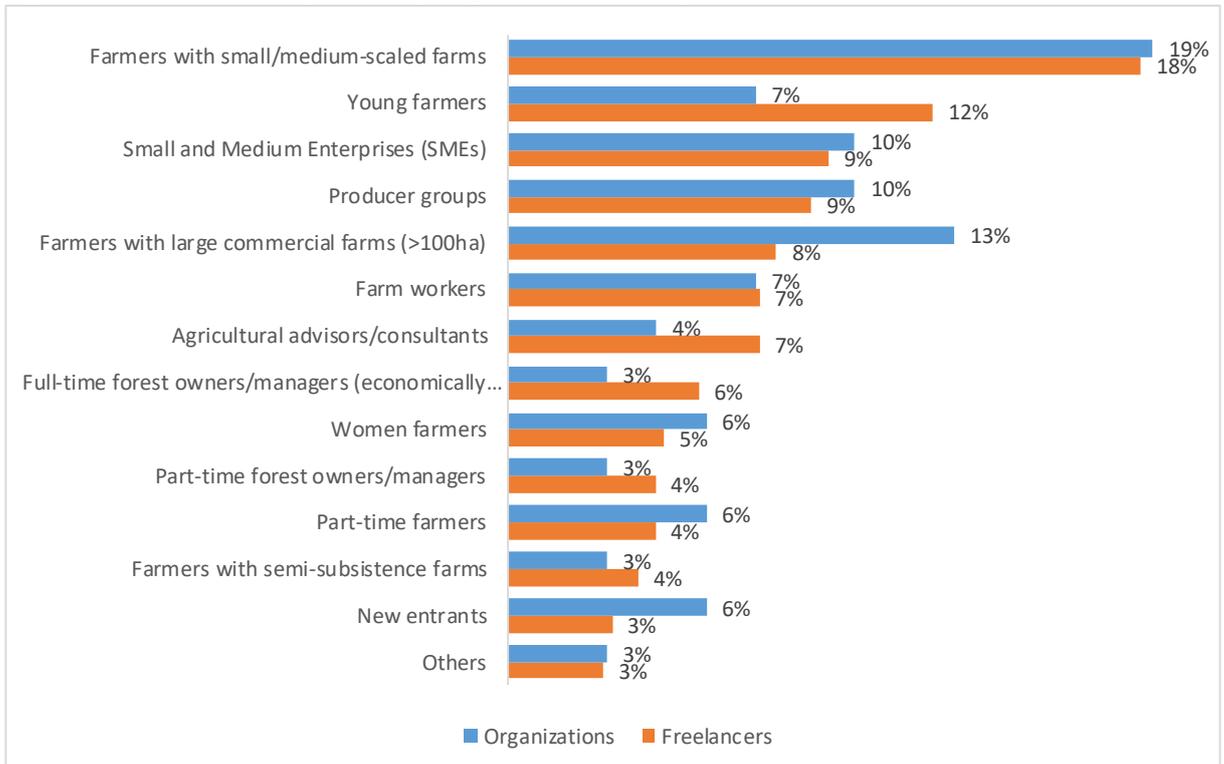
The clients and topics of advisory services vary depending on the type of service providers, topics/contents of advice, productive sector and region in which the provider operates, and it is not possible to make a general assessment without go in depth.

In general, in the last years, Italian advisory services seem to have extended the range of their clients and topics. This is mainly due to the enlargement of advisory topics related agricultural challenges and a disruptive effect of the cooperation measures (new actors involved and new functions to play) since the previous programming period. In particular, the survey highlights a major involvement of clients from the forestry sector, namely forestry enterprises and SMEs (first processing or food distribution firms).

The survey confirms that advisory services are addressed to several types of clients (fig. 9). Small/medium farms are the most frequent target group for both organizations and freelancer, probably due to the characteristics of the Italian farms itself. However, the organizations seem to advise also larger farms, while

freelancer are more focused on young farmers, also thanks to the new entrants in agriculture encouraged by the EAFRD Measure 6.

Figure 9: Main clients of advisory organizations and freelancers

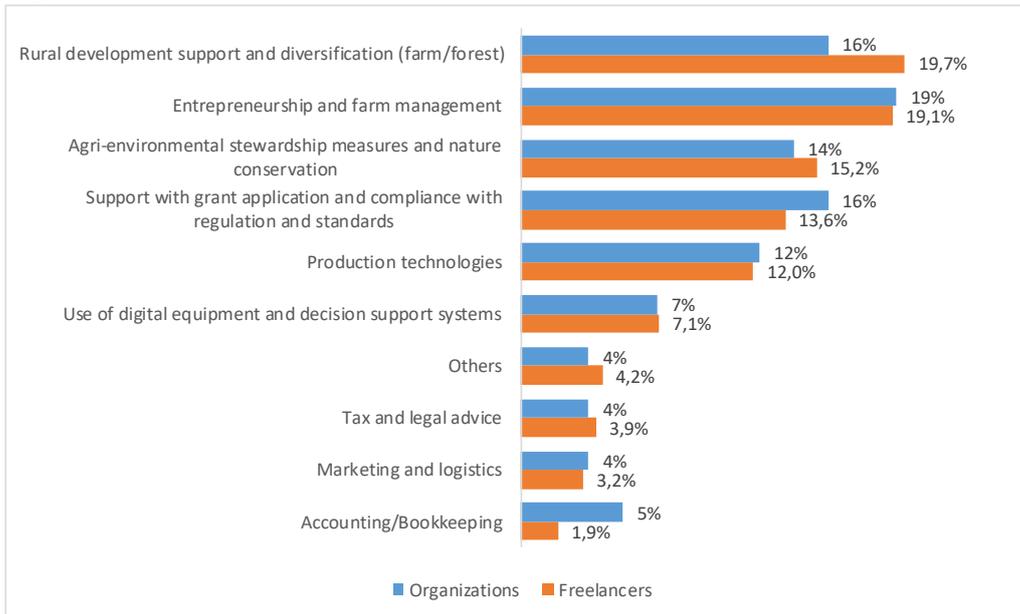


Source: Our elaborations based on survey

The contents of advisory cover a wide range of topics, that includes the traditional support for the implementation of technical processes and production reconversions, but also the support for regulatory compliance, the financial and economic management of the farm, the design of communication and marketing strategy, the use of data for financial and economic purposes (RRN, 2020).

Survey respondents indicate the areas of farm competitiveness through diversification, entrepreneurship, farm management and application support and the support for compliance with agri-environmental schemes as the main topics addressed (fig. 10). The percentage of the use of production technologies and digital equipment is relevant, also due to the pandemic situation. On the other hand, the provision of bookkeeping, tax and legal service is scarce, probably because it is entrusted to labour consultants. The same is true for marketing and logistics topics, which are probably provided by specialized advisory services providers which were not involved in the survey.

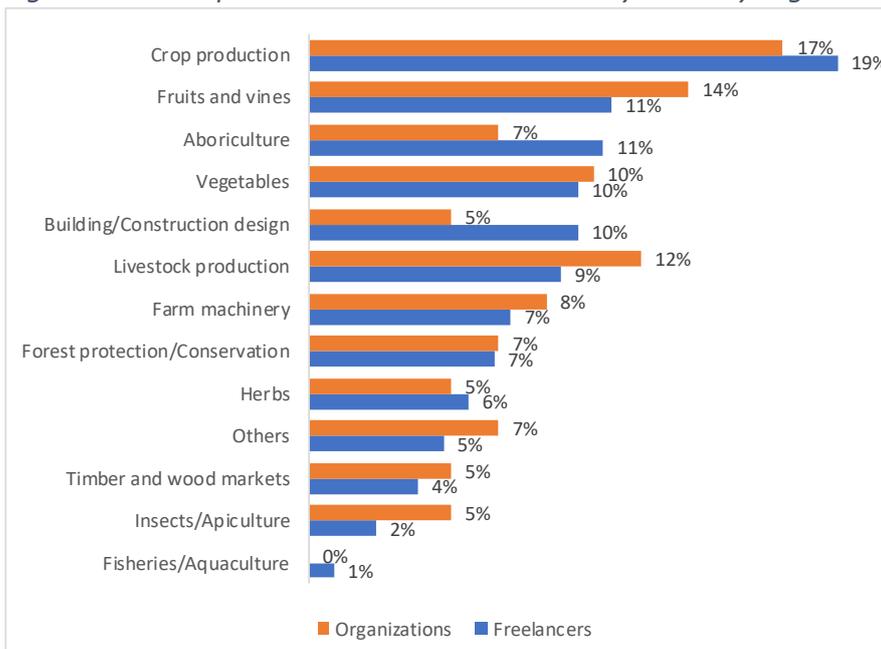
Figure 10: Main cross cutting topics addressed by freelancers and advisory organizations



Source: Our elaborations based on survey

Focusing the attention on specific production sectors, the most relevant for both freelancers and organizations are crop production, fruits and vines and, in some ways, also livestock production (Fig. 11). Less frequent fisheries and aquaculture.

Figure 11: Main production sectors addressed by advisory organizations

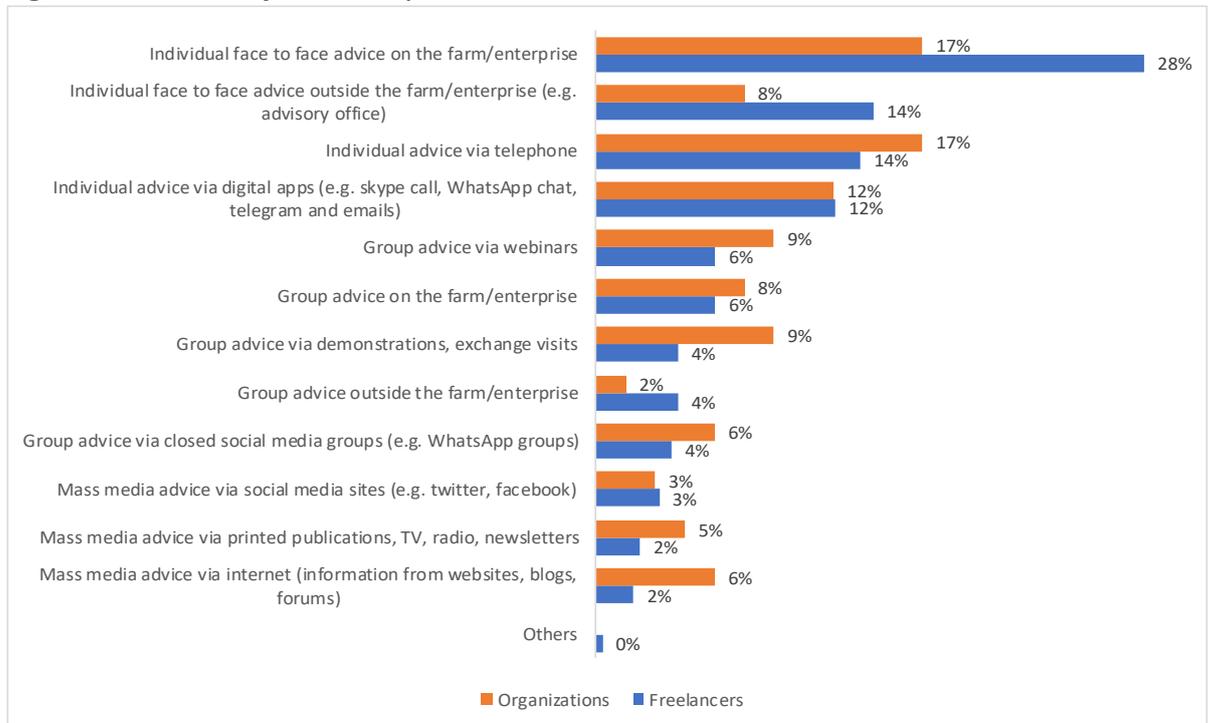


Source: Our elaborations based on survey

According to the survey, advisory provision seems to be outsourced only in a very limited percentage by advisory organizations, since they have necessary skills and human resources internally to provide advisory services.

In practice, the interviews revealed that the farmers' unions, which provide advice to a large number of associated farms, outsource a large part of their services to freelance advisors because the number of technical expert in-house staff has been reduced throughout the regions to a limited number of units. Moreover, in some regions, the selection criteria of Measure 2 require that organizations applying to the funding have expertise in all the productive sectors and cover the entire regional territory. This, in fact, prevents individual advisors from applying to the measure, encouraging associationism and, to a certain extent, also outsourcing. Recent studies showed that a wide range of advisory methods and functions are used by Italian advisory services, depending on the farmers characteristics and needs and the advisory services providers expertise (Carta et al., 2019a; Cristiano et al. 2015). However, face-to-face methods are the prevailing ones, as shown by both freelancers and advisory organizations within the survey. Particularly, freelancers seem to mostly use individual face to face support on the farm, but also outside. The organizations also use other devices (telephone, skype, WhatsApp) in a high percentage. Group advise, when used, is via webinar or demonstrations, while mass media method is not so frequent, especially among freelancers.

Figure 12: Methods for advisory services used



Source: Our elaborations based on survey

Thus, the individual advise is the preferred method and the Covid-19 pandemic has strengthened this preference because of the mobility and reunions restrictions. In fact, the majority of respondents had to change their previous methods, increasing the use of digital supports and telephone to better reach their clients.

4.4. Human resources and methods of service provision

Human resource

Human resources of the organizations answering the survey have significantly variable dimensions. On average the participant to the survey state to have about 50 employees, although there are significantly larger organizations (300 employees). No relevant changes were recorded in the last five years, even if in some cases the increasing number of clients and services provided required an expansion of the staff.

The staff is mostly composed by advisors (33%). The female component is quite low. Only the 10% of the employees are females, a quota that decrease considering the sole advisors.

Figure 13: Number of employees in advisory organizations

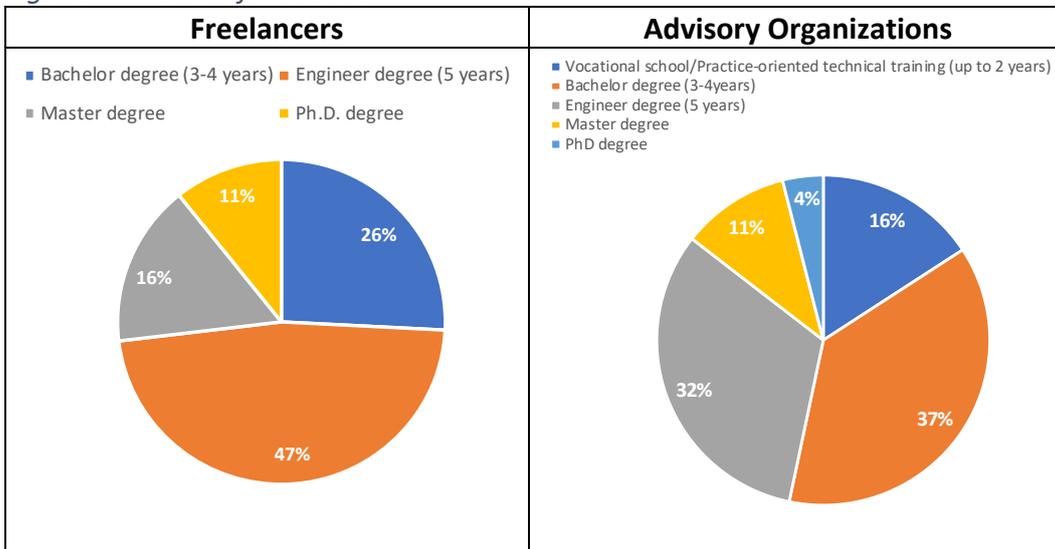
	Number of Employees (mean)
Total	49,1
Whereof: Female	10,1
Whereof: Advisors	33,3
Female Advisors	7,2
Back office activities	12,4

Source: Our elaborations based on survey

Education level of advisors

The prevalent level of education for both freelancers and advisory organizations is the degree (e.g. Agricultural sciences, Veterinary medicine), while the highest university degree (PhD) is less represented.

Figure 14: Level of education

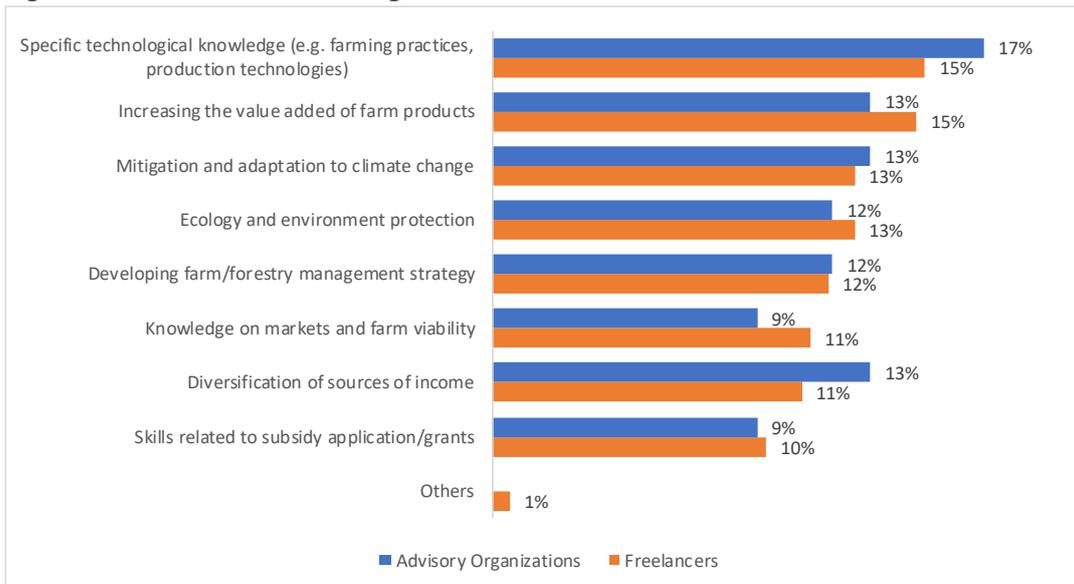


Source: Our elaborations based on survey

With reference to the skills, there is a kind of alignment among freelancers and advisory organizations, for both technical knowledge and methodological and communication skills. On one hand, the technical ones are quite diversified and strong in several topics, although advisors state to be more skilled on specific

technological knowledge (e.g. farming practices, production technologies) and increasing the value added of farm products. On the other hand, the self-assessment of their own skills and knowledge needs shows a proactive attitude of the advisors to keep up with changing times.

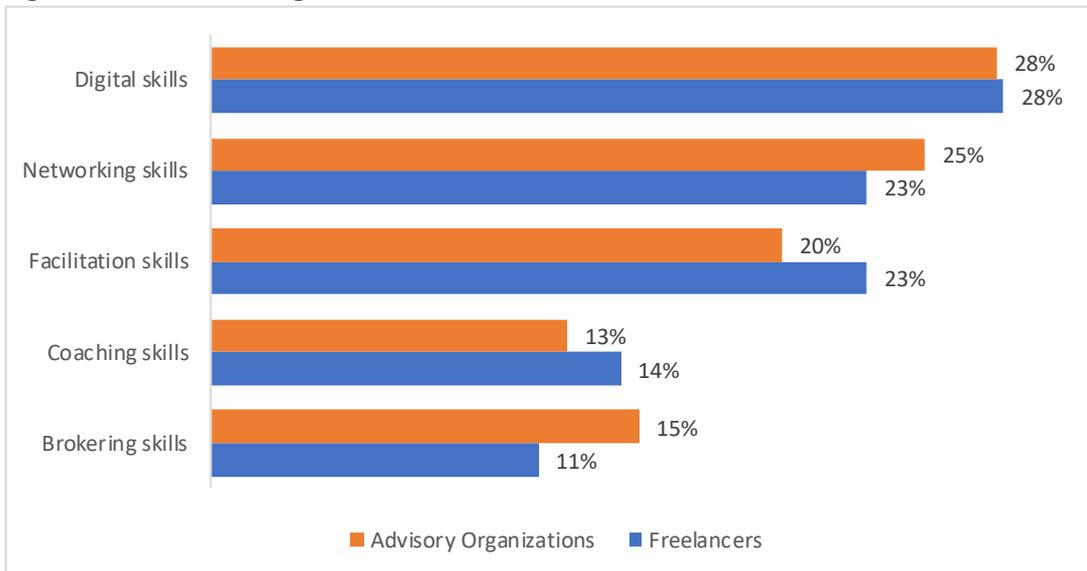
Figure 15: Technical knowledge and skills



Source: Our elaborations based on survey

Currently, digital and networking skills are the methodological and communication expertise more frequently owned by advisors; they were particularly useful during this pandemic that required the use of IT platforms and software. Rather, freelancers highlight more weaknesses in brokerage skills (mediation, facilitation, conflict management, networking, etc.), that are becoming more and more relevant and popular.

Figure 16: Methodological and communication skills

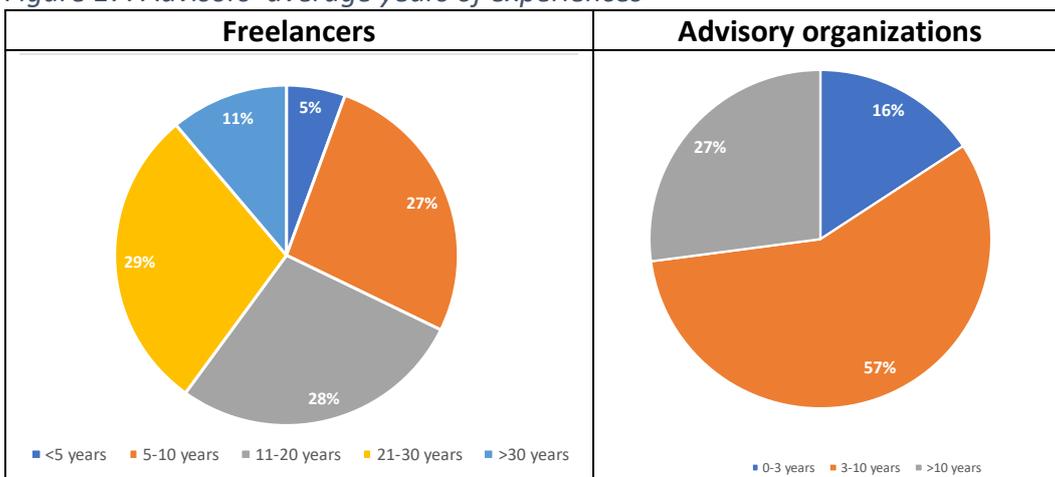


Source: Our elaborations based on survey

Professional experience in years

The professional experience in years varies significantly between freelancers and advisory organizations that seems to have, with respect to the surveyed, a prevalence of junior advisors in staff. The freelancers are mostly senior, with a good percentage of advisors with more than 30 years of experience (fig. 17).

Figure 17: Advisors' average years of experiences

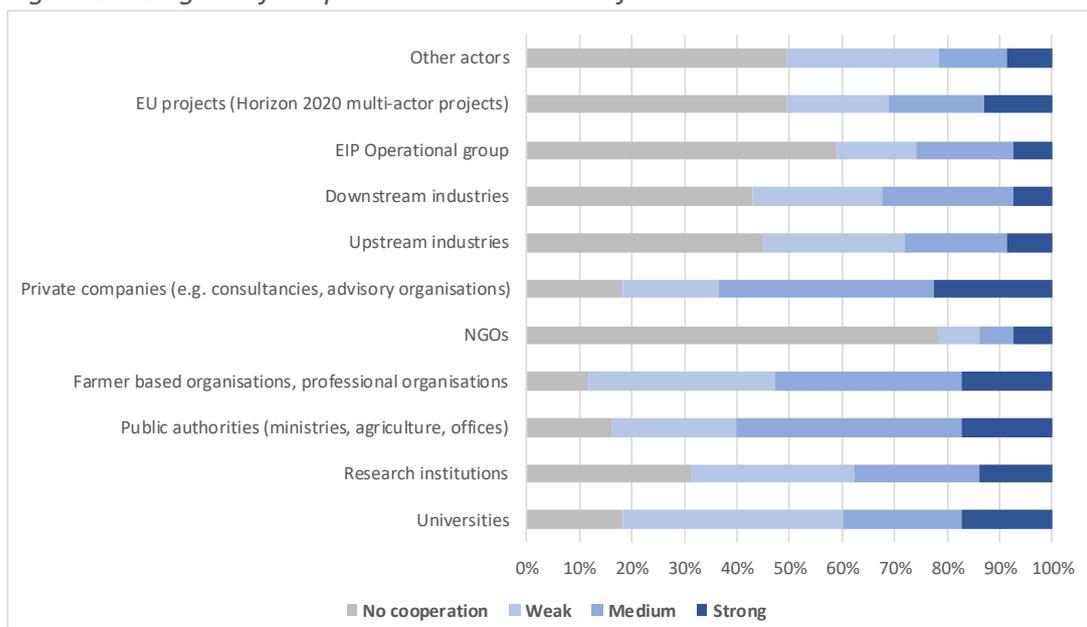


Source: Our elaborations based on survey

4.5. Linkages with other AKIS actors/knowledge flows

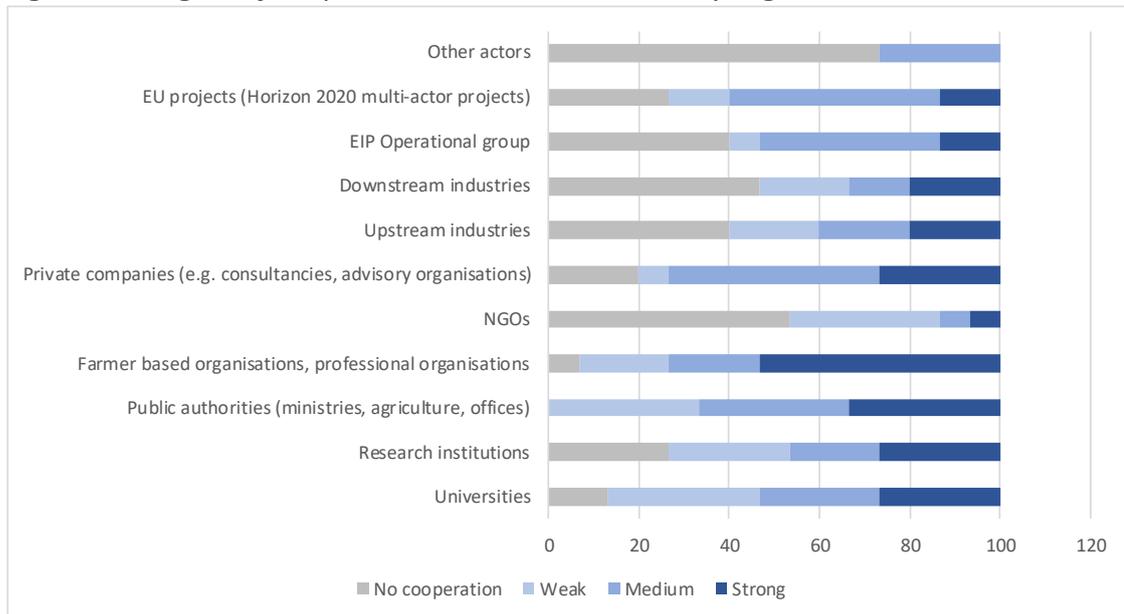
The relationships with other AKIS actors vary depending on the type of advisor considered. Freelancers have stronger links with private enterprises, such as other advisory organizations, universities, farmers’ organizations and public authorities. This is because freelancers often provide advice on behalf of upstream and downstream industries, farmers’ unions and other advisory organisations, university spin-offs, etc. On the other hand, organised advisory services have strongest links with farmer-based organizations. In both cases, there are linkages with OGs, which operate in several Italian regions.

Figure 18: Degree of cooperation with actors – freelancers



Source: Our elaborations based on survey

Figure 19: Degree of cooperation with actors – advisory organizations



Source: Our elaborations based on survey

4.6. Programming and planning of advisory work

Staff development strategy

Agronomists, veterinarians and agrotechnicians registered with the Professional Orders are required to undergo regular training organized by the national Councils and regional professional orders. To this end the professional orders are organized to provide at national level the rules and guidelines for lifelong learning, including requirements on minimum training per year to maintain the registration; while, training protocols with agencies and courses are conducted under the responsibilities of national, regional and provincial levels. All of the three professional orders have established specific websites for the training courses and other capacity building events. Besides, information and updating of the registered is provided by monthly newsletters.

Most of the advisory organizations that answered the survey have a staff development strategy, which allows them to keep their advisors trained. On average, they receive 14 days training on topics concerning knowledge and advisory skills. However, there is not often a rewarding system to recognize good performance and incentivize skill developments for advisors.

Figure 20: Staff development strategies in advisory organization

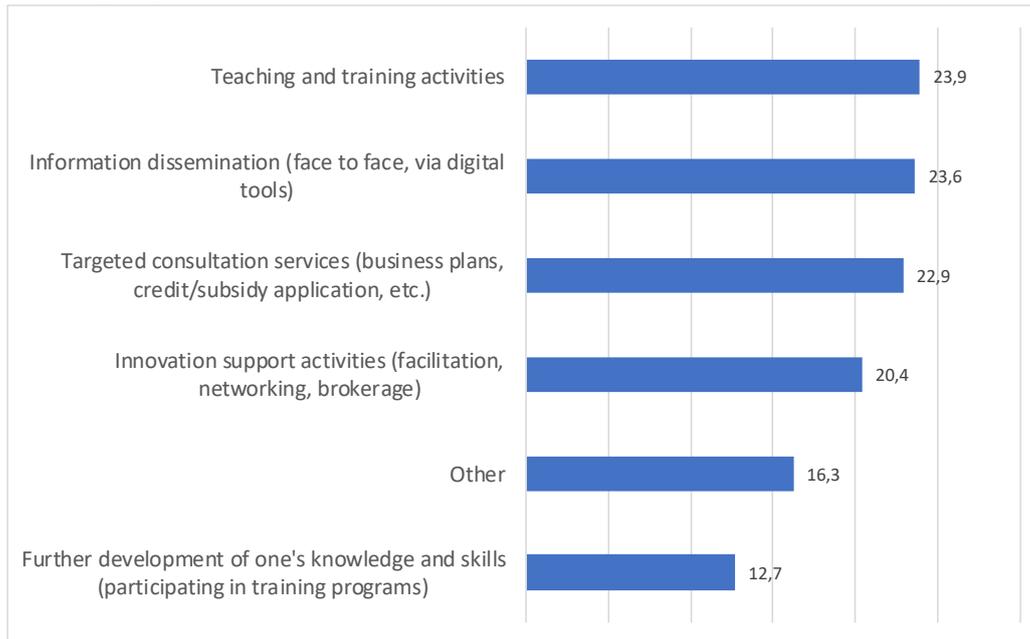
	Staff development strategy
Yes	60%
No	40%
Average days of training	14,29
	Rewarding system
Yes	13%
No	87%

Source: Our elaborations based on survey

Time allocation for advisory work

According to the survey, the time of advisors working in organizations is mostly spent on teaching and training activities, as well as on information and dissemination, while participation in training programs represents a weakness.

Figure 21: Average proportion of time (%) allocated to the following activities in advisory organization



Source: Our elaborations based on survey

4.7. Advisory organisations forming the FAS and evaluation of their FAS implementation

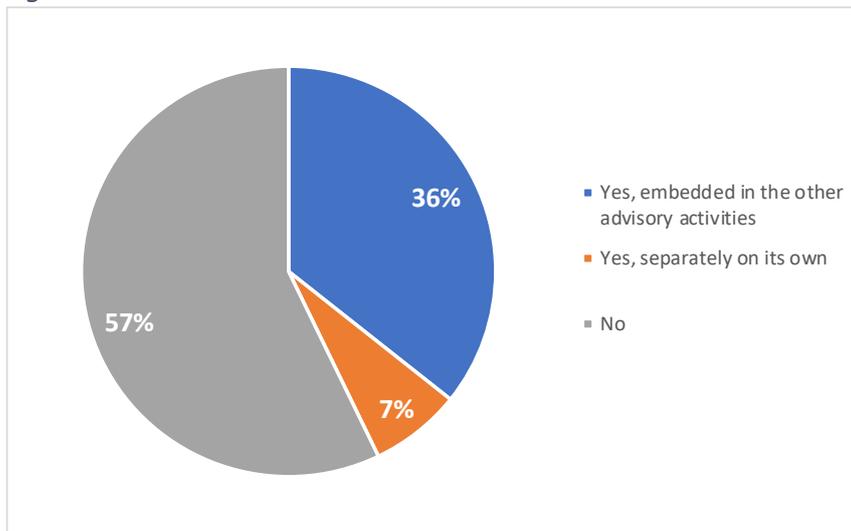
Considering the variety of organisms providing advisory services (mainly private) and the decreasing of financial and human resources devoted to public advisory services, due to budget constraints, the Regions pushed the RDP to urgently cover all advisory needs at regional level. Therefore, in Italy, the implementation of the Farm advisory system is completely dependent from RDPs's (namely, current Measure 2 and previous measure 114) (cfr. § 2.1.1.). As a matter of fact, during the programming period 2007-2013, measure 114 supported about 32,100 and the most requested advisory topics related to cross-compliance (Licciardo F., 2017). While, the actual implementation of measure 2 registers only about 6,883 beneficiaries of advisory services. On this regard, the most part of advisory organizations that answered the survey claim not to provide EU-FAS (57%). While, in some cases, the cross-compliance requirements, when provided, are embedded in the other advisory activities.

As a general comment, FAS implementation encountered some problems, especially during the current programming period and these mainly regard: (a) lack of attractiveness of the theme for farmers; (b) complex administrative and

beurocratic rules, which where solved by the ominibus regulation only in late 2018; (c) fear by the farmers that advisory services would be used to check effective compliance with EU standards (Cristiano, 2012).

However, it is widely recognised that the FAS has effectively supported the more diffuse knowledge of EU rules concerning environmental issue.

Figure 22: Advisory services on EU-FAS cross-compliance requirements in advisory organizations



Source: Our elaborations based on survey

5. Summary and conclusions

5.1. Summary and conclusions on sections 1 – 3

Italy is characterized by a large plurality of AKISs, representing different structuring and functioning degrees, that reflect the diversity of the country in terms of farming systems, socio-economic background, cultural values, environmental and orographic features of the territories, as well as the decentralisation of administrative functions.

These systems show different degrees of cohesion and organization, and the development of systemic thinking, common vision and system commitment by the players animating them are closely linked to the identity dimensions embedded in each territory

For these reasons, a single country-perspective of the Italian AKIS cannot provide the real state of the art of the country, which rather requires a multi-perspective analysis, as it includes a supply chain perspective, a farming system perspective and a local ones.

A plurality of AKISs, but also a wide plurality of actors, representing an asset in terms of cross-fertilization and growth of knowledge and innovation systems at different levels.

Certainly, European policies for innovation have contributed to a certain dynamism of Italian AKISs, triggering a transition process, that is characterised by the rise of new actors and a slow, but progressive, awareness about new possibilities to innovate and share knowledge. Since the introduction of the European innovation policies within the last two CAP programming periods, a general and widespread strengthening of local relational systems can be observed. This is as indicated, as an example, by the maintenance of relationships beyond the innovation projects term and by the sustainability of innovation partnerships through the different programming periods (submission of consecutive proposals from measure 124 of RDPs 2007-2013 to measure 16 of the RDPs 2014-2020). In many cases, these partnerships and/or innovation networks include a variety of actors (farmers, advisors, researchers, SMEs, local administrations, consumers), so as to be considered as micro-AKIS where an interactive innovation transfer model is implemented.

An important element that is certainly characterizing the strengthening of a country-perspective AKIS is the progressive consolidation of trans-territorial relationships, triggered by actors that are sufficiently well organised (research, advisory, input providers) to permeate the different regions, that foster the cross-contamination of the different AKIS in terms of knowledge, leading to the definition of new knowledge co-creation processes.

The greatest constraint of Italian AKISs is undoubtedly the shortage of financial resources to be allocated to research and advisory that, since several years, are exclusively restricted to European sources. Considering the dynamism and a growing awareness that arises from the territories in terms of new cooperation capacities, which have proven to be able to overcome individualism and pool knowledge sources, the absolute dependence on European funds is a missed opportunity. In fact, national or regional resources would allow to give more continuity and consistency to cooperative partnerships, allowing relationships to grow and thus feeding the AKIS.

5.2. Summary and conclusions on sections 4

The state of the art of agricultural and forestry advisory service(s) confirms the trends that have distinguished Italy for at least twenty years: the presence of a plurality of advisory service providers and the exclusive dependence of public services provision on CAP funding.

The introduction of the EIP-Agri has led to new demands for advisory services and, therefore, new subjects able to provide them have emerged. Therefore, there has been a widening of advisory providers, that now include also actors from downstream of the production chain (agri-food sector) or from other sectors to provide intermediation services, project design and management, administrative services, etc. The emergence of different service providers, as well as new models of services provision, has been facilitated by a gap in traditional advisory services that followed a progressive cut in public funds and the failure of the Farm Advisory System (Cristiano and Proietti, 2015).

Due to this breakpoint, even some traditional providers have been forced to review their role and competencies (reorganize) to meet new needs. This is the case, for example, of the Regional Agencies, which have been revitalized through the assignment of new functions within innovation processes. In several regions,

Regional Agencies play a key role as brokers, carrying out a needs assessment, aggregating relevant partners around a project idea, supporting the co-ordination of the wider dissemination of project results (through farm visits, events, etc.).

Farmers' Unions have also gone through a transformation phase, enhancing their role in supporting new innovation pathways, thanks to an internal reorganisation, the acquisition of new skills, and the outsourcing of some services.

Finally, there are freelance advisors who, being aware of the need to widen their professional skills in order to provide adequate solutions to a wider range of needs from the different territories, have started organizing themselves through innovative advisory networks and other associative arrangements. In general, they show a higher propensity to update their own networking, communication, and facilitation skills, as well as to identify the enabling conditions for acting as go-between farmers' needs and the different knowledge sources.

This phase of general re-organisation of service providers turns the spotlight on professional skills development and update. The current system of life-long learning credits provides a dynamic skill updating mechanism that is able to cope with rapid changes affecting the agricultural sector. This system has fostered the rise of a certain variety of actors that are specialised in providing technical updating services, while also bringing advisors closer to emerging research issues. On the other hand, there is also a need to systematise existing expertise (e.g. to train new generations) through a greater use of innovative approaches such as coaching.

6. Acknowledgement of partners, information sources and gaps

We would like to thank all the actors interviewed that provided us valuable information.

List of interviewed persons:

NAME	ORGANISATION	DATE
Fabbri Fausta	The Interregional Network for Agricultural, Forestry, Aquaculture and Fisheries Research – Tuscany Region	July 2020
Gemmiti Alessandra	The Interregional Network for Agricultural, Forestry, Aquaculture and Fisheries Research – Tuscany Region	July 2020
Patrizia Bacchiega	The Interregional Network for Agricultural, Forestry, Aquaculture and Fisheries Research – A.P. Bolzano	July 2020
Cianciosi Lucio	The Interregional Network for Agricultural, Forestry, Aquaculture and Fisheries Research – Tuscany Region	July 2020
Gandolfi Ferdinando	The Interregional Network for Agricultural, Forestry, Aquaculture and Fisheries Research – Campania Region	July 2020
De Franciscis di Casanova Emiddio	The Interregional Network for Agricultural, Forestry, Aquaculture and Fisheries Research – Campania Region	July 2020
Coletta Lucia	The Interregional Network for Agricultural, Forestry, Aquaculture and Fisheries Research – Campania Region	July 2020
Stellato Massimiliano	The Interregional Network for Agricultural, Forestry, Aquaculture and Fisheries Research – Campania Region	July 2020
Pandozy Gianmarco	The Interregional Network for Agricultural, Forestry, Aquaculture and Fisheries Research – Lazio Region	July 2020
Santalucia Gioacchino	The Interregional Network for Agricultural, Forestry, Aquaculture and Fisheries Research – Lazio Region	July 2020
Brugna Elena	The Interregional Network for Agricultural, Forestry, Aquaculture and Fisheries Research – Lombardia Region	July 2020

Luigi Trotta	The Interregional Network for Agricultural, Forestry, Aquaculture and Fisheries Research – Puglia Region	July 2020
Bacinelli Mauro	The Interregional Network for Agricultural, Forestry, Aquaculture and Fisheries Research – Umbria Region	July 2020
Terenzi Angela	The Interregional Network for Agricultural, Forestry, Aquaculture and Fisheries Research – Umbria Region	July 2020
Vianello Monica	The Interregional Network for Agricultural, Forestry, Aquaculture and Fisheries Research – Veneto Region	July 2020
Trentin Giorgio	The Interregional Network for Agricultural, Forestry, Aquaculture and Fisheries Research – Veneto Region	July 2020
Boscolo Bielo Luca	The Interregional Network for Agricultural, Forestry, Aquaculture and Fisheries Research – Veneto Region	July 2020
Garbin Matteo	The Interregional Network for Agricultural, Forestry, Aquaculture and Fisheries Research – Veneto Region	July 2020
Restaino Rocco Vittorio	MA RDP Basilicata Region 2014-20	July 2020
Lasala Pier Michele	Farmer	July 2020
Poddie Maria Annunziata	Sardinia Region – Assessorato dell'Agricoltura e riforma agropastorale della Regione Sardegna	July 2020
Lai Elena	Sardegna Ricerche	July 2020
Medda Maria Chiara	Farmer / Advisor	July 2020
Conforti Gabriele	Sardinia Region – Assessorato della programmazione, bilancio, credito e assetto del territorio	July 2020
Bartalucci Laura	Tuscany Region – Head of the Department “Sviluppo dei partenariati europei per l'innovazione in agricoltura”	July 2020
Ulivi Angela	Freelance advisor	July 2020
Berna Enrica	Advisor - Studio BPM, Contact person for the advisors' network Tos.ca	July 2020
Vagnozzi Anna	National Rural Network	August 2020
Roggero Pier Paolo	University of Sassari	August 2020

Perniola Michele	University of Basilicata	August 2020
Puliga Serenella	MIPAAF – Research Department	September 2020
Trioli Gianni	VINIDEA	September 2020
De Rosa Marcello	Cassino University	September 2020
Falzarano Pasquale	MIPAAF	September 2020
Colombo Luca	FIRAB	September 2020
Sileo Rocco	ALSIA	September 2020
Zurru Roberto	AGRIS	September 2020
Selis Tonino	LAORE	October 2020
Lorenzoni Antonio	Advisor	October 2020
Diamanti Sabrina, Pecora Carmela	CONAF	October 2020
Varotto Fabrizio	Advisor	October 2020
Rossi Daniele	CONFAGRICOLTURA	October 2020
Aquila Gianpiero	Istituto tecnico agrario di Alvito (High School)	November 2020
Stefani Alessandra	MIPAAF – Forestry Department	November 2020
Miozzo Marcello	DREAM Italia	November 2020
Mori Paolo	SHERWOOD REVIEW	November 2020

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Appendix 1 Overview of the organisations providing advisory services

Provision of service				Source of financing								
Status of the organisation	Type of organisation	Number of organisations	Number of advisors	Public funds			Farmers			Private	NGO	Other (specify)
				EU funds	National funds	Regional funds	Farmers' levies	Farmers' contribution	Billing services	Other products (inputs, outputs)	foundation	
Public authorities	Advisory department of the Regions	3	n.a.			X						
	Regional Agencies for Development and Innovation	17	n.a.	X***		X						
	Experimental Zooprophyllactic Institutes	10 (with 87 peripheral diagnostic sections)	n.a.		X							
Private sector	Independent advisors	70.000	n.a.	X					X			
	Advisors associations and networks	n.a.	n.a.	X					X			
	Upstream industries	n.a.	n.a.							X		
	Downstream industries and Large Distribution	n.a.	n.a.									Contract farming
Farmer based organisations	Farmers' unions	4	n.a.	X				X				
	Cooperatives and consortia of which POs	5.080	n.a.	X**				X		X		

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INTERACTIVE INNOVATION

	- Fruit and vegetables	310										
	- Cereals	15										
	- Milk	54										
	- Meat	25										
	- Olive and olive oil	110										
	- Others	53										
	Producers Associations	n.a.	n.a.	X				X				
	Farmers' networks	n.a.	n.a.	X**				X				
NGO												

X* Instrumental services supporting research activities

X** Innovation support services within Operational Groups

Appendix 2 – The AKIS in Basilicata Region

Basilicata is a small region in southern Italy, characterized by a rich variety of landscapes. Agriculture is its most important sector both from the economic and social point of view and regional agriculture is very specialized on a territorial basis:



- Fruit and vegetables are essentially located in the Metapontino Plain, in the Lavello Plain and in the Valley of the river Agri. It is one of the most competitive sectors of Lucanian agriculture. Regional fruit and vegetables sector is renowned at the national level for the quality of its productions (strawberries, apricots, peaches and nectarines), many of which reach European markets.
- Livestock breeding is carried out on the whole regional territory, with the production of meat, milk and cheese, although in the last two decades has shown a reduction both in the number of the heads and, in smaller numbers, of the farms
- Cereal growing is especially widespread on the hills of Matera and Vulture Melfese, where durum wheat is by far the most cultivated crop.
- Vulture territory is traditionally suited to viticulture, while oliviculture has recently obtained the PDO certification

Lucanian agriculture is capable of expressing a wide range of quality products (oil, wine, cheeses, cured meat, pasta) that have become a point of strength in regional economy. As a matter of fact, there are food excellences in most of regional agro-food compartment.

The Agriculture & Forest Knowledge and Innovation System of Basilicata is populated by many actors, in order to better meet the needs of the Lucanian food system (figure 1). Over the years there has been a positive growth in terms of knowledge and skills of agricultural and forestry entrepreneurs. The knowledge system of Basilicata presents a rich picture of actors (public and private) who move between rules and instruments of public governance with different degree of

interaction. The interviews carried out with experts and key stakeholders allowed to understand the relationships among them but have highlighted a quite faint relational system.

The main actors of the regional AKIS are listed below.

Research and Education

In Basilicata operate public and private research institutions. Over the years, the role of the Basilicata University has grown both from the point of view of the learning activities and the research.

Extension and Advisory services

The private advisory providers are well-integrated within the AKIS and include:

The Livestock Breeders' Association of Basilicata (ARA), provides veterinary services for the prevention and treatment of diseases and services relating to feeding and livestock productions.

Nine fruit and vegetable producers' organizations. They provide advisory services to their farmers.

The Agricultural Professional Organizations provide consulting services on topics such as marketing, production chains, health and safety, correct use of pesticides, and pay particular attention to the classification and quality of products. With regard to the dissemination and testing of innovations, there are only a few activities already in place or in progress. For example, Coldiretti has started a training course as an Innovation Advisors (RRN Magazine, 2019), while CIA has focused its attention on the possibility of introducing fertirrigation methods in areas outside the land reclamation consortia boundaries.

Downstream industries' technical representatives provide advice on agronomic treatments and crop needs, but usually are related the use of a certain input.

Larger farms acquire the necessary managerial and/or product/service specific skills externally, often by hiring a professional or attending fairs and markets where they can learn about innovations and new markets. On the other hand, smaller, and more economically fragile farms do not receive valid support from public services and cannot afford private consultants.

Advisory public services

Public services in Basilicata have been reorganized through a series of different regional acts influenced also by the CAP. Models adopted in the region, have

changed many times, as for roles and functions, over the years. They have been characterized by a progressive substitution of service activities by including research.

In 1996, in Basilicata, an effective management of consulting services model was developed, by establishing the Lucanian Agency for Development and Innovation in Agriculture (ALSIA), the Interregional Consortium for Agricultural Dissemination and Training (CIDFA) of professional agricultural organizations and by using experimental and model farms, directly managed by the Regional Department of Agriculture.

In 2001, with regional law n. 29, ALSIA became an essential component of the Regional consulting services system through its Experimental Demonstration Farms and Specialized Services. The new organizational model provided for a greater interaction between the sectors of research and experimentation, dissemination, training and technical assistance.

However, from 2000 to 2005 the agricultural services of Basilicata started an internal restructuring of the range of activities for agricultural innovation due to a lack of skills and in order to promote a more rational exploitation of the financial opportunities offered by the RDP.

Over the years, ALSIA's involvement in the field of consultancy services has decreased for various reasons, ranging from the downsizing of experimental and model farms, to problems related to the governance of the agency itself, at the point that the Agency has been put under receivership.

In 2013, ALSIA acquired the "Metapontum Agrobios" Research Center, located in Metaponto (a sub-region on the Jonic coast of Basilicata), ALSIA's range of activities has been enriched of new expertise in the field of agronomic research.

Eventually ALSIA was last reorganized in 2015, and to date, has three action areas: a) planning and development, b) research, c) basic services. According to the law n.ro 9 of 2015 the Agency uses the regional structures and infrastructures for the exercise of its activities. In addition, the permanent staff in service at the Agency has been transferred to Basilicata Region and functionally assigned to ALSIA.

Basic services are further divided into transversal components such as the Lucano Agrometeorological Service (SAL), which collects data disseminated through the site, IRRIFREM, devoted to the collection and dissemination of data on innovative irrigation techniques, SEDI, defence service and phytosanitary monitoring and

SETI, training service for technicians in charge of calibrating spraying machines, phytosanitary alert, which provides forecast models on climate trends and possible attacks by pathogens for some crops. Also, experimental farms have been restructured in order to guarantee a more direct relationship with agricultural companies, mainly on technical issues on crop production and animal husbandry. Also multifunctionality (farm holidays, educational farms, etc..) and quality schemes, have entered the topics of ALSIA's advisory activities.

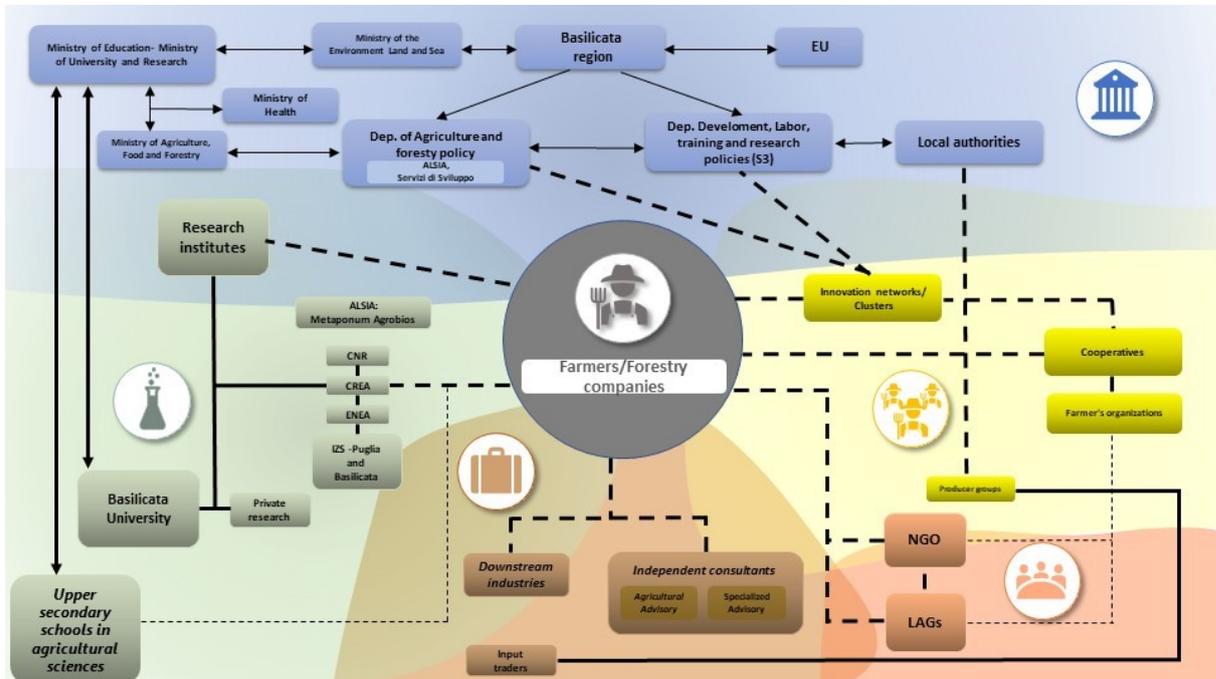
In addition, ALSIA carries out research activities in the agriculture, agro-industry, green chemistry and bio-economy sectors.

BOX A1 - Lucan's Bioeconomic Cluster

In July 2016, in Basilicata, was established the Lucan's Bioeconomic Cluster (CLB) in accordance with the Basilicata Regional strategy for research and innovation, also known as "Smart Specialization Strategy" or "S3", introduced via the ERDF 2014-2020 Operational Programme (OP). This Cluster has gathered 55 agricultural, food and environmental companies and all public agricultural research operating in Basilicata. CLB is managed by ALSIA.

CLB participated to call for proposals for "Support for the creation and management of operational groups PEI", in 2017, and it had ten projects financed. Moreover, ALSIA is partner in 8 OG engaged in dissemination activities.

Figure A1: AKIS Diagram for Basilicata Region



Source: Our elaborations based on interviews

Appendix 3 – The AKIS in Sardinia Region

Sardinia is a region with a strong pastoral vocation (with more than 3,2 million of sheeps and 270 thousand of goats, the 43% of the Italian sheeps and goats)¹, with an inherent ageing of breeders, a small medium size of farmers and very low propensity to innovation.



The AKIS in Sardinia presents a structural complexity due to the high number of actors involved not always well connected and coordinate. (Fig. A2). Also, the competences seem to be quite fragmented because the lack of a continuous synergies among the actors' activities.

Since 2003, through a series of regulatory acts of the Region, the different components of the regional AKIS (R&I, education and advisory) have been re-organized and targeted towards the implementation of a substantial intervention plan of research and technological development. This process, reflecting a strong public direction, brought to a new functional organization of the AKIS components in a systemic perspective, through defining cross cutting linkages in the research and innovation system and the attribution of the different roles and functions.

Particularly, the “Regional Plan for Research and Technological Development” (2003), defined a regional innovation strategy, mainly focused on establishing the regional R&I infrastructures along three strategic areas of intervention: i) the development of “Territorial Innovation Clusters”; ii) integration, crossing and fertilization; iii) science and technology park. Particularly, the Innovation Clusters aimed to develop new technologies and innovations in some specific fields. The Clusters identified were: a) Informatics and communications; b) Biotechnology in the field medicine, veterinary and pharmaceutical industry), in the field industry, and in agriculture; c) Environmental Sustainability and Energy; d) Traditional

¹ Source: ISTAT (2020). Database i.Stat available at: <http://dati.istat.it/>.

sectors (cork, stone and aggregates, agro-food, chemical, etc.); e) Technological innovation in the cultural sector.

The second regulatory process (Regional Law n.7/2007) addressed more specifically the functionality and knowledge flows within the AKIS, in order to increase the cohesion between the different components, through organizing roles and functions of the different components, including the governance structures. Meanings of the interplays between the different regional institutions were clearly defined, through creating at the same time a close integration between research, the research system and farmers' needs.

Besides, coordination arrangements of regional interventions on research and innovations included the setting up of the technical advisory bodies as a governance body and the of the Regional Register of Scientific Research and Technological Innovation, entitled to monitor and systematizing all information on public and private entities and research projects. Eventually, a research and technological innovation fund was established to support the implementation of all regional interventions on R&I, through creating synergies among all regional Public administrations and avoiding double funding.

Finally, this widespread process of systematization of the AKIS in the Region included the dismissal of the Regional Agricultural Development and Technical Assistance Agency (ERSAT), the reform of local authorities and the reorganization of functions in agriculture through the establishment of the three currently main regional Agencies, AGRIS, LAORE and ARGEA. ARGEA, however, doesn't perform any advisory activity. (Regional Law N.13/2006).

All in all, the AKIS actors in Sardinia can be categorized as follow.

Research

The Agricultural Research Agency of Sardinia (**AGRIS**) is the regional agency dedicated to the scientific research and experimental and technological innovation in the agricultural, agro-industrial and forestry sectors. AGRIS promotes the transfer of the results obtained from its research and experimental activities to farms. Its competences related to the following incorporated entities: the Interprovincial Fruit Growing Consortium, the Provincial Fruit Growing Consortium, the Sardinian zootechnical and dairy Institute, the Cork Experiment

Station, the Regional experimental center in agriculture and the Institute of Equestrian boosting. However, some of the activities performed by these entities has progressively reduced, enhancing the role of private actors. AGRIS is well connected with other research and academia bodies at regional, national and international level. It is involved in several national and European project (as LIFE projects) and it is currently engaged in an important collaboration with the Agricultural High School, aimed at training to students and benefit from fruitful exchanges with the educational system.

BOX A2 – The Regional Network of Agricultural High Schools

Unlike other Italian regions, Sardinia can consider its network of Agricultural High school as an active AKIS actor. The network is coordinated by the Institute Duca degli Abruzzi, based in Cagliari, which collaborates with AGRIS in some European projects. Particularly with AGRIS vaunts a consolidated cooperation to provide a joint point of reference for technicians and farmers. Moreover, the possibility to build a direct bridge between future advisors/ farmers and research can be a good way to create the basis for a more integrated AKIS, facilitating the transfer of knowledge and innovation.

Sardegna Ricerche was established by the Sardinia Region in 1985, under the name “Consorzio Ventuno” and took its current name in January 2007. With the Regional Law n. 20/2015 it became a regional agency. The agency pursues the institutional aims of promoting research, innovation and technological development, supporting companies and providing services. Sardegna Ricerche controls four research institutes/companies: CRS4 (Center for advanced studies, research and development in Sardinia); Porto Conte Ricerche; IMC Foundation (International Marine Centre) and Pula Servizi e Ambiente. It plays a key role in the AKIS System because of the supporting activities carried out through the financing of innovation clusters projects and innovation programmes related also to the agricultural and agri-food sector. The cluster projects are not fixed but they change every 2 or 3 years, to cover different topics. At the moment under the cluster “Agro-industry” 17 projects have been financed.

IZS (Experimental Zooprohylactic Institute) carries out experimental veterinary scientific research and assessment and certification activities for animal welfare.

Extension and advisory services

LAORE (box n.1) provides technical assistance and advisory support to the farms and to transformation companies aimed at quanti-qualitative optimization of production processes and the introduction of technological and product innovations.

BOX A3 - LAORE – Regional Agency

LAORE represents the public advisory services provider in Sardinia. The main aim of the agency is to promote the development of the territories, multifunctionality, agrobiodiversity and Sardinian food products. It is a key actor in the Sardinian AKIS because of its role in providing technical assistance to farmers. Thanks to its 32 territorial offices is able to cover the entire regional territory and to be close to farmers. The principal functions of LAORE are:

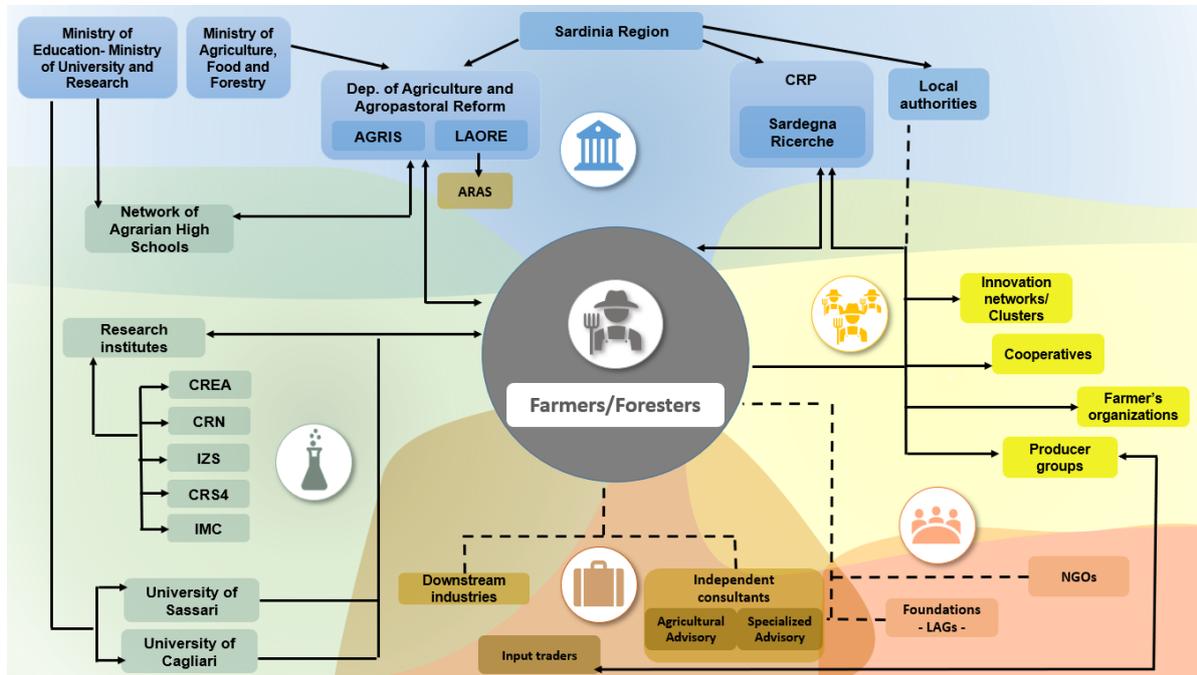
- To provide technical assistance to both public and private entities;
- To provide information and organize dissemination activities;
- To act as an intermediary between the production system and research in order to promote an effective transfer of innovations to farms;
- To promote and participate in regional, national and European projects;
- To collect and elaborate statistical data in several sectors;
- To support Local Action Groups.

Moreover, LAORE manages the list of farm advisory organizations for the RDP Measure 2. It also used to organize testing phases for farms innovations in demonstration fields, however this activity is decreasing due to the lack of human resources. It collaborates with several schools (of every grade) especially related to the school-work alternation compulsory in the Italian educational system.

Regional Breeders Association of Sardinia (ARAS) is a private association of technicians, agronomists and vets who work directly on the farm. ARAS has a milk analysis laboratory that collect and analyse information to improve the quality of the milk and related products. In the near future, ARAS might become part of LAORE.

The Region owns also some public experimental farms and other research centres.

Figure A2: AKIS Diagram for Sardinia Region



Source: Our elaborations based on interviews

The interviews carried out with experts and key stakeholders allowed to understand the relationships among the AKIS actors.

In general, the perception regarding the current agricultural knowledge and innovation systems in Sardinian region is quite low, both in terms of a systemic vision/approach than in terms of impression to be part of a system from the AKIS actors. This aspect influences the relations among farmers and the rest of the system, creating strong bilateral linkages, but weaker multilateral relations within the AKIS. The Operational Groups of EIP AGRI are perceived as a useful instrument to enhance the cohesion, in the next few years.

The transfer of process innovations seems to be harder than product innovation, requiring trustworthy relationship between advisors and farms. The transfer is basically top down through events, open day in demonstrations fields, seminars, publications, provided by the RADIs but also Universities and Research institutes. From this point of view, input traders can be said to be very effective, covering activities before performed by the RADIs (e.g. nursery and propagation materials).

Even though, these actors sometimes are not able to understand the territorial needs, but they pursue only business goals.

According to the interviewed, some sectors, primarily viticulture, livestock and fruit and vegetables, especially in medium-big farms, show major predisposition to innovate and they vaunt the frequent presence of advisors embedded in the farms.

Private advisors don't always seem to be able to bridge research and knowledge needs of farmers. Some of important aspect of improvement are lack of training for advisors, especially about business management, digital technologies, project management and communication. Particularly, these last two points are crucial to manage and carry out research and innovation projects. Moreover, from the farmers side, it would be necessary to improve innovation and knowledge transfer on ICT and Digitalization, blockchain, cost reduction and the productions of goods with a profitable end market.

AKIS and advisory services in *Latvia*

Report for the AKIS inventory (Task 1.2) of the i2connect project

Date: January 2021

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Executive summary

The aim of the report is to provide a description of the Agricultural Knowledge and Information System (AKIS) in Latvia and brief outlook of Forestry AKIS (FKIS). This report represents an output of the i2connect project. It is one of 30 country reports compiling an inventory of AKIS. AKIS describes the exchange of knowledge and supporting services between many diverse actors.

The report will give an overview of the AKIS infrastructures and on the predominant agricultural advisory services on national level. The term 'agriculture' is used in its comprehensive form to also include forestry, fisheries and horticulture. The intention is that through these reports, essential features of the institutional and infrastructural environment in which advisors in the green sector operate, will be revealed (Knierim et al. 2020:32-34).

Agriculture has a strategic position in economy of Latvia and rural development through employment. Agriculture is dominated by a small scale agricultural produce producers and a growing number of large scale farms.

AKIS includes traditional service providers consisting of research, advisory and educational organizations that are structured and managed by agriculture, science and education policy. There are different formal and non-formal learning areas and innovation networks that often connect knowledge actors with different organizational and industry experience.

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Abbreviations

AKIS	Agricultural knowledge and information services
CC	Cross compliance
CCAO	Consultative Council of Agricultural Organisations
EIP	European Innovation Partnership
ESU	European Size Units
EU	European Union
FADN	Farm Accountancy Data Network
FAS	Farm advisory system
FKIS	Forestry knowledge and information services
GDP	Gross domestic product
LACA	Latvian Association of Agricultural Cooperatives
LFFE	Latvian Federation of Food Enterprises
LIAA	Investment and Development Agency of Latvia
LRATC	Latvian Rural Advisory and Training Centre
LLU	Latvia University Life Sciences and Technologies
MoA	Ministry of Agriculture
NGO	Non-Governmental Organisation
NRN	National Rural Network
RDP	Rural Development programme
UAA	Utilized agricultural area

1. Main structural characteristics of the agricultural and forestry sector

The total area of Latvia is 64.6 thousand km², of which 96% is land and 4% is inland waters. In 2019, GDP at current prices was 30.5 billion euros, but in 2015 at constant prices - 27.5 billion euros, the economic growth rate compared to the previous year was 2.2%.

The population of Latvia continues to decline. Since the beginning of 2010, it has decreased by 200 thousand, and at the beginning of 2020, the preliminary population of Latvia is 1 million 908 thousand. During 2019, it decreased by 0.6% (in 2018 - by 0.7%). [1]

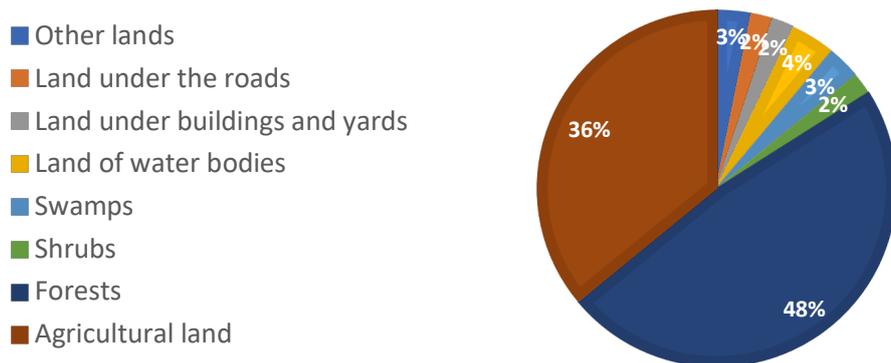


Figure 1 Land use in Latvia in 2019

In 2019, 36% or 2.32 million of all land uses in Latvia were agricultural land. ha (2.33 million ha in 2016).

Agriculture

In 2019, the average number of employees in agriculture, forestry and fishing combined in the age group from 15 to 74 years was 66.3 thousand. The share of employees in crop production, animal husbandry and hunting from the total number of employees in the country in 2019 was 5.0%. In agriculture, the average gross salary in 2019 reached 1,035 euros.

Agriculture, hunting, forestry and fisheries represent approximately 4% of the Latvian economy, 16% of trade and 7% of employment; the share of all these areas

is higher than average in the EU. Agriculture plays an even greater role in rural areas, employing around 20% of population.

The total value added of agriculture, forestry and fishing in 2019 has increased by 9.2% compared to 2018, while its share in the total GDP added values reach 4.3% of the total value added of GDP [46]

At the end of 2019, in Latvia there were 75.8 thousand agricultural holdings the average size whereof constituted 38.3 ha – 8.8 ha or 30 % more than in 2010. Agricultural area on average per holding increased from 19.6 ha in 2010 to 26.0 ha in 2019. Over the period, the total utilised agricultural area in the country grew by 153.9 thousand ha or 8.5 %, reaching 1959.4 thousand ha in 2019.

In 2019 compared to the year before, arable land increased by 23.8 thousand ha or 1.8 %. On average in the country arable land takes up 67 % of agricultural area. In 2019, areas of meadows and pastures dropped by 2.9 thousand ha or 0.5 %. [46]

In 2019, compared to 2018, the average rent of agricultural land has risen by 3.3 %, reaching 63.89 EUR/ha. Compared to 2011, it has grown by 35.25 EUR/ha or more than twice (from 28.64 EUR). Compared to 2017, in 2018 the average purchase price of agricultural land has risen by 357 EUR/ha or 12.6 %, reaching 3 188.08 EUR/ha. Over the past eight years, it has grown 3.7 times (from 869.66 EUR/ha in 2011). Amongst other price increases, in 2018, compared to the year before, price of arable land grew by 880 EUR/ha or 29.6 %, reaching on average 3 855.93 EUR/ha, which is 3.3 times higher price than recorded in 2011.

Livestock

At the end of 2019, agricultural holdings were breeding 395.3 thousand cattle (similar to the number recorded in 2018). The number of dairy cows dropped by 6.1 thousand or 4.2 %, whereas the number of other cows rose by 4.7 thousand or 9.2 %. In 2019, compared to 2018, number of exported live cattle decreased by 3.6 thousand heads or 6.0 %. Young stock aged under 1 year constituted 27.3 % of the total number of cattle exported (32.1 % in 2018). Number of imported cattle fell by 2.8 thousand or 2.7 times.

Compared to the previous year, the number of pigs increased by 9.3 thousand or 3.1 %. Compared to 2018, exports of live pigs increased by 4.7 thousand or 3.5 %.

Out of the total number of pigs exported, piglets for fattening constituted 56.3 % (34.0 % in 2018). Number of imported pigs rose by 16.5 thousand or 71.1 %.

The number of sheep and goats fell by 7.5 thousand and 0.5 thousand or 7.0 % and or 4.5 %, respectively. The number of horses in Latvia keeps declining – at the end of 2019, compared to the year before, it dropped by 0.1 thousand or 1.5 %. At the end of 2019, the number of poultry increased by 287.3 thousand or 5.3 %, of which number of laying hens by 211.5 thousand or 7.1 %.

Production

In 2019, compared to 2018, agricultural output at constant prices rose by 20.2 %. The rise was due to the increase in output of crop products (of 42.7 %) caused by the upturn in harvested production of grain (of 53.8 %). Output of livestock products, in turn, reduced by 1.4 %.

The results of 2019 in the agricultural sector show a record increase in income compared to the previous year, which in turn showed a significant decline. The most significant factor that increased income has been the increase in crop production (by 44.6%) due to significantly higher yields of main crops. On the other hand, the volume of animal husbandry has slightly decreased - by 0.6%. The impact of price and subsidy changes has been slightly negative this year, especially given the 9% reduction in subsidies. However, as income from production increased significantly, it did not prevent an unprecedented increase in income per full-time employee in the last 10 years - by 34.5%.

The share of winter crops in the structure of grains has significantly increased, which was lower in 2018 due to unfavorable conditions during their sowing. The share of winter crops in the total yield in 2019 is 70% (-49% in 2018). The main grain crops are wheat, the value of which in 2019 reached 70% of the value of grain production. Other important products also have a significant increase in total yield: vegetables - by 24%, potatoes - by 17%, and fodder crops - by 16%. There is a slight decrease in the total yield of legumes - by 2%, as well as fruits and berries - by 15% due to spring frosts. In the livestock sector, the total has hardly changed in the last two years. In 2019 as a whole, the volume has even slightly decreased (by 0.6%). Trends of change are different for individual livestock products. The production of the most important product - milk - has not changed significantly (the volume of final production has increased by 0.5%), but a significant increase

has been observed in egg production - by 11.4%. The production of honey (by 7.4%), pork (by 2.2%) and poultry meat (by 0.3%) has slightly increased. The production of other major livestock products has decreased: for beef - by 8.2%, for sheep - by 3.7%, but the sharpest decline is in fur production - by 53%.

Price changes tend to have the opposite tendency to volume changes, which also explains the small decrease in the average producer price of agricultural products in 2019. This was due to a 1.7% drop in crop prices. This factor has slightly hampered income growth in this sector. At the same time, average prices of livestock products have increased by 3.6%. This was facilitated by an increase in the average purchase price for milk by 3.6%, as well as a significant increase in the price for pork (by 13.9%) and poultry (by 6.6%). On the other hand, for some other livestock products the average price has decreased, including for sheep meat and eggs by 4%, for fur by 9% and for honey by 11%. There is a significant price increase for potatoes - by 16% and vegetables - by 12%. The price has also risen slightly for rapeseed (by 4%) and legumes (by 3%). In contrast, the price of grains has fallen by an average of 7%, including 14% for rye and oats. The large share of cereals in the structure of crop products also contributed to the decrease in the average price in crop production.[3]

Forestry

On January 1, 2020, forests in Latvia occupy 3,292 thousand ha, of which 1,521 thousand ha are managed and administered by the state (46.2% of the total forest area), while the forest area of other owners was 1771 thousand ha (53.8% of the total forest area).

Both coniferous and deciduous trees grow in Latvian forests. Birch, pine and spruce stands together cover 72.5% of the total forest area. The rest of the forest is covered with white alder, aspen, black alder, ash and oak stands and other hard deciduous trees.

Due to animals, pests, diseases, wind and snowbreaks, forest fires, excessive humidity and other damage, in 2019 damaged and lost forest stands in the amount of 2,218 hectares, which is 71% more than in 2018 (1,298 ha). In 2019, the most significant cause of forest area damage was pest damage (spruce eight-toothed bark beetle) - 40%. Damage caused by wind and snowbreaks accounted for 27%

of dead stands. Diseases, animals and fires in 2019 caused less damage to forest stands.

In 2019, 5,323 ha of forest stands were planted on non-agricultural lands, or by 9% more than in 2018. The planted areas in 2019 consisted of the following main tree species: birch (33%), spruce (43%), pine (7%), white alder (9%) and other tree species (aspen, black alder, oak, etc. - 8%).

2,589 micro-reserves have been established in the forest lands of the territory of Latvia. In terms of the number and area of micro-reserves, the largest number of micro-reserves has been established for capercaillies, black storks, small eagles and sea eagles, accounting for 88% of the total area of forest micro-reserves and 60% of the number of forest micro-reserves. In terms of area, 91% of micro-reserves are located in state forests, 7% - in private forests and 2% - in municipal forests.

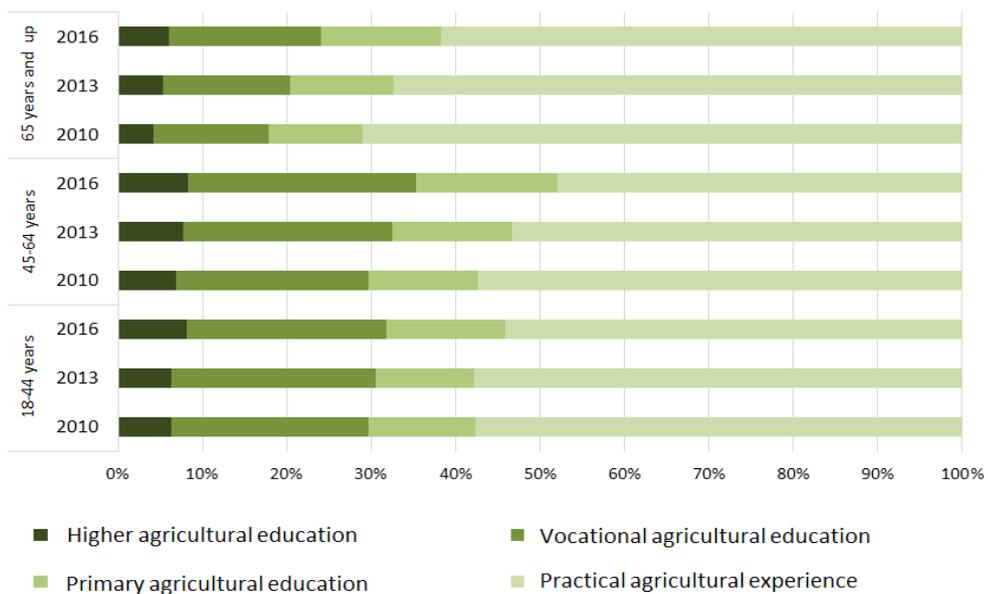
In 2019, a total of 13.3 million cubic meters of timber was felled in Latvia - of which 6.6 million cubic meters of timber were harvested in state forests, but 6.7 million cubic meters of timber were harvested in the forests of private forest owners, municipalities and other forest owners. In 2019, compared to the previous year, the total amount of felled wood increased by 4%. The amount of timber felled in the state forest has increased by 687 thousand cubic meters of wood, but in the rest of the forest decreased by 206 thousand cubic meters of wood.

In 2019, the volumes of reforestation (44,681 ha), compared to the previous year, have increased by 9%. 38% (17,035 ha) of forests were artificially restored, but 62% (27,646 ha) were naturally restored. In 2019, 16,829 ha or 38% of the total restored area was restored with conifers, but 27,852 ha or 62% of the total restored area with deciduous trees. The forest is regenerated with five main commercially available tree species - birch, pine, spruce, aspen and white alder. Of conifers, spruce (9,539 ha) was planted the most - 12% of the restored total area, but of deciduous trees birch (12,817 ha) - 29% of the restored total area.[4]

Farmers and Forest owners' education

Comparing 2016 data with 2010 data, it can be concluded that the share of farm managers with acquired basic, vocational or higher agricultural education has increased by 8% pp., which may have been driven by linking rural development

support measures to acquired higher, secondary vocational agricultural education or the acquisition of basic agricultural knowledge for at least 160 hours in volume. However, the overall level of education and knowledge of farm managers remains to be described as insufficient. The representatives of farmers' organizations involved in the future CAP discussions organized in 2019 in cooperation with the NRN acknowledged that the lack of knowledge is a key factor preventing innovation and the entry of modern technologies in the sector, thereby undermining the competitiveness of rural companies, which in turn leads to the competitiveness of the sector in the international market. The OECD study entitled "Innovation, Agricultural Productivity and Sustainability in Latvia" ¹ also stated that "there has been a significant increase in the number of adults in education (mainly non-formal education), but the increase is mainly due to the low initial level. Measures should be promoted to ensure that both formal and non-formal lifelong learning is accessible, including financial access to such learning. The study also concludes that "low innovation capacity and low-complexity business are linked to low birth rates, continuous (mostly young people) emigration, skilled labour shortages and a high proportion of the shadow economy. These factors affect Latvia's medium-term productivity and competitiveness". Moreover, the agricultural and forestry industries in Latvia have long been characterised as fragmented, which is a restrictive factor in making it easy to access quality counselling and educational services to entrepreneurs in the sector.



¹ Innovation, Agricultural Productivity and Sustainability in Latvia, OECD, 2019

Figure 2 The level of education of Latvian farmers is characterised by available farm structure and farm census data for 2010, 2013 and 2016. ²

Even if the level of education and knowledge of entrepreneurs in rural areas is sufficient, taking into account rapidly occurring changes in all sectors, including agriculture, where market conditions are still changing, innovation, robotisation processes are taking place, knowledge and advisory support is important, which can respond rapidly to demand by attracting Latvian or world leading specialists in specific areas. Higher education and vocational education programmes are not so rapidly adaptable to market changes.

The provision of high-quality lifelong learning and continuing education services to rural entrepreneurs and citizens increases the number of young people and adults in rural areas with adequate quality and skills to carry out their work, as well as the knowledge and skills needed to manage the business.

² LRATC medium-term performance strategy, 2021-2025, picture by A.Radžele-Šulce, 2020

2. Characteristics of AKIS

The Latvian AKIS includes a wide range of participants who ensure, manage, finance, carry out, implement, inform and facilitate innovation. The main players are policy makers, researchers, teachers, advisors, farmers, private enterprises, consumers, non-profit organizations and markets.

AKIS includes traditional service providers consisting of research, advisory and educational organizations that are structured and managed by agriculture, science and education policy. There are different formal and non-formal learning areas and innovation networks that often connect knowledge actors with different organizational and industry experience.

Forestry KIS (FKIS) consists of state-owned forests, which are fully managed by an JSC “Latvian State forests” under the authority of the Ministry of Agriculture. Municipalities are managing their forests by themselves, through advisory service providers or management institutions established by them. Private forest owners are extremely diverse, too. There are 150 000 private forest owners. Some of the forests belong to small local forest owners and part of them, submerged through local businesses, is owned by large foreign conglomerates.

Depending on the forest owner, the way in which the advisory service is provided is changing significantly. The sector is even more fragmented than the Agricultural AKIS.

2.1. AKIS description

Public sector

Government

The Ministry of Agriculture of the Republic of Latvia is the main governmental institution responsible for the sector of agriculture, food, forestry and fisheries. Its main objectives are formation and implementation of strategies and policies in the aforementioned areas.

Areas of expertise:

- Agriculture

- Animal health, welfare and breeding
- Fisheries and aquaculture
- Forestry
- Common Agricultural policy and Rural Development
- Trade and Market Surveillance
- Climate Change, Bioeconomy and Sustainable Use of Resources
- EU and International Affairs
- Research and Education

Subordinate institutions of MoA are:

- Paying agency
 - Rural Support Service
- Controlling Agencies
 - Food and Veterinary Service
 - State Plant Protection Service
 - State Forestry Service
 - Agricultural Data Center
 - State Technical Monitoring Agency
- Education and research organizations
 - Latvia University Life Sciences and Technologies
 - Institute of Agricultural Resources and Economics;
 - Institute of Horticulture
 - Latvian Plant Protection Research Centre Ltd.
 - Latvian State Forestry Research Institute "Silava";
 - National Research Institute of "Food Safety, Animal Health and Environment".
- The Ministry is a public shareholder in such capital:
 - State Joint Stock Company "Latvian State Forests";
 - State limited company "Ministry of Agriculture, Real Estate";
 - State limited company "Amelioration project";
 - Public limited company "Latvian Rural Advisory and Training Centre".

The Ministry of Education and Science is responsible for the policy of science and education. It works on scientific and technological developments and innovation policy and coordinates its implementation. Still, Latvian University of Life Sciences and Technologies as the only agricultural university and state funded agricultural and forestry research organizations are supervised by the Ministry of Agriculture. Agricultural vocational education level is coordinated by the Ministry of Education and Science.

Ministry of Environmental Protection and Regional Development areas of activities directly or indirectly connected to AKIS are Global climate change, GMO free territories in Latvia, Green public procurement, Protection of Species and Habitats, Regional development, Soil quality and Specially protected nature territories, Water protection.

It is also overseeing Latvian **Municipalities**, which are able to impact development in local level, by closely cooperating with farmers, forest owners and rural development actors, or choose other priorities.

ALTUM is a state-owned development finance institution, which offers state aid for various target groups with the help of financial tools (such as loans, credit guarantees, investing in venture capital funds, etc.). ALTUM develops and implements state aid programmes to compensate for the market's shortcomings that can't be solved by private financial institutions.

State aid programmes administered by ALTUM, are implemented with public resources – European Union and other international institutions, national and ALTUM's attracted financing. ALTUM's shareholders consist of the Republic of Latvia's Ministry of Finance, the Ministry of Economics and the Ministry of Agriculture.

Advisory organization

Latvian Rural Advisory and Training Centre (Public/commercial)

Latvian Rural Advisory and Training Centre (LRATC) is the largest agriculture and rural advisory organization in Latvia. LRATC is advisory enterprise which is owned by the state (99%) and the Latvian Farmers Federation (1%). It was established in 1991 and consists of a central office in Ozolnieki and 26 branches throughout the whole territory of Latvia.

Following objectives have been set out for the operation of the operation:

- Facilitate rural development by improving the professional and economic knowledge of rural entrepreneurs;
- ensure organisation of advice and training in all Latvia's territory;
- increase the competitiveness of the rural population in the European Union;
- Organise post-graduate education of the staff of institutions reporting to the MoA.

For the moment most of the organization's financing is based on annual contract with MoA for implementing different tasks concerning agricultural and rural development, advisory and training funded either by national or EU budget. At the moment LRATC provides its services to over 20,000 farmers and rural businesses.

Since 2008 LRATC has the delegated task to act also as a **Latvian Rural Network Support Unit**, which since 2018 includes **EIP Support Unit**, and acts also **Latvian Fisheries Network Support Unit** since 2010. During this period experts have been working in a wide range of activities:

- Networking - especially on the local level, involving also those who are not active in the farming NGO. Number of seminars, working groups, conferences, etc. are organized every year all over the country.
- Providing support to youth and entrepreneurship in the countryside, fostering new businesses through training, inspiration, assistance and competition.
- Preparing agricultural, aquaculture and other calculations to the Ministry of Agriculture for decision making, setting the amount of various compensations, payments.
- Experience exchange and good practice transfer activities.
- Preparation and dissemination of newsletters and magazines (separate in Rural development, Forestry, Fisheries and aquaculture, animal husbandry), which are issued in different frequency – from monthly to quarterly editions. The E-newsletter is prepared on a weekly basis.

LRATC is also active in the vocational training of the farmers, forest owners and other entrepreneurs. Besides vocational education programs as "Basic Agriculture", "Organic farming", "Fresh-water fish and crayfish aquaculture",

which are accredited in the Latvian Ministry of Education and Science, LRATC is also providing a wide scope of different vocational training programs.

All services of LRATC are provided by:

- 26 regional offices providing state and EU funded information services and advice (incl. activities of National Rural Network and Fisheries Network) and commercial services (incl. agri-environmental advice, crop, livestock, accounting, economy, trainings) and other activities.
- 9 forest advisory offices, providing trainings, information and advice for private forest owners.

National Centre in Ozolnieki, provides methodological advice for the regional offices and development of new products and services.

Forest management organization

Joint Stock Company “Latvia’s State Forests”

The purpose of the activities of Joint Stock Company “Latvia’s State Forests” (LVM) is administration of state-owned forest property and management of public forest, ensuring preservation and increase of its value and generation of revenue for its owner – the State.

LVM manages and administers 1.63 million ha of land, including 1.60 million ha of forest land, which incorporates 1.41 million ha of forest. The territories under the governance of LVM, in respect of which the main management goal is production of high quality timber, comprise 1.17 million ha of forest.

Farmer based organizations

There are several types of Farmer based organizations in Latvia. They act as NGO’s or Cooperatives.

Farmer based NGOs

In Latvia, farmers are represented by a wide range of non-governmental organizations. The largest of these are:

- Farmers Parliament

- Latvian Agricultural Organization Cooperation Council
- Young Farmers club
- Latvian Organic Agriculture association
- Latvian Farmers association
- Farmers association
- Association of Statutory companies
- Latvian Agricultural Cooperatives association

These NGOs also participates in the **Advisory Council of Non-Governmental Organizations of Farmers**, which works to provide sectoral ministry with proposals for drafts of regulatory enactments and policy planning documents, taking into account the interests of farmers.

Most often, NGOs do not hire advisors, but they are composed of industry experts who have the possibility to advice members of organizations. They often participate in international projects, thus being at the forefront of the exchange of information.

Sectoral farmer based NGO's – such as Latvian Goat breeders association, Beekeepers association, Latvian Association of Meat Beef Growers, Association of seedling growers and so on.

These organizations mostly do not provide advice directly, but act as information exchange point for its members. From time to time these organizations organize some seminars or trainings and during those farmer-to-farmer advice is ongoing.

Cooperatives

The work of cooperatives is regulated by Cabinet Regulation No. 357 of 16 July 2019, Regulations on Conformity of Cooperative Companies (Regulations) and it lays down the eligibility criteria for cooperative societies and the procedures for evaluating them.

The cooperative has to fill the eligibility rules and then it is a kind of guarantor for the peasant that this cooperative can be trusted. It is also then possible to receive the national and European Union support for cooperatives and other legislative advantages.

Main benefits of the accession of the cooperative are:

- Materials and raw materials required for farming at lower prices;
- Ensuring markets for sale and higher prices for production;
- Greater market power and wider export opportunities;
- Education and new knowledge with exchange of experience, training and counselling;
- Help sales and marketing;
- Responsibility and involvement in decision-making;
- Organised cultural and entertainment activities;
- Financial aid in the non-financial years;
- Sustainability and long-term profits.

There are several types of Cooperatives in Latvia and they are certified by Latvian Agricultural Cooperatives Association. In 2020 there are 50 cooperatives which have passed the eligibility rules:

• Dairy cooperatives	25
• Grain growers' cooperatives	14
• fruit growers' cooperatives	4
• Sheep breeders' cooperative	1
• Forest owner cooperatives	3
• Vegetable growers' cooperatives	1
• Small scale food produces' cooperative	1
• fruit and vegetable producers' cooperative	1

As for advisory work, some cooperatives employ advisors and usually they are paid via participation fees. Mostly cooperatives are interested in maintaining constant quality of production.

Forest owner based NGOs

The Forest Advisory Council (MCP) is an advisory and coordinating body whose performance is aimed at promoting the shaping and implementation of a balanced forest sector policy in Latvia, the operation of which is determined by BOM Regulation No 473 of 3 July 2012, "Forest Advisory Board by-law".

The MCP consists of representatives of private and public forest owners and managers (public and local government), timber industry, forest non-timber value

managers, forest management services providers, environmental and nature protection, and employee interest groups.

Private sector

Private advisory organizations

Integrated growing school (LTD) (Private) The aim of the school is to increase the level of knowledge of learners and trainers, to raise the prestige of agronomics, agriculture and forestry and the competitiveness of Latvian national producers in the European market, on the basis of the principles of integrated farming and cultivation. To achieve the objectives, the School shall carry out adult vocational development education programmes, training, courses, decision support systems, individual advice, as well as applied science studies and recommendations development in Latvia and Europe.

eAgronom

eAgronom is an international company, which claims to give an independent agricultural advice. There are three advisors in Latvia and the company bases their advice on advanced AI-based decision support toolkit that leverages prescriptive analytics to increase productivity. Company through digital applications provides such tools agronomical planning, financial analysis, employee management, AI alerts and Suggestions and also direct advice.

Sellers (input market)

Farmers, especially commercial farmers and cooperatives, rely on the advice and technology of Sellers, like agro-chemistry companies, agricultural machinery companies. These companies associate advice with marketing, organize demonstrations.

These companies need strong advisers as a marketing tool – no money is required for advice, but the advisor, essentially, performs the role of sales representative and makes money for the company.

This kind of advice often can be considered to be biased, with the purpose of growing production sales. Often sellers do not come with an advice, but with a solution in a form of chemical.

Processors

Mostly processing companies are interested in maintaining constant quality of production, thus they provide some kind of advice or even experience exchange visits for farmers.

Private innovators

Some farmers or individuals are very active and creative. They find unexpected ways to develop their businesses - it being a primary agriculture (for example by growing unaccustomed species or using different methods, or secondary (by processing agricultural produce). Often they are ready to share their experiences and show others their way of work (for example Pupuči, Grasbergs, Milzu).

Freelance advisors

Freelance advisors must be of good repute, persuasive and effective performance so that farmers can re-trust their advice. Freelance advisors, participating in the survey, both have higher education and significant years of experience in the field. There is no register of independent advisors available in Latvia, so it is difficult to judge the number.

Third sector

Other NGO's

Natural protection NGO's tends to teach farmers and forest owners, mostly through demonstration activities, how to operate in areas with care of a nature. They can play a particularly important role in the field of forestry, when it is possible to completely break down forest management activities in a given area by locating a specific habitat there.

The Natura 2000 network includes 333 sites in Latvia – 4 nature reserves, 4 national parks, 239 nature closures, 37 nature parks, 9 protected landscape areas, 7 protected marine areas, 9 natural monuments and 24 microreserves. Land areas cover 12% or 787729 ha of Latvian land area (excluding waters). These areas have different protection and management regimes, ranging from minimum restrictions in protected landscape areas to a complete ban on economic activity in nature reserves.

Operational groups

Operational groups usually consist of farmer, scientific institution and advisory service provider. These are strong, usually project directed unregistered unions that aim for a common development goal via innovation.

LEADER Local action groups (LAG's)

Local action groups play a large role in rural areas. These formations collaborate with municipalities, local NGOs, entrepreneurs and farmers in order to develop the local territory. They can impact a development direction of a local community towards or away from agricultural activities.

Research and education

Research institutions in Latvia are research institutes, universities, companies and other organizations that are established in order to carry out research and development of scientific qualification, and are registered in the National Register of Research Institutions. In 2020 there are 62 research institutions registered in Latvia, 22 of them are public research institutions funded by the government.

Latvian University of Life Sciences and Technology (LLU) is one of six universities in Latvia. LLU carries out studies in various sectors of the economy specializing in bio-science (agriculture, veterinary, forest science), engineering (food technologies, engineering, environmental and water management of agriculture and forestry, land management, landscape architecture and planning, construction), sustainable rural development and environmental protection (climate change and adaptation regional impacts, social sciences, agrarian and environmental economics, regional development and governance).

The LLU also implements study programmes in agriculture, forestry, veterinary medicine, in woodworking, bio-material-based construction, electric energy based on use of renewable resources, water purification and distribution, water and land resources in management, nature tourism, the food industry and biochemistry, ICT.

Although official scientists and trainers of the LLU do not provide advice but only scientific support, advisory support for farmers, foresters and entrepreneurs in a form of call or short e-mail is not denied, most often without any remuneration. Advice is based on knowledge and enthusiasm of scientific and teaching staff.

One of institutes, working within LLU is **The Institute of Agricultural Resources and Economics (AREI)** with more than 100 years of history, is a unique scientific platform not only in Latvia, but in whole of Europe. AREI is the leading crop breeding institute in Latvia. The research directions of the institute are related to crop genetics and breeding, crop management and agroecology for sustainable farming provide quality requirements of raw materials for processing, as well as development of sustainable rural space economic analysis for agriculture, food production and fisheries. The institute operates in Rīga, Priekule, Dižstende and Viļāni. One of Scientific institutes is AREI. The scientific expertise of AREI covers areas related to the sustainable use of agro-resources and the development of rural areas. The fields of scientific research of AREI are based on the topics of the agricultural and rural economy today and on the future vision of sectoral needs, as well as on past experience, research base and traditions of the scientific institutes consolidated within AREI. Particular attention is paid to the integrated development of research through agricultural education and agricultural practices, ensuring the use and transfer of newly created knowledge.

Directions of the **Institute of Horticulture's** activities are scientific activity in the sectors of horticulture and healthy food; protection of genetic resources and promotion of sustainable use; integrated sectoral, scientific and educational development promotion and Promotion of awareness of the institute and the sector.

LLU includes also other other Research Institutes, Research trial centres and Research Laboratories, which are a part of scientific basis and demonstration activities.

Other Publicly funded research institutes:

Derived public person "**Latvian State Institute of Wood Chemistry**" research themes' priorities embrace practically all fields related to the utilization of wood and lignocellulose biomass and are based on interdisciplinary theoretical wood and lignocellulosic materials studies on the molecular and nano-level.

Latvian State Forest Research Institute "Silava" is the main centre of forest science in Latvia and leader of scientific ideas in forestry and the related research

and development in the country. Its Research areas are: Forest ecology and silviculture; Forest tree breeding and climate change; Genetic Resource Centre; Forest regeneration and establishment; Forest phytopathology and mycology; Forest entomology; Forest operations and energy; Wildlife management; Forest products processing; National Forest Inventory.

Institute of Food safety, Animal Health and Environment "BIOR" is a research centre of national importance which develops innovative research methods and creates new practically applicable knowledge in the following areas of science: public and environmental health, food, fishery and veterinary medicine.

Registered Research institutes, not directly funded by State:

Baltic Studies Centre (BSC) is a private non-profit research organisation in the field of social sciences.. The areas of BSC expertise include sociology, sustainable agriculture, food supply chains, innovation networks, peri-urban agriculture, community development, public policy analysis.

BSC undertakes action oriented research strategies and cooperates with producers' organisations, policy makers, municipalities, SMEs, and other research and advisory organisations nationally and internationally. This helps to focus the research on the needs of practitioners and enhance practical innovations.

Latvian Academy of Agricultural and Forestry Sciences aims to to consolidate and organise the potential of scientists in the fields of agriculture, veterinary medicine, food, the agrarian economy, engineering and forest in addressing the most pressing nature laws and economic challenges and Encourages cooperation with producing companies and farms.

The vast majority of scientific institutions mentioned above offer scientific services, but scientific institutions such as BIOR, SILAVA, AREI and some others also provide a specific advice, mostly through demonstration and paid services.

Vocational education

There are 10 schools which provide agricultural education and one school that provides forestry education in Latvia. In AKIS these act mostly as information receivers, seldom participating in innovation projects.

Other

Agricultural media

There are several agricultural and forestry magazines available in Latvia. AgroTops, Lopkopis (livestock farmer), SaimnieksLV(Master), Lauku māja (Farmhouse), Dārza pasaule (Garden world), Medības (Hunt), Profi, Dārzs un Drava (Garden and apiary), Bioloģiski (Biological).

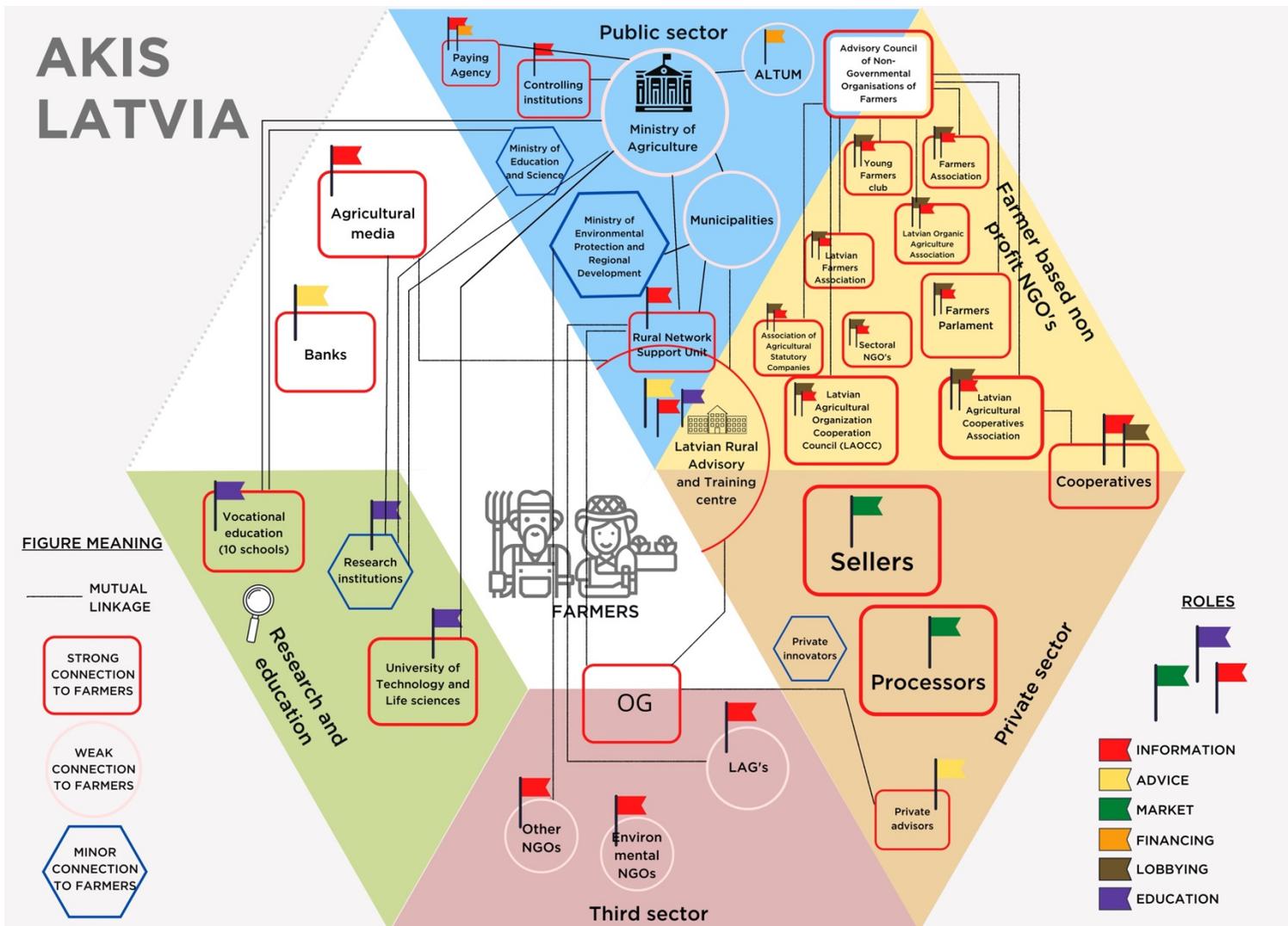
Also TV broadcasts Zemes stāsti (Earth stories) and Uz meža takas (On the forest trail) are present.

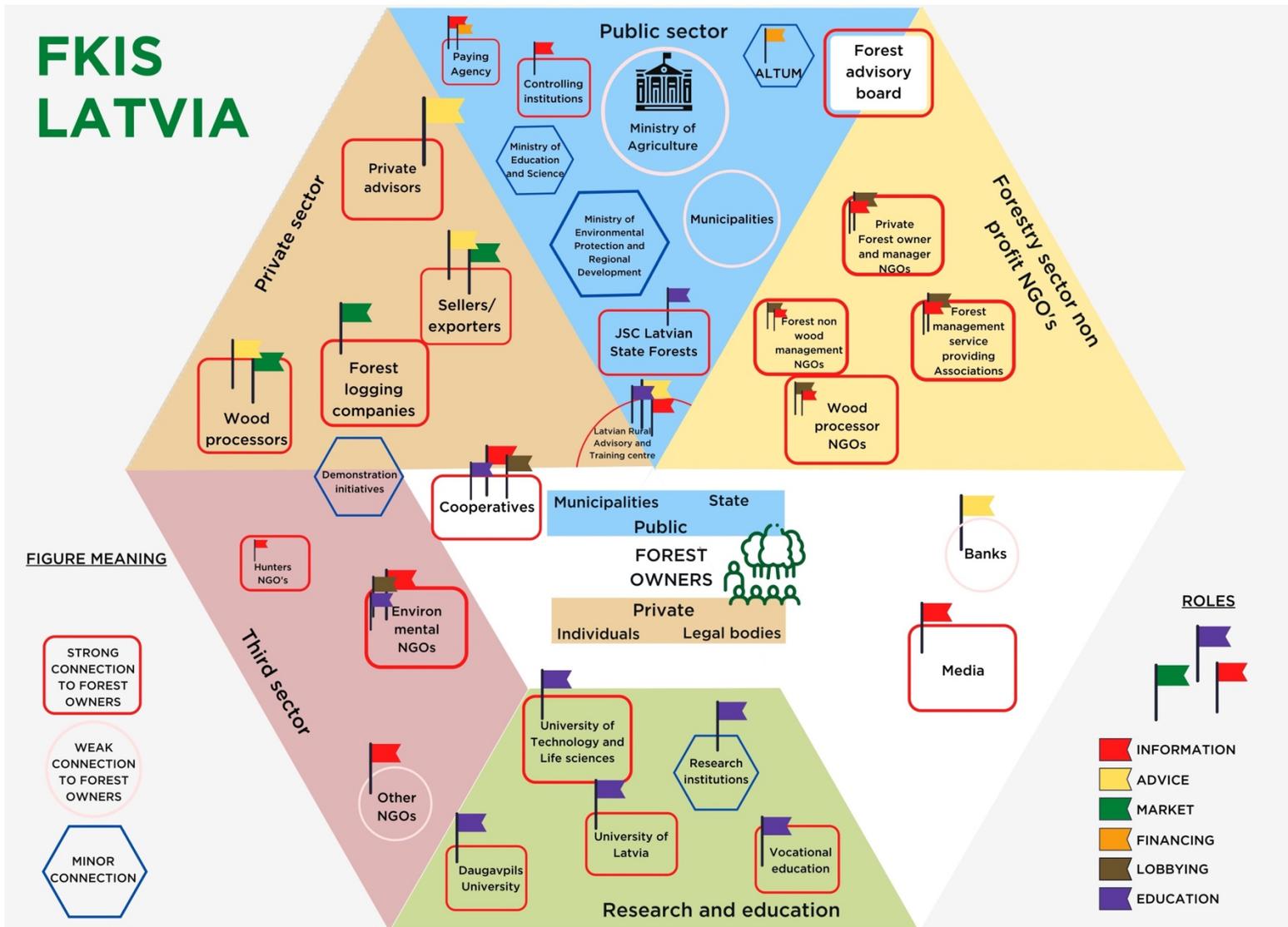
From time to time Journalists and TV producers are inviting advisors to talk about actual topics, but usually these broadcasts can not be considered as advisory method.

Banks

Banks have an impact to development of the farms, since often different fiscal instruments are necessary for farm development and project implementation.

2.2. AKIS diagram





3. History of the advisory system

“The re-establishment of an independent Latvia in 1990 and the accompanying political, social and economic transformations set the major implications on the composition and functioning of the current Latvian AKIS. Many AKIS institutions (universities, agricultural schools, research institutes) have a long history dating back to even the 19th century and the traversing Soviet period, and there are well established research traditions, institutional relations and accumulated knowledge stock. However, the specific post-socialist conditions of privatization, introduction of the market economy and restructuring of agricultural production also demanded reorganization in the agricultural knowledge and information system. In order to respond to the knowledge needs of new farmers, many of whom were even without specific agricultural backgrounds, and in 1991 the Ministry of Agriculture and the Latvian Farmers’ Federation established the Latvian Rural Advisory and Training Centre with an extensive advisers’ network all across the country. Also new research issues were identified in both the social and natural sciences in relation to land and agrarian reform, new food production technologies, new crop varieties etc.

The EU accession process, launched in the second half of the 1990s, is another major milestone which has driven considerable transformations both in agriculture and the AKIS. In the result of the harmonisation of national and EU legislation (which often meant, though, one-sided approach “accordingly to the provisions of EU laws”) agricultural legislation, priorities, regulation and support measures have significantly changed. In order to effectively transmit this new framework to agricultural producers, an active involvement of AKIS institutions was necessary. LRATC was reorganised in 2004 into a limited liability company and its selffinancing part has increased. But it is retaining the strong influence of MoA, which contracts LRATC for the implementation of specific rural development programmes. In parallel to LRATC services, there has been an increasing number, and role, of various private actors in AKIS, in particular agricultural inputs from industry, professional organizations and farmers’ cooperatives. Their knowledge supply is often more specific and better focused, but it involves the risks of biased knowledge as well as fragmentation and uneven access to knowledge at the system level.”³

³ AKIS and advisory services in Latvia Report for the AKIS inventory (WP3) of the PRO AKIS project S.Šūmane, M. Grīviņš, T. Tisenkopfs (Baltic Studies Center), 2014

In recent years, EIP-AGRI's activities have facilitated cooperation between AKIS actors. The new opportunities and funding available have contributed to mutual negotiations and cooperation. Currently 94 innovative projects are being introduced for agricultural development. It promotes not only direct cooperation in the course of ongoing projects but also new contacts and collaborative ideas outside them.

The second instrument, introduced recently, is Innovation voucher, which is government financial support tool offered by the Investment and Development Agency of Latvia (LIAA) with an objective to drive collaboration between industry and the research community. It is available to all size companies (including startups) registered in Latvia which seek to innovate their existing product/technology or develop a new one. Farmers and rural entrepreneurs also do not hesitate to use it. In many cases, not only scientists are involved in cooperation, but also advisers to move the idea more widely.

As a part of the national innovation policy, in Latvia are establishing Business incubators, Knowledge transfer centers, Industry innovation clusters and similar trans-disciplinary platforms, where learning, exchange and collective knowledge creation takes place.

4. The agricultural and forestry advisory service(s)

The survey was sent twice to 57 agricultural and forestry advisory service providers and NGOs. Almost all email receivers were reached also by telephone. Unfortunately the response rate was small. Only eight service providers filled the survey questions. Only LRATC responses cover forestry advisors as well. The assumption is that there were several main reasons for that:

- LRATC, which is the author of the Country Report, is the biggest agriculture and forestry further education and advisory provider of the country. The survey can be seen as a competitiveness risk.
- The Survey for organization, providing advisory, took at least 50 minutes to fill in and if there is no clear benefit for the organization for filling it, it can be seen as unnecessary work.
- The survey was not working or allowing to fill it in in Latvian for most of the time. Authors have at least three known indications about that.

Significant amount of description and information comes from the studies of literature, gray documents, policy documents and Expert interviews.

Several actors were interviewed:

- Raimonds Bērmāns – Director of Forest Advisory Services Centre;
- Sandra Muižniece – Brasava - Professor, lead researcher and Head of LLU Innovation and Technology Transfer Centre.

4.1. Overview of all service suppliers

Advisory services in Latvia are provided by several types of service providers. Some of them offer advice as a service, some do not formally consider their service as advice, although in substance it is (for example scientific institutions, paying and controlling agencies) and some call the service as advice, even though it is essentially the sale of the product.

Agricultural advice in Latvia can be described as decentralized. Even the main agricultural advisory organization is covering big part of the market, it still covers just a part of it and there is an increasing number of public, private and third sector organizations, which provide direct or indirect advice. There is no coordination between organizations providing agricultural advice, nor common certification system or similar, which could indicate the most suitable advisors.

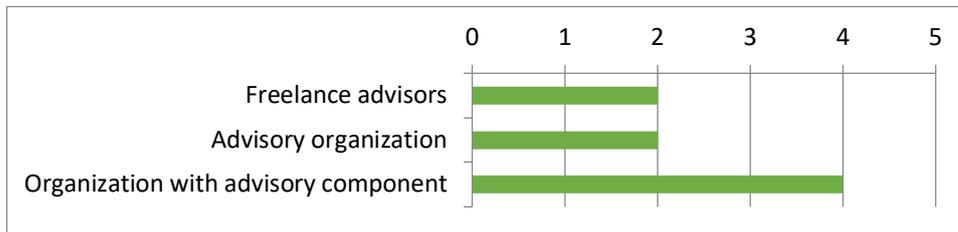


Figure 3 Advisory providers, participating in a survey.

Only eight agricultural and forestry advisory service providers filled the survey. Forestry advisory is given only by one organization of those (LRATC). Six of those submitted their responses anonymously.

4.2. Public policy, funding schemes, financing mechanisms, advisory service providers

Government via Ministry of Agriculture, Ministry of Education and Ministry of Economy leads innovation system: it develops innovation policy and monitors and implements innovation programmes, provides funding for research and development and education budget and support for business innovation.

The Ministry of Economy determines innovation policy and coordinates its implementation. Latvian Investment and Development Agency (LIAA) supports business development by promoting more foreign investment, as well as increasing the competitiveness of Latvian entrepreneurs in domestic and foreign markets.

The Ministry of Education and Science works on scientific and technological developments and innovation policy and coordinate its implementation. In this process, it works with Ministry of Economics and other sectoral ministries and, where appropriate, consult with industry associations and social partners.

Ministry of Welfare draws up state policy to reduce unemployment, participates in the development of employment policies and the development of a career development support system, also coordinating the development of proposals for active employment measures (including the unemployed training).

In Latvia, most of the agricultural and rural development aid is provided under the CAP, mainly through a single hectare aid under the direct payment scheme. Direct aid granted to specific products has been progressively reduced since 2004.

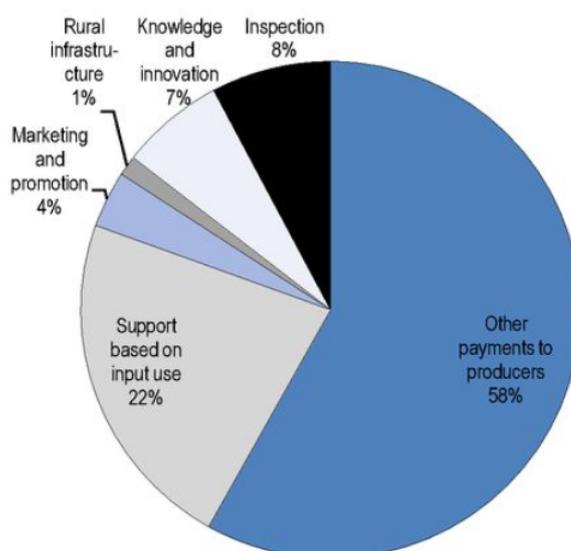


Figure 4 Composition of national support to agriculture in Latvia 2004-2016⁴

The RDP supports knowledge transfer and information activities and advisory services. Innovation is also promoted by the support of the RDP for cooperation and participation in the working groups of the European Innovation Partnership (EIP).

Organizations, participating in survey are funding their activities from several sources: Two of organizations are funded only by cost recovery from farmers fee. Bigger ones are also funded by public financing (State and EU) and thus are able to participate in different international project programmes (Horizon 2020, Interreg programmes, Erasmus+, LIFE).

4.3. Human resources and methods of service provision

Human resource

	Advisory organisation		Organisation with advisory component			
Total: employees	420	2	7	56	11	2
Total: advisors	306	2	3	18	6	2
Back-office employees	Yes	Yes	No	Yes	Yes	No
If yes, how many?	82	1			10	
Changes	Same	Same	Decr.	Incr.	Same	Same

⁴ Innovation, Agricultural Productivity and Sustainability in Latvia, OECD, 2019
www.zm.gov.lv/public/ck/files/OECD_petijums_LAT.pdf

Table 1 Number of employees in organisations, 2020

The range of advisors number in each advisory organization differs. The biggest is LRATC, which has 420 employees. 306 of those are providing advice. They are advisers and service providers in rural development, plant production, animal husbandry, forestry, fisheries and aquaculture, farm management, bookkeeping. The second largest is organization with advisory component with 56 employees, of which 18 are directly providing advisory services to farmers. This is also the only organization, indicating a significant increase of employees, mentioning continuous growth year by year.

Smaller organizations have the total number of employees from 2 to 11. And all, except the smallest ones, have personnel, dealing with other duties than advice.

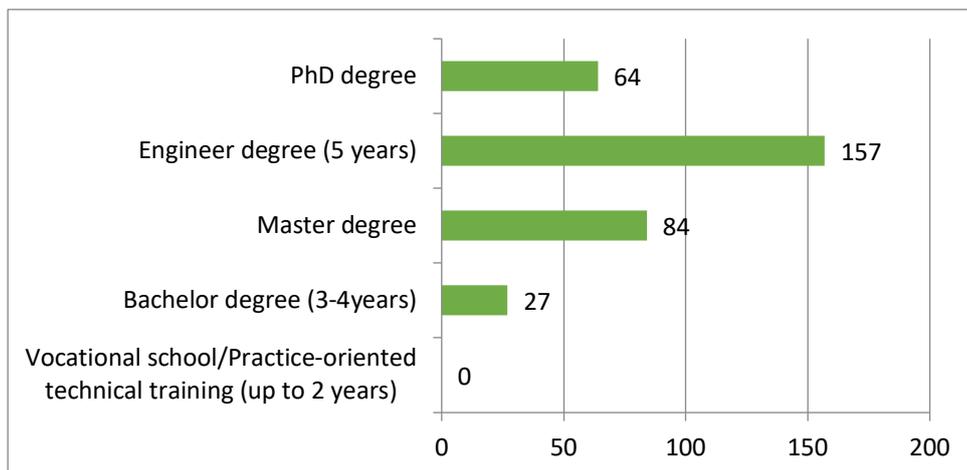


Figure 5 Education level of advisors and freelancers

Total count of all advisors represented in the Survey is 337. As shown in Figure 5, 311 or 92% of those have a higher education.

Additional requirements for recruitment of advisors, but when starting their work, some organizations require several kind of certifications.

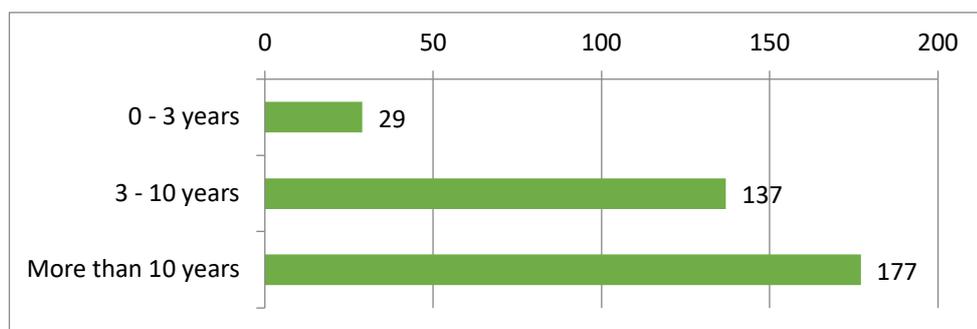


Figure 6 Advisors professional experience in years

In accordance to survey data, more than half or 52% of advisory service providers work more than 10 years in the field. Those with minor experience mostly work in advisory organizations and organizations with advisory component with bigger number of employees (8% of 306 advisors, 17% of 18 advisors). Therefore it can be concluded that those who want to start their career in advisory field, are mostly trained by those organizations and after gaining an experience can decide to go work elsewhere or stay in the organization.

As for the freelance advisors, it is possible to decipher the exact time period working as an advisor, and it is significant – 25 and 32 years for those, participating in the survey.

Advisory certification

Only advisory organizations are mentioning the advisory certifications. Respondent with two employees does not explain it further.

LRATC as an organization has two certificates: Certificate of the advisory company issued by the Rural Support Service; Certificate of the Education Authority issued by the Ministry of Education and Science.

Only LRATC is mentioning advisor certificates and is using several. In certain sectors (e.g. crop production, livestock production), the labor market does not ensure the availability of qualified specialists, so the internal certification system is an important instrument for ensuring the competence, knowledge, skills and skills of employees of LRATC.

The by-law provides that the competencies of employees are increased through two training and certification systems:

- the sector professional qualification system (mandatory) provides an annual training process and knowledge test (production technologies, EU and Latvian legislative requirements);
- the International Certificate for European Consultants in Rural Areas (European Rural Regional Consultants Certificate, “CECRA”) (optional), which ensures that qualifications are raised in general advisory methods.
- External certificates are used to improve the professional skills of Forestry advisory specialists Plant protection specialists.

One of Freelance advisors has mentioned the presence of certificate of Plant protection advisor.

4.4. Clients and topics

Comparing 2016 data with 2010 data, it can be concluded that the share of farm managers with acquired basic, vocational or higher agricultural education has increased by 8% pp., which may have been driven by linking rural development support measures to acquired higher, secondary vocational agricultural education or the acquisition of basic agricultural knowledge for at least 160 hours in volume. However, the overall level of education and knowledge of farm managers remains to be described as insufficient. The representatives of farmers' organisations involved in the future CAP discussions organised in 2019 in cooperation with the NRN acknowledged that the lack of knowledge is a key factor preventing innovation and the entry of modern technologies in the sector, thereby undermining the competitiveness of rural companies, which in turn leads to the competitiveness of the sector in the international market. The OECD study entitled "Innovation, Agricultural Productivity and Sustainability in Latvia" also stated that "there has been a significant increase in the number of adults in education (mainly non-formal education), but the increase is mainly due to the low initial level. Measures should be promoted to ensure that both formal and non-formal lifelong learning is accessible, including financial access to such learning. The study also concludes that "low innovation capacity and low-complexity business are linked to low birth rates, continuous (mostly young people) emigration, skilled labour shortages and a high proportion of the shadow economy. These factors affect Latvia's medium-term productivity and competitiveness". Moreover, the agricultural and forestry industries in Latvia have long been characterised as fragmented, which is a restrictive factor in making it easy to access quality counselling and educational services to entrepreneurs in the sector.

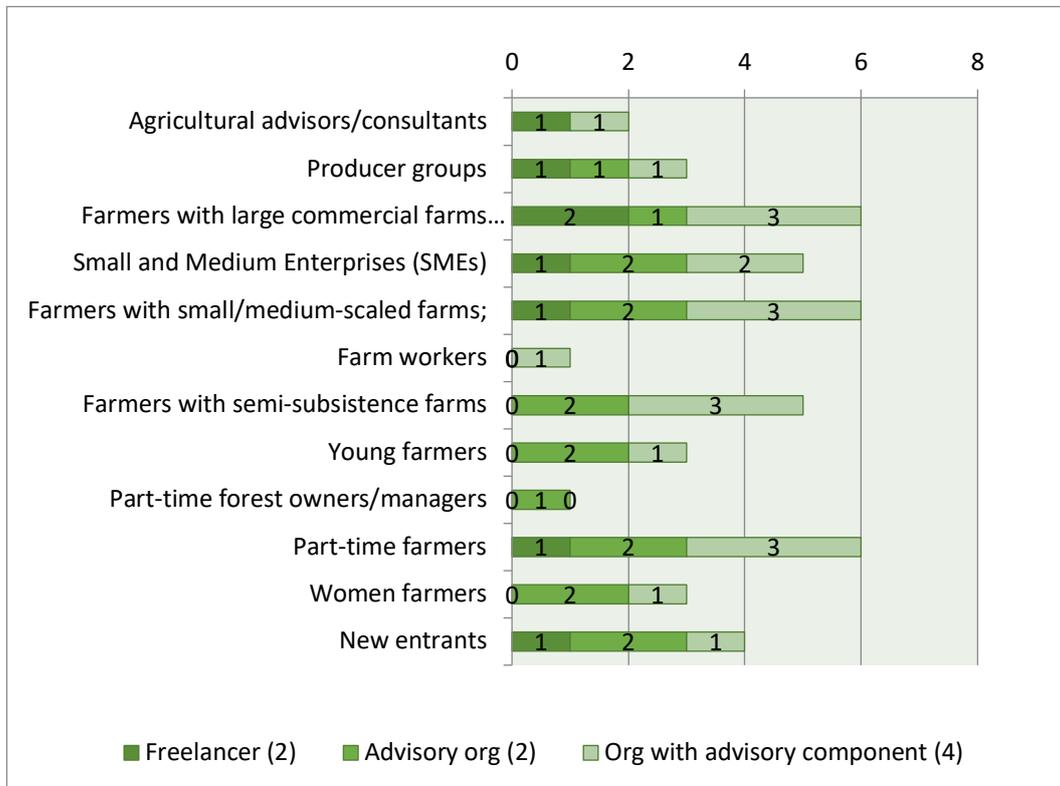


Figure 7 Frequency of client groups by advisory organization type

Client groups differ by respondents. Most active users of advisory services are Farmer groups with large and medium/small farms, as well as part time farmers (which can be included in two previously mentioned groups). All three advisory providing categories are working with those in similar amount. Also Small and medium enterprises are mentioned similarly. But, there is a possibility that within those survey participants can include also small and medium sized farmers.

The less targeted client group is Farm workers, which is mentioned only by one participant. Also Forestry advice is provided only by one respondent. The Forestry sector advisors were targeted during the Questionnaire, but none responded.

When analyzing target clients of the Freelance Advisors, it can be seen, that mostly these are stable clients, paying the costs. Organizations however are funding part of their activities not only from cost recovery from farmers, but also from Public funding (both national and EU project funding), therefore they are able and are working with those clients, which are not yet stable enough to pay their own fees. Also it is a nuance of Rural development, since different Rural actors are targeted for diversified development.

Advisory topics provided	Freelancer	Advisory organization		Org with advisory component		
Crop production		x	x	x	x	x

Farm machinery			x		x		x	
Vegetables			x	x			x	
Fruits and vines			x	x				
Herbs				x				
Arboriculture			x					
Forest protection/Conservation			x					
Livestock production			x	x			x	
Timber and wood markets			x					
Fisheries/Aquaculture			x					
Insects/Apiculture			x	x				
OTHER								
Business planning	x		x					
Environmental solutions	x		x					
Food production and processing	x							
Cash flow management, financing			x					x

Table 2 Advisory topics provided

From Table 2 it can be concluded that Freelance advisors and organizations with advisory component work with few specific topics, rather than advisory organizations, which provide wide range of options. It can be connected to a specialization of a freelancer or an organization. The interesting part is that both participating advisory organizations are providing wide range of expertise, but in the same time – one of them has 420 employees, but other – only two. The big gap can be also seen in the number of clients, where LRATC has 6000 clients, but the other organization – 10.

Most demanded Cross-cutting advisory topics	Freelancer		Advisory org		Org with advisory component			
Entrepreneurship and farm management	x		x	x	x		x	x
Production technologies		x			x	x	x	
Accounting/Bookkeeping			x	x				
Use of digital equipment and decision support systems		x					x	
Tax and legal advice			x	x				
Marketing and logistics							x	
Rural development support and diversification (farm/forest)			x	x			x	
Support with grant application and compliance with regulation and standards	x		x				x	x
Agri-environmental stewardship measures and nature conservation		x	x	x				

Table 3 Most demanded Cross-cutting advisory topics

When comparing with most demanded advisory topics (Table 3), it can be concluded that the Advisory organizations are providing also more advice, which is not directly connected to a production, but is more general – connected with accounting, legal advice and taxes. Still, the questionnaire asks the most demanded advisory topics, so it cannot be concluded that Advisory organizations are not providing other mentioned topics, but possibly doing it in a smaller scale, when compared with ticked ones.

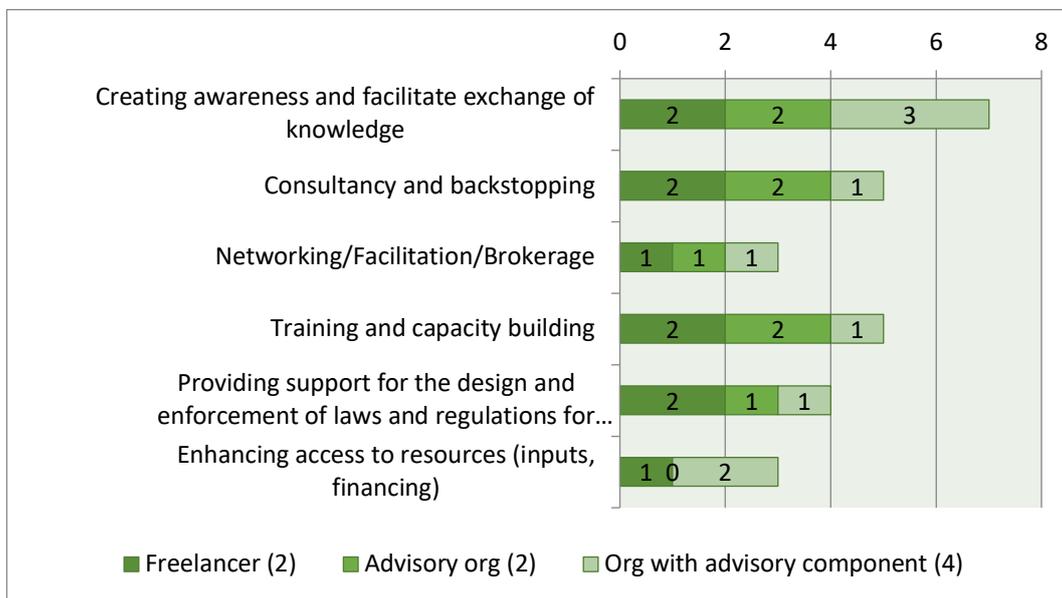


Figure 8 Advisory activities by advisory organization type

Most frequently used activity is creating awareness and facilitating exchange of knowledge, which is done by 88% of advisors and organisations. Less – five of eight are providing consultancy and backstopping, and training and capacity building. Less used is Enhancing access to recourses and networking, facilitation and brokerage.

Two of the organizations are outsourcing some of the topics. One of those mentions Crop production, Animal husbandry and Cross-Compliance in some cases, but not significantly.

Advisory methods

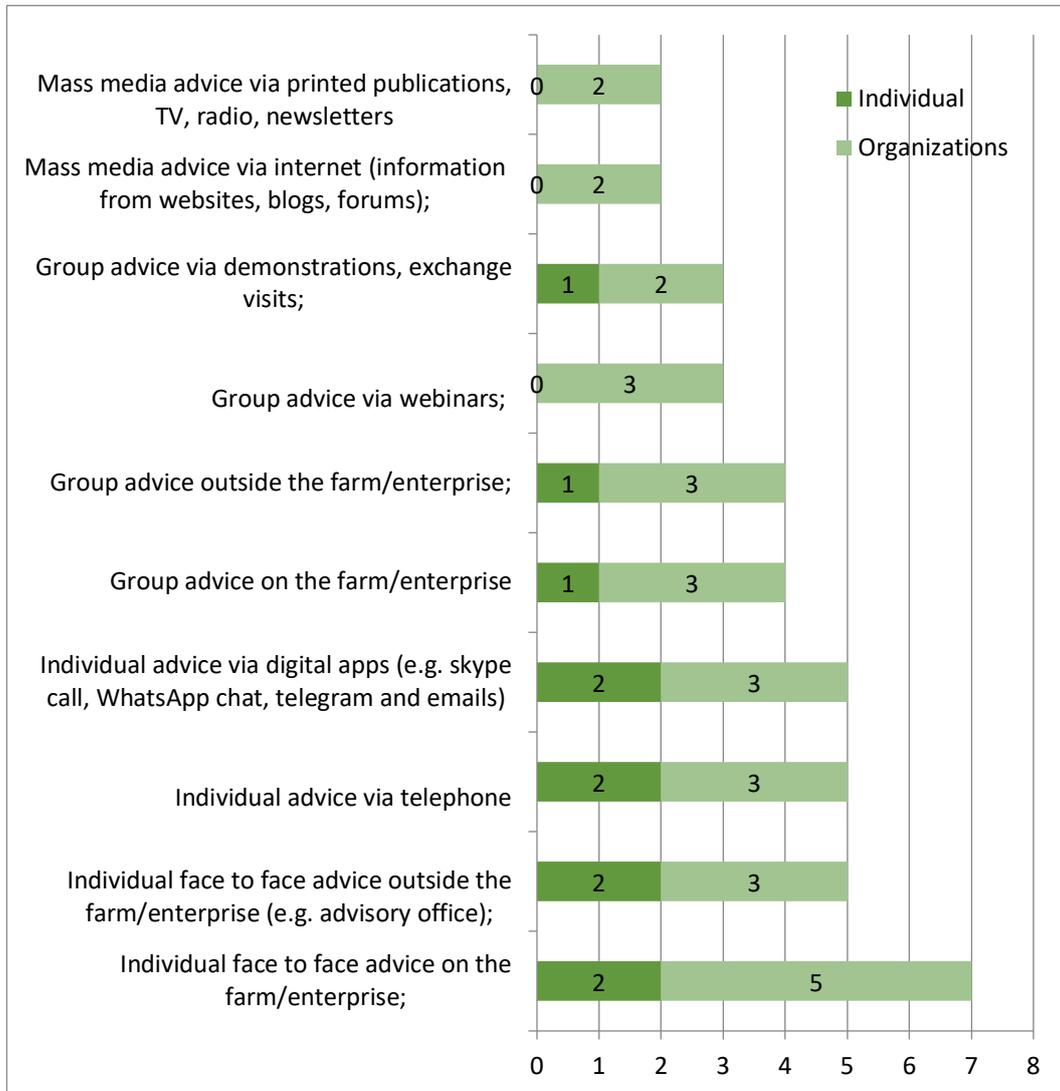


Figure 9 Advisory methods, used by respondents

Most frequently used is an individual advice– on the phone, different communication tools or face to face advice on and off the farm premises. These are done both, by individual advisors and organizations.

Group advice is used less, and mostly by organizations. Mass media advice is used only by some of organizations and none of individual advisors who responded, are using it.

Type of advisor	Individual	Group	Mass media
1. Freelance	100	0	0
2. Freelance	70	30	0
1. Advisory organisation	80	17	3
2. Advisory organisation	100	0	0
1. Organisation with advisory component	70	20	10
2. Organisation with advisory component	30	40	30
3. Organisation with advisory component	20	70	10
4. Organisation with advisory component	100	0	0

Table 4 Advisory methods used based on type of advisor (%)

When looking at percentage of usage of advisory methods by different types of advisors and organizations, no strong correlations can be seen.

COVID-19 has not changed the use of advisory methods for freelance advisors and those, working with small number of farmers. Others had to change the methods, working more online, via phone and emails. The bigger organizations are working also on online seminar and video streaming options. A lot of on-site group and individual meetings, seminars and experience exchange options are not allowed, so part of events are being postponed, hoping for better conditions soon. Organizations are forced to work more online, which can be both – positive and negative. The positive aspects – wider range of farmers and rural inhabitants can be reached, negative – possibility of specific, targeted questions is less possible. Also, older generations often are not able to fully participate online due to lack of digital skills.

4.5. Linkages with other AKIS actors/knowledge flows

	Freelance advisor	Freelance advisor	Advisory org.	Advisory org.	Org. with an advisory component			
Universities	Weak	Medium	Medium	No coop	Medium	Medium	Weak	No coop
Research institutions	Weak	Medium	Medium	No coop	Strong	Weak	Medium	No coop
Public authorities	Medium	No coop	Medium	No coop	Medium	Weak	No coop	Strong
Farmer based organisations, professional organisations	Weak	Medium	Weak	Medium	Medium	Medium	Medium	No coop
NGOs	No coop	No coop	Medium	No coop	Weak	Weak	Medium	No coop
Private companies (e.g. advisory organisations)	Weak	Medium	Weak	No coop	Medium	Strong	No coop	No coop
Upstream industries	No coop	Medium	Weak	No coop	Medium	Weak	No coop	No coop
Downstream industries	No coop	No coop	Weak	No coop	Medium	Weak	No coop	No coop
EIP Operational group	No coop	Strong	Medium	No coop	Medium	No coop	Weak	No coop
EU projects (Horizon 2020 multi-actor projects)	No coop	No coop	Strong	No coop	Weak	No coop	Medium	No coop
Other actors	No coop	Medium	Weak	No coop	Medium	Weak	Weak	No coop

Table 5 Cooperation between AKIS actors

Since the response rate was 8 respondents, it is possible to combine all answers in Table 5. When looking at color coded answers, it is clear that the type of organization (or freelancer) does not affect the strength of cooperation with different types of organizations. Almost all survey participants assess that they are cooperating with farmer based organizations, research institutions and universities. The least cooperation seems to be with downstream industries and EU projects.

The cooperation with other actors is totally up to a respondent, and is not affected by the type of it.

4.6. Programming and planning of advisory work

Two of the organizations have a staff development strategy. One of those is LRATC and other is the organization with advisory component. Both respondents have the biggest amount of employees between the respondents (420 and 56). It can be concluded that when there is small amount of employees, it is easier to keep track of each strengths and necessary improvements, but when there is a large amount of people working in the organization, some kind of structure has to be applied. Both organizations also are the only ones to have a rainer/training unit responsible for capacity development.

Organizations in their responses do not mention specific programs. LRATC by-law provides that the competencies of employees are increased through two training and certification systems:

- the sector professional qualification system (mandatory) provides an annual training process and knowledge test (production technologies, EU and Latvian legislative requirements);
- the International Certificate for European Consultants in Rural Areas (European Rural Regional Consultants Certificate, “CECRA”) (optional), which ensures that qualifications are raised in general advisory methods.

The mechanism for rewarding the advisors is mentioned only from side of LRATC. Organization is accounting the revenues of each consultant and the premium according to the amount of work done. Also each year the best advisors in each sector are congratulated.

4.7. Time allocation for advisory work

	Advisory org	Org with advisory component	
Teaching and training activities	15	10	10
Innovation support activities (facilitation, networking, brokerage)	2	5	10
Targeted consultation services (business plans, credit/subsidy application, etc.)	65	60	30
Information dissemination (face to face, via digital tools)	3	20	10
Further development of one's knowledge and skills (participating in training programs)	5	5	10
Others	10		30

Table 6 Amount of time an advisor spends for each activity (%)

Three respondents have given an answer to a question about time, allocated for activities. In all cases most time is allocated to Targeted consultation services and non-specified “other” in case of one organization with advisory component. For further development they are using 5-10 percent of their time. All respondents use 0-15% of time for teaching and training activities. Estimated percentage of time differs for dissemination of information activities, varying from 3 to 20 percent.

4.8. Advisory organizations implementing the EU-FAS

“In Latvia, the EU Farm advisory system (EU-FAS) is organised at the national level. The delivery of the EU-FAS is granted to an advisory organisation on the basis of public procurement procedures. In practice, there are only two advisory organisations which have been able to comply with the tender rules and have been granted the EU-FAS contracts. These are LRATC, the biggest EU-FAS provider and the only provider of the EU-FAS in agriculture, and the Forestry Cooperative Society, a union of three forestry cooperatives that offers EU-FAS services only in forestry. Financially and in terms of the number of consultations and clients covered, LRATC is by far the largest EU-FAS provider and provides the full spectrum of the mandatory EU-FAS consultations. 70 out of 306 advisors employed by the LRATC are directly involved in the delivery of the EU-FAS. However, to be capable to ensure the full range of consultations required by the tender rules, LRATC has to involve experts from other organisations, notably the Latvia University of Life Sciences and Technologies, some research institutes, as well as cooperatives.

EU-FAS activities in Latvia are fully funded from public sources. Approximately 68% of the finances come from the European Agricultural Fund for Rural Development and the remainder is national funding.

The key strengths of the EU-FAS in Latvia are that it is a unified and nationally-operating system that is well supported by a digital management platform. The weaknesses are that farmers are insufficiently aware about the services and there is a limited capacity of service providers to increase the number of EU-FAS consultations.”⁵

⁵ Review of the implementation of EU-FAS policy in Member States of EU- Latvia, E.Kīlis (Baltic Studies Center), 2019

5. Summary and conclusions

Latvia has identified all the necessary elements so that AKIS system can operate. Still more coordinatory work needs to be introduced to enhance the mutual cooperation in long term.

In the field of education there are few new entrants to the sector, the role of lifelong learning is therefore very high and necessary for the development of agriculture and forestry.

Although there are difficult climatic conditions in Latvia and a short period of vegetation, the availability and quality of agricultural land and water are very good. There is very good environmental quality in the country and no national problems have been identified so far, despite the intensive use of fertilisers over the last ten years. The main problem of water management is the sustainable amelioration of excessively wet soils. Monitoring and improving the impact of agriculture on the environment must be carried out continuously.

Today, crop cultures and dairy livestock accounts for the majority of Latvia's agricultural production. The structure of commercial holdings is twofold: livestock farms are generally smaller than average EU holdings, while crop culture farms are mostly large and export-oriented. Grain is Latvia's main agricultural and food export group.

5.1. Summary and conclusions on sections 1 – 3

The overall level of education and knowledge of farm managers remains to be described as insufficient.

Measures should be promoted to ensure that both formal and non-formal lifelong learning is accessible, including financial access to such learning.

The agricultural and forestry industries in Latvia have long been characterized as fragmented, which is a restrictive factor in making it easy to access quality counselling and educational services to entrepreneurs in the sector.

The Latvian Agriculture AKIS includes a wide range of participants who ensure, manage, finance, carry out, implement, inform and facilitate innovation. The main players are policy makers, researchers, teachers, advisors, farmers, private enterprises, consumers, non-profit organizations and markets.

In recent years, EIP-AGRI's activities have facilitated cooperation between AKIS actors.

Currently 94 innovative projects are being introduced for agricultural development. It promotes not only direct cooperation in the course of ongoing projects but also new contacts and collaborative ideas outside them.

Government financial support tool - innovation voucher, offered by the Investment and Development Agency of Latvia is available to all size companies (including startups). In many cases, not only scientists are involved in cooperation, but also advisers to move the idea more widely.

As a part of the national innovation policy, in Latvia are establishing Business incubators, Knowledge transfer centers, Industry innovation clusters and similar trans-disciplinary platforms, where learning, exchange and collective knowledge creation takes place.

5.2. Summary and conclusions on sections 4

One of the reasons for low responsiveness to a questionnaire could be that the study was carried out by the largest advisory company in the sector. Respondents may not have wanted to disclose information to competitors.

A lot of different projects have recently been asking to provide similar information. It would be desirable to work more closely with other projects to obtain information, rather than regularly asking primary providers to prepare it again and again.

Large organisations care about the education of their advisers, while independent consultants and the small consulting firms leave their self-development in their own ways. This may be due to easier traceability of employees, but it is noted that AKIS would have the opportunity to coordinate the training processes of advisers.

Individual advice is still ongoing, but as the costs of advisory services increase, advisors will have to switch to the forms of group advice.

New advisers should be encouraged to enter the system, since a large number of advisers are working for 10 years and more.

Advisory companies also offer general (legal, taxes, networking) advice rather than directly related to production.

Less targeted group is farm workers — When working with small holdings, fewer advice is provided to employees of large holdings.

6. Acknowledgement of partners, information sources and gaps

Unfortunately the response rate to a questionnaire was low. Only eight service providers filled the survey questions. Only LRATC responses cover also forestry advisors. The assumption is that there were several main reasons for that:

- LRATC, which is the author of the Country Report, is the largest agriculture and forestry further education and advisory provider of the country. The survey can be seen as a competitiveness risk.
- The Survey for organization, providing advisory, took at least 50 minutes to fill in and if there is no clear benefit for the organization for filling it, it can be seen as unnecessary work.
- The survey online system was not working or allowing to fill it in in Latvian language for most of the time. Authors have at least three known indications about that.

For this report, three special interviews were conducted:

- Raimonds Bērmanis – Director of Forest Advisory Services Centre;
- Sandra Muižniece – Brasava - Professor, lead researcher and Head of LLU Innovation and Technology Transfer Centre;
- Inta Nagle - Head of Rēzekne LRATC offices;

In addition, insights from other conversations, conducted by the author during other activities regarding AKIS in Latvia were used:

- 8 personal interviews and regarding study on knowledge transfer, cooperatives and NGO's.

Special thanks to Survey participants for devoted time.

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Appendices

Appendice 1 List of AKIS institutions

AKIS and advisory services in *Lithuania*

Report for the AKIS inventory (Task 1.2) of the i2connect project

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Executive summary

The main aim of this report is to provide a detailed description of Agricultural Knowledge and Information System (AKIS) in Lithuania giving special focus on agricultural advisory services. In addition, forestry advisory service providers are addressed.

The report represents an output of the Horizon 2020 project *i2connect*, Connecting Advisers to Boost Interactive Innovation in Agriculture and Forestry (<https://i2connect-h2020.eu/>). The report is one of 31 country reports prepared in 2020 by project partners providing information about AKIS in their countries. The first inventory on Agricultural Knowledge and Information Systems and advisory systems in the EU countries was set up in the context of the PRO AKIS project in 2015. One of the aims of the *i2connect* project is to update existing AKIS descriptions for the 27 EU member states as well as for Croatia, Switzerland, Montenegro, and Serbia as institutional and structural changes are constantly caused by changes in national and CAP policies.

The report covers main structural characteristics of agricultural and forestry sectors, history of advisory system in Lithuania, overview of service suppliers, public policy and funding schemes, methods of service provision, linkages with other AKIS actors, programming and planning of advisory work and other relevant topics. Furthermore, a detailed description of Lithuanian AKIS is provided and AKIS diagramme is included.



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Abbreviations

AKIS	Agricultural Knowledge and Information Systems
CAP	Common Agricultural Policy
EIP	European Innovation Partnership
FAS	Farm Advisory System
FBO	Farm Based Organisation
GDP	Gross Domestic Product
IKMIS	System of Integrated Plant Protection Information, Consulting and Training
LAAS	Lithuanian Agricultural Advisory Service
NGO	Non-governmental Organisation
USSR	Union of Soviet Socialist Republics
VMU AA	Vytautas Magnus University Agriculture Academy

Introduction

One of the main goals of AKIS is to promote the exchange of knowledge and innovations between interacting organizations, institutions, farmers and foresters, in order to implement innovations as effectively as possible, to link science and to apply the acquired knowledge in practice. The operation of AKIS in Lithuania ensures that persons who participate in agricultural sector activities always receive the knowledge necessary for the development and expansion of their activities, and competitive and profitable establishment in the market.

As the Common Agricultural Policy evolves, so does AKIS of the countries, with new participants entering the system. The interrelationships between the participants in the agricultural knowledge and innovation system itself are also changing, therefore, AKIS of the countries is periodically updated.

In today's market, in order to maintain both the competitiveness of agriculture and the viability of rural areas, it is necessary to apply the latest ways of sharing knowledge and experience. The establishment of AKIS in national institutions, culture and laws is not directly compared between the countries, but is assessed according to two criteria, i.e. strength of institutions participating in AKIS and the level of institutional integration. A strong, direct link between institutions ensures efficient, continuous functioning of the knowledge system, indicating that state investments are available for knowledge dissemination, sharing, consulting and improvement. The level of integration indicates that there are strongly functioning and coordinated knowledge networks, supported by national AKIS policy. In a fragmented AKIS, relationships between some of participants in it may exist, but are often uncoordinated. There are cases when the institutions participating in AKIS compete with each other, acting for the benefit of themselves and not the agricultural entity. The ongoing fragmentation may reduce the capacity of AKIS to meet the needs of farmers, as institutions are more interested in meeting their own needs.

Lithuanian AKIS is shaped by governmental, scientific and study institutions, private sector organizations, farmers' organizations and non-governmental organizations. The Ministry of Agriculture of the Republic of Lithuania is responsible for the execution, implementation and development of agricultural policy. The Rural Business and Market Development Agency provides accreditation to advisory institutions and advisers working for them. The main institutions providing advisory services to farmers in Lithuania are the Lithuanian Agricultural Advisory Service and the Lithuanian Chamber of Agriculture. Science

and study institutions share the latest knowledge and research, help farmers to integrate innovations into their farming activities, providing the latest research information both at the national and international levels. The best cooperation between the institutions of AKIS takes place when the activities of the European Innovation Partnership are implemented, when equal involvement of each country is necessary. It is planned to strengthen the activities of the Lithuanian rural network in the period 2021–2027, to ensure cooperation between participants, greater involvement and mutual dissemination of knowledge, so that all these processes would act more efficiently in terms of AKIS.

1. Main structural characteristics of the agricultural and forestry sector

Lithuania is a land of plains and forests. The forest territory makes up about a third of the territory of Lithuania. This affects the density of population. According to the data of 1 January 2020, Lithuanian population is 2 million 794, 3 thousand, its density in the country is 42.8 people per square kilometre. In the first half of 2020, GDP at current prices amounted to 22.7 billion EUR. Agricultural land accounts for 52.06 percent, forests – 33.02 percent of the country’s land area (as of 1 January 2020).

Table 1 Distribution of land fund by arable land area in per cent

Distribution of land fund by arable land area in per cent		
52.06 %	33.02 %	14.92 %
agricultural land	forests (forest land)	other land

The number of agricultural land plots is 102,466, they account for 184,519.3038 ha; the number of forestry land plots is 22,121, which accounts for 1087,781.432 ha.

The average farm size is 15.54 ha. The table below provides information on the distribution of farms by total area (ha).

Table 2 Distribution of farms by total area (ha)

Farm size, ha	Up to 0,5	0,5-1	1-5	5-10	10-20	20-30	30-50	50-80	80-100	100-150	150-200	200-300	300-500	>500
Number of farms	4 877	4 892	31 239	17 023	13 371	5 188	4 106	2 427	777	1 033	419	404	239	72

Holdings with a land area of 1 to 5 ha predominate in Lithuania. Large holdings, i.e. holdings with an area of 300 to 500 ha make the lowest number.

The distribution of farmland use is as follows:

Table 3 Distribution of farmland use

Type			
agricultural, ha	forests, ha	water, ha	other, ha
1 170 254.69	83 240.61	15 799.93	55 965.85

Distribution of holdings by kind of economic activity (as of 1 January 2020):

Table 4 Distribution of holdings by kind of economic activity

Plant production	Mixed agriculture	Forestry	Alternative activities	Animal husbandry	Services	Fishery
80 044	55 118	2 487	841	15 634	233	30

During 2019, the percentage of land use did not change. According to the data of 1 January 2020, the largest holdings are located in Kaunas, Šiauliai and Panevėžys counties. The smallest holdings are registered in Alytus, Vilnius and Klaipėda counties.

Lithuania is characterized by an aging farming community. According to the data of 1 January 2019, the group of holding managers – natural persons – was dominated by holding managers from the age of 41 until retirement age. They accounted for 50 percent of the total holding managers. 38 % of the total holding managers were of retirement age. Holding managers under 40 years of age made the smallest number – 12 %. From 1 January 2019 to 1 January 2020 the number

of young farmers, i.e. persons under 40 age, decreased by 405 farmers in all municipalities. In terms of gender distribution of farmers, according to the data of 1 January 2020, 60.99 % of farmers are men and 39.01 % are women. According to the data of 2020, the agricultural, forestry and fisheries sectors employ 23,300 people.

According to the data of 2019, cereals occupied the largest area sown with agricultural crops:

Table 5 Area sown with agricultural crops, thousand ha

Area sown with agricultural crops, thousand ha		
1 361.40	87.7	245.7
Cereals	Oats	Rapeseed

During the second half of 2019, the number of cattle decreased by 31,720 and that of dairy cows – by 13,283. In Lithuania, cattle herds are also decreasing. From the beginning of 2014 to the end of 2019, they had decreased by 35,083, however, according to the number of cattle per herd, the average herd size is constantly increasing. From the beginning of 2014 to the end of 2019, the average cattle herd size increased from 9.7 to 16.8 cattle.

2. Characteristics of AKIS

The Agricultural Knowledge and Innovation System (hereinafter referred to as the AKIS) includes the process of knowledge sharing and information dissemination in the country. This process involves individuals and institutions from the state, public and private sectors. Involved parties are encouraged to jointly develop and share agricultural knowledge and innovations. Farmers and forest owners must have access to reliable and appropriate sources of knowledge in order to analyse and apply innovations in their activities. The aim is to strengthen the ongoing processes of knowledge and information dissemination in order to streamline the processes of knowledge provision, advising and training, increase the dissemination of agricultural innovations, which would contribute to more productive work results in the agricultural sector. Lithuanian AKIS consists of governmental, scientific and study institutions, private and public sector, farmer and non-governmental organizations as well as natural entities (see Table below).

Table 6 Institutions constituting AKIS

Organization status	Type of organization
Governmental institutions	<ul style="list-style-type: none"> • Ministries of the Republic of Lithuania • Controlling authorities • District municipalities: municipal agricultural divisions, local action groups • State-managed data sources (information systems / registers / databases)
Scientific and study institutions	<ul style="list-style-type: none"> • Higher education (universities and colleges) • Science, study and business centres, institutes (valleys) • Schools of technology and business
Private and public sector organizations (business)	<ul style="list-style-type: none"> • Financial institutions (banks, credit unions) • Commercial companies, suppliers of equipment / services / products (engaged in the sale of services, products, equipment or machinery and related advising) • Impartial advisory institutions, impartial advisers, innovation support services, innovation brokers • Digital innovation centres
	<ul style="list-style-type: none"> • Lithuanian Agriculture Council • Chamber of Agriculture • Organizations uniting farmers and forest owners: <ul style="list-style-type: none"> - Lithuanian Farmers' Union

Farmers' organizations	<ul style="list-style-type: none"> - Lithuanian Association of Agricultural Companies - Lithuanian Grain Growers' Association - Lithuanian Milk Producers' Association - Lithuanian Association of Grain Processors and Traders - Association of Lithuanian Dairy Farms - Lithuanian Organic Farms Association - Lithuanian Rural Communities Union • Other members of the Lithuanian rural network
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By interacting with each other, different types of organizations maintain the competitiveness of farms in the market and support the viability of agriculture in rural areas, therefore it is necessary to constantly apply new methods of knowledge sharing and disseminate good practices. AKIS scheme is centred around farmers and forest owners, for whom a network of organizations provides constant access to necessary and reliable sources of knowledge that help to solve emerging problems, providing opportunities for development not only in the national market.

On 19–20 November 2019, Vytautas Magnus University Agriculture Academy (hereinafter – VMU AA) hosted the first such international event organized in Lithuania – the meeting of the Standing Committee on Agricultural Research (SCAR). This committee analyses and presents conclusions on the issues of the Agricultural Knowledge and Innovation System (AKIS). The organizers of the event were VMU AA and PI Lithuanian Agricultural Advisory Service (hereinafter – LAAS). LAAS has been participating in SCAR AKIS activities for several years. The list of SCAR AKIS members include representatives of national ministries of agriculture, scientific and advisory bodies and non-governmental organizations. Representatives of Lithuania also participate in SCAR AKIS meetings: specialists of the Ministry of Agriculture of the Republic of Lithuania, Vytautas Magnus University AA research scientists and representatives of LAAS.

After 2020, every EU country will have to be ready with AKIS. According to Vaida Jankauskaitė, a specialist of Science and Innovation Division of the Ministry of Agriculture of the Republic of Lithuania, in 2021–2027, AKIS strategic plan envisages strengthening the links between research and practice, promoting interactive innovation, strengthening farm advisory services and supporting the digitalization of agriculture.

It has been observed that digitalization and other innovations have significantly increased the speed of information transfer and communication. LAAS Director, Dr. Edvardas Makelis, notices that new knowledge and innovations reach farms not only through advisers, but also through researchers and agribusiness companies. Innovation is no longer linear, it becomes interactive, which means that innovation can occur not only in science, but also in business or may be created by the farmer himself.

Independent advisers will play an important role in the implementation of the post-2020 CAP. In order to improve the quality and effectiveness of advice, Member States will need to involve advisers in AKIS in order to provide up-to-date information on technology and science based on research and innovation.

2.1 AKIS description

Lithuanian AKIS consists of institutions of various fields of activity and subordination. The Ministry of Finance of the Republic of Lithuania, the Ministry of Economy and Innovation of the Republic of Lithuania, the Ministry of Health of the Republic of Lithuania, the Ministry of Education, Science and Sports of the Republic of Lithuania, the Ministry of Environment and the Ministry of Agriculture of the Republic of Lithuania. They are marked in blue in the diagram. Lithuanian farmers do not have a direct connection with ministries, but members of farmer organizations, i.e. representatives of the country's farmers, as social partners, regularly participate in discussion groups and meetings organized by ministries and other authorities to discuss the situation and try to find appropriate solutions. Direct communication with farmers is maintained by institutions subordinate to ministries (administrative) such as the National Paying Agency under the Ministry of Agriculture of the Republic of Lithuania, the National Land Service under the Ministry of Agriculture, the State Food and Veterinary Service, the State Tax Inspectorate under the Ministry of Finance and others. The activities of the administrative institutions include environmental, financial (including tax), agricultural and forestry activities. There are about ten institutions under the Ministry of Agriculture of the Republic of Lithuania that perform monitoring or control. Institutions such as the State Enterprise Agricultural Information and Rural Business Centre, GIS-Centre, and the State Plant Service under the Ministry of Agriculture of the Republic of Lithuania are subordinated to the Ministry of Agriculture of the Republic of Lithuania. The Lithuanian Hydrometeorological Service reports to the Ministry of Environment of the Republic of Lithuania, and

the State Enterprise Centre of Registers reports to the Ministry of Economy and Innovation of the Republic of Lithuania. GIS-Centre, State Plant Service, State Enterprise Centre of Registers, Lithuanian Hydrometeorological Service, National Paying Agency, State Enterprise Agricultural Information and Rural Business Centre are collectively referred to as data sources, as according to their functions they are information systems, registers and databases. LAAS also falls into this category with the System of Integrated Plant Protection Information, Consulting and Training (IKMIS (<https://www.ikmis.lt>)). There are seven data sources. The link between ministries, administrative institutions and data sources is strong. Ministries of the Republic of Lithuania issue laws, procedures and other documents, the institutions responsible for monitoring and control check compliance with laws and procedures. This connection is indicated by a solid line in the diagram. The pointer indicates the subordination of these institutions to the ministries. These institutions communicate directly with farmers and forest owners; therefore the connection between them is also marked by a solid line. As farmers have to report to the monitoring and control authorities, they receive requests from these institutions; farmers themselves usually do not initiate the dissemination of information and knowledge with these authorities, so a one-sided line is marked and a line leaving the farm block is marked with a dotted line.

The link between farmers and data sources (information systems, registers and databases) is strong, marked by a continuous two-way line, as farmers themselves are data providers, users of data sources, and data sources collect, process and store farmers' data. The situation is similar with the relationship between data sources and impartial advisory institutions, innovation support services, innovation brokers and impartial advisers. The relationship between these two blocks is marked by a continuous two-way line, as providers of impartial advice are the providers of the data stored in data sources, but at the same time the users of databases, registers and information systems. A direct contact with farmers is maintained by municipal agricultural departments, which operate in every Lithuanian municipality and provide services to farmers. They provide information to agricultural entities about support opportunities, implement the structure of agricultural production, which promotes production of competitive products, implements the state policy of rural development, market, investment, transformation of farming activities and promotes the application of science and new technologies in agriculture.

The Bank of Lithuania is independent of the Government of the Republic of Lithuania and other state institutions; according to the Constitution of the Republic of Lithuania, the Bank of Lithuania is owned by the State of Lithuania. The Bank of Lithuania reports on its activities to the Seimas of the Republic of Lithuania, the founder of the Bank of Lithuania. The Bank of Lithuania supervises and controls the Lithuanian banking market. Currently, there are seven banks, eight branches of foreign banks and forty-five credit unions in Lithuania. Financial institutions provide services directly to farmers as well as individual information on financial issues, they organize information seminars for target groups of farmers and participate in discussions, therefore, the connection between these two blocks is strong, marked by a continuous one-way line. Bank smart apps are especially popular among young farmers, they facilitate the processes of delivering the services provided by banks, and operations are usually performed remotely. Financial institutions not only provide individual consultations to farmers, but also invite farmers to seminars, and actively participate in events and discussions organized by farmers. Farmers especially use the services of credit unions in Lithuanian regions. It is easier for small farmers to get credit from credit unions as their main customers are smaller farms, which increases the chances of getting a loan. Partnerships between credit unions and farms contribute to the stability of the agricultural sector.

At the initiative of the Ministry of Economy and Innovation and industrial communities, digital innovation centres have been established in Lithuania. These centres act as centres of excellence. Regional multilateral cooperation between partners is crucial, not only between digital innovation centres across Europe, but also involving universities, industry associations, chambers of commerce, business incubators, regional development agencies and even governments. These centres have strong links with the latest technology and service providers. As the digital innovation centres were established at the initiative of the Ministry of Economy and Innovation, the connection between them is marked by a continuous one-way line. Weaker links exist between digital innovation centres and research and study institutions. A dotted line is marked here. Digital innovation centres typically bring together organizations from science, education, business, the public sector and governmental institutions. There are also links between digital innovation centres, impartial advisory institutions and impartial advisers. This link is also not particularly strong, it is marked by a dotted one-way line, as impartial advisory institutions and impartial advisers do not directly influence the activities of digital innovation centres. Research and study institutions, in cooperation with digital

innovation centres, pass on the latest knowledge to impartial advisory bodies, which in turn share innovations with farmers and forest owners. Farmers and forest owners also do not directly affect the activities of digital innovation centres, they can find information about the innovations promoted by these centres, therefore, the connection between these two blocks is marked by a dotted one-way line.

Institutions of science and studies, marked in green in the scheme, are subordinated to the Ministry of Education, Science and Sports of the Republic of Lithuania. In order to encourage the interaction between the science and study system and the farm, and the development of promising technologies and their implementation into knowledge-intensive business, the creation of integrated science, study and business centres (valleys) has been started in Lithuania. The main goal of one of the valleys operating in Lithuania is to mobilize the potential of agricultural, forestry and food research, studies and knowledge-open business (the totality of entities), having a common and networked research and experimental development infrastructure and purposefully contributing to agricultural, forestry and food economy development, creation of knowledge economy, and an increase of competitiveness of the Lithuanian farm. Science, study and business centres (valleys) contribute to increasing farm progress by providing farmers with the latest research information. Science, study and business centres (valleys) are subordinated to the Ministry of Education, Science and Sports and the Ministry of Economics and Innovation of the Republic of Lithuania. The link between research and study institutions and authorities is strong, marked by a solid line. In addition, science and study institutions are related to institutions providing impartial advice and impartial advisers, as Lithuanian higher education institutions and schools of technology and business train agricultural specialists. The arrow between these blocks is continuous, indicating a strong connection. Consequently, impartial advisory institutions, whose specialists come from higher, technological and business schools, will be directly involved with farmers and forest owners, as these specialists will provide advice to farmers and forest owners.

Research institutions have the opportunity to publish the results of research and innovations in the Applied Innovation Research and Results Information System TITRIS (<https://titris.lzukt.lt/>), which is administered by the LAAS Innovation Support Service. TITRIS collects, stores and disseminates data on applied

innovation research and its results, which can potentially contribute to more efficient, sustainable and environmentally friendly farming.

The European Innovation Partnership is joint activities of farmers, forest owners, researchers, agricultural and forest advisers and other actors of the rural development sector supported by EU support measures to develop competitive and sustainable agriculture and forestry through knowledge and innovation. In other words, the European Innovation Partnership Action Group must be composed of natural and / or legal persons from business, agriculture or forestry, science and advising. Consequently, the EIP block will be closely linked to the blocks of science and studies, impartial advisory institutions, farmer and forest owner organizations, and farmers / forest owners themselves, and is therefore connected with a two-way continuous line.

In the case of farmer organizations, marked in yellow in the scheme, it should be noted that the members of farmer and forest owner cooperatives, associations or unions are farmers and forest owners themselves, therefore, the link between these blocks is particularly strong and marked by a continuous two-way line. Farmers and forest owners participate in the activities of the European Innovation Partnership action groups, therefore, there are also close links between these blocks, i.e. a solid line. The activities of the Lithuanian Union of Rural Communities, whose members are farmers and forest owners, are especially beneficial for people living in rural areas, as they contribute to making rural areas a safe and attractive place to live. One third of the country's population lives in rural areas of Lithuania. The membership of farmers in organizations ensures that rural areas become more advanced and innovative, and the agricultural, forestry and fisheries sectors are developed. The Union of Lithuanian Rural Communities contributes to even development of rural regions by coordinating social and economic policies.

With regard to the business sector, suppliers of products and equipment and those who provide advice on the use of equipment and products are distinguished. The business sector is marked in brown in the diagram. Farmers and forest owners are in direct contact with suppliers of products or equipment, therefore, the link between these two blocks is strong, marked by a solid line in the diagram. The line is a two-way one as both farmers and suppliers of products and equipment are the beneficiaries, i.e. farmers and forest owners receive products, equipment and / or advice, while for the business sector, farmers and forest owners are potential customers. The business sector is also involved in data sources, as for example, SE Centre of Registers collects and stores information on legal and natural persons.

Thus, you can find information on suppliers of products and equipment, and advice providers in databases, registers and information systems. The relationship between data sources and business blocks is strong, marked by a solid line in the diagram. Suppliers of products and equipment are controlled by the Ministries (of Finance, and Economy and Innovation) of the Republic of Lithuania. Suppliers of equipment and products, as well as providers of advisory services, are also related to institutions providing impartial advice, impartial advisers, and innovation brokers. The connection is not strong, in the diagram it is marked with a dotted line. Both of these blocks are linked by farmers and forest owners as they are potential customers of both.

The media is also included in AKIS. The press, radio, television and the Internet not only inform farmers and forest owners about today's issues, but also create new perspectives for constantly obtaining up-to-date information both nationally and internationally, helping to share experiences that farmers can achieve in order to address complex challenges. Farmers and forest owners have access to smart tools-apps to manage their farms. Farmers and forest owners can get advisory services with the help of a mobile application, it is enough to have a mobile phone or tablet. LAAS has developed the System of Integrated Plant Protection Information, Consulting and Training (IKMIS), the mobile application of which is available to every farmer. With a mobile IKMIS application, a farmer can access meteorological station data at any time, which is linked to new disease and pest forecasting modules to help calculate the likelihood of disease or pest occurrence. It is also possible to observe the situation of various agricultural crops throughout Lithuania or participate in distance learning. The smart app simplifies the work process of farmers, reduces time and financial costs of searching for necessary information. The already mentioned LAAS advisory tool TITRIS is also available online. TITRIS is a knowledge repository, a free platform for practical and scientific innovation, where users can find information on applied innovation research, its data and results.

To receive support from EU funds, farmers and forest owners fill in applications online. In addition, farmers and forest owners can report to monitoring and control authorities through online applications administered by these authorities. For example, the National Paying Agency under the Ministry of Agriculture of the Republic of Lithuania uses the "NMA agro" mobile app. With the help of the app, farmers and forest owners can provide information on the activities carried out or

problems related to the support obligations and can report improperly maintained fields or other violations.

The main objectives of AKIS include the activities of various institutions that facilitate knowledge sharing, learning, ensure the exchange of good practices between farmers, advising and the activities of innovation-creating networks. The role of all organizations operating in AKIS is understood as an aid that helps to attract the farmer to the latest market trends, encourages their implementation and use on their farms to make the processes more profitable and productive. The exchange of knowledge ensures that farmers can overcome emerging challenges more easily and learn useful solutions to problems. The workshops organized by the institutions of the agricultural sector contribute to the fact that farmers can try out new technologies, feel tangible benefits and see how all this can be applied to their farming activities. By communicating with experts and receiving their advice and assistance, farmers can process the necessary resources for farm development faster and improve work processes. Advice on agricultural services can contribute to the establishment, management and maintenance of each farm, as well as create opportunities for learning and improving by developing their professional and managerial competencies. Using information technologies such as various smart apps on phones, you can faster access the necessary information, receive agricultural news from different locations not only at home but also from abroad.

AKIS diagramme

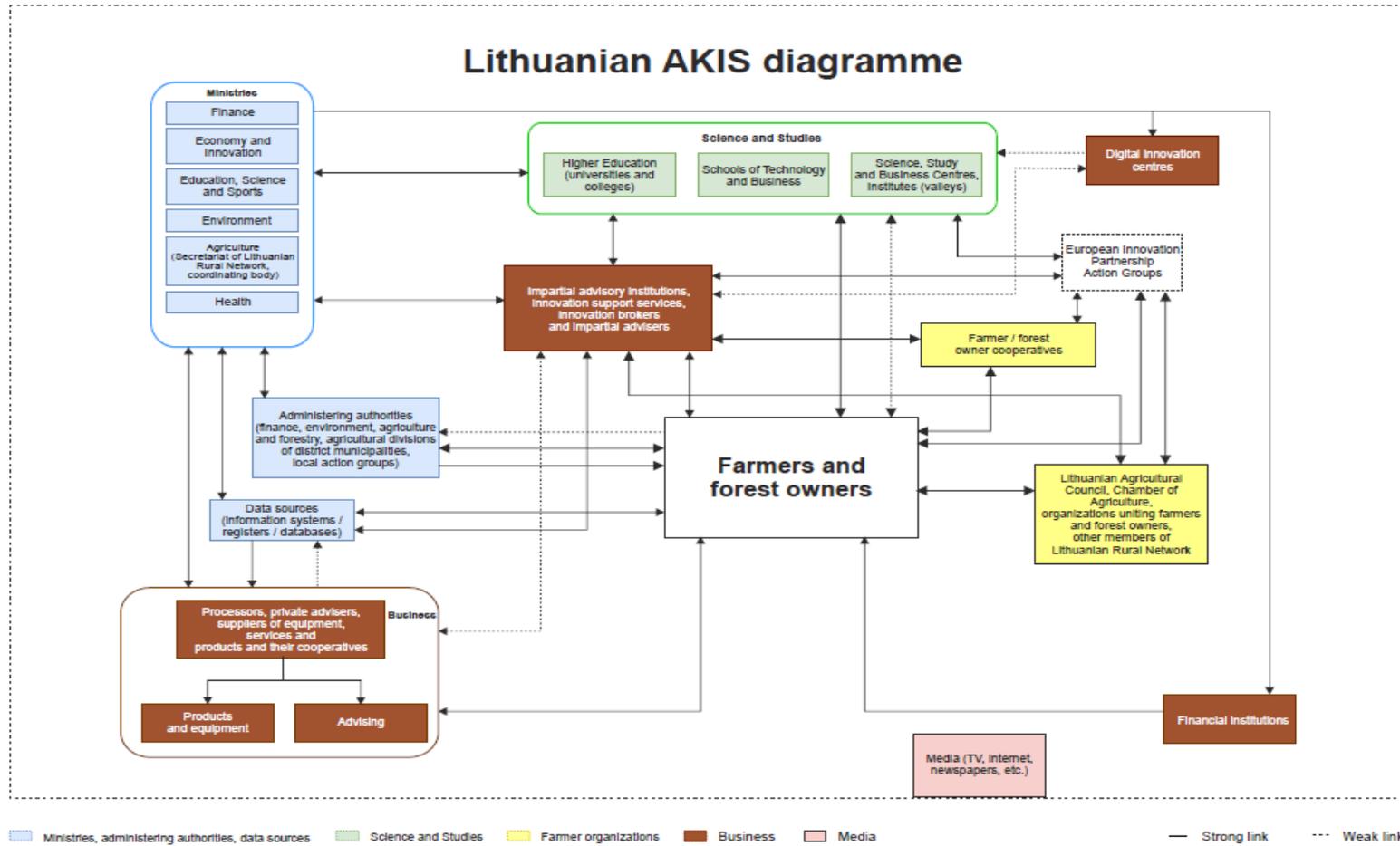


Figure 1 AKIS diagramme

3. History of the advisory system

Advising is described differently in different sources, but in summary, advising is a process in which an adviser in a particular field helps to solve a problem by providing professional help or simply by providing the necessary information to guide an effective decision. Agricultural advice has become necessary today as fast-paced innovations have become essential for every farmer to make the farm profitable, remain competitive and expand. Constantly updated technology and the integration of information technology into farm processes naturally encouraged every farmer to learn and improve in order to maximize yields and economic benefits.

In view of the emergence of the advisory system, it is necessary to mention that in September 1991, a land reform was launched in Lithuania, aimed at restoring private land ownership, returning land to former owners and their heirs confiscated during the USSR occupation, and transferring state land to rural residents free of charge, through sale or lease. Until 2014 property rights to land, forest and water bodies were restored to 762,300 persons, i. e. 97.5 % of applicants. Animal husbandry and plant production has fallen sharply as a result of the agricultural reform. This was due to the emergence of many smaller agricultural producers instead of large farms, for whom scientific institutions were unable to provide assistance. Many citizens without agricultural education received the right to own land and started farming, and a large part of the rural population lacked the knowledge to develop a modern farm profitably. With this situation in agriculture, the need to advise and train farmers, and improve their qualifications greatly increased.

After Lithuania regained its independence, in 1991, the Chamber of Agriculture, which had operated in interwar Lithuania, was restored. It is one of the oldest institutions in Lithuania providing consultations to farmers. Later, as the problem of farmers' lack of knowledge grew, on 1 June 1993 the Lithuanian Agricultural Advisory Service was established, the shareholders of which are the largest farmers' organizations – the Lithuanian Farmers' Union, the Lithuanian Association of Agricultural Companies and the Ministry of Agriculture of the Republic of Lithuania. LAAS works both as an instrument for the implementation of agricultural policy and as an institution meeting the individual needs of farmers. LAAS is the main and the first agricultural advisory institution with a developed network of services throughout Lithuania. The advisory network operating

throughout Lithuania allows to be close to the farmer, to solve emerging problems here and now, to provide qualified assistance and integrate advanced processes onto the farm, as well as perform complex studies. LAAS currently provides advisory services from forty-eight offices, employing a total of more than four hundred employees. Customers are provided with comprehensive accounting, business economy, plant production, animal husbandry, forestry, occupational safety and fire safety services. Training is provided for farmers and non-agricultural customers. LAAS implements national and international projects in order to take over good practice from foreign partners and implement constant innovations in its services.

There is no common agricultural advisory system in Lithuania, but there are several individual institutions providing individual advisory services to agricultural entities and other rural residents. According to the data of 2020, there are 13 accredited advisory institutions in the country and 282 accredited advisers. Since Lithuania became a full member of the EU and acquired the right to use the support mechanisms applied to the Member States, the number of advisers and advisory institutions has increased.

4. The agricultural and forestry advisory service(s)

The growth of agricultural advisory services is influenced by the fact that only about a quarter of those working in agriculture have finished agricultural studies, the multi-enterprise farms that predominated before are changing their structure, however, there are still farms with worn-out machinery, insufficient qualifications of employees and lack of farm management skills. Public and private institutions, as well as impartial advisers provide agricultural advice in the country. Suppliers of equipment, services and products, i.e. representatives of the business sector, advise on agricultural topics too.

In order to obtain more accurate and detailed information on the advisory services provided, clients of advisory services and institutions providing advisory services were asked to participate in an anonymous survey, answer questions about their advice and organization of the advisory process and thus contribute to the preparation of the Lithuanian AKIS description.

Ten national institutions providing advisory services took part in the survey, including public institutions, private limited companies, science and study institutions operating on a regional (3 of them), national (5 of them) and international (2 of them) level.

4.1 Overview of all service suppliers

Almost half of Lithuania's forests are state-owned. They are supervised and the right of trust is managed by the State Forestry Enterprise under the Ministry of Environment of the Republic of Lithuania. Most forest owners are not foresters. Most of them are not familiar with the legislation governing private forest management. Specialists of the State Forestry Service under the Ministry of Environment of the Republic of Lithuania are tasked with advising forest owners on all issues of private forest maintenance and controlling economic activities in private forests. Unfortunately, due to the large amount of work, they are not able to perform the functions assigned to them in time.

Specialists of regional offices of SE Lithuanian State Forests also provided advice for private forest owners, but after the reform implementation at the beginning of 2018 the advisory activities of SFE became non-priority.

Forest owners are also advised by specialists from commercial companies however, the consultations usually end with an offer to buy their services or sell the forest, and thus the forest owner receives biased advice.

Quality consultations are provided by the Forest Owners Association of Lithuanian, but its capacity is small and the advice is given online.

According to the 2020 data, 14 accredited advisers in Lithuania can provide professional consultations on forestry issues. There are 7 accredited forestry advisers at Kaunas College of Forestry and Environmental Engineering, 3 at LAAS, 2 at Vytautas Magnus University and 2 at the Chamber of Agriculture of the Republic of Lithuania.

Advice on forestry is also provided by LAAS advisers. The institution does not carry out economic activities in forests, does not cut, buy or sell them, therefore the provided consultations are impartial. Forestry advisers provide services and advice to all private forest owners and others interested in forestry development. The advice provided by LAAS specialists is paid, but private forest owners who have not received education on forestry, have an opportunity to use the project “Individual consulting of forest owners in their forest holdings” implemented by the Ministry of Environment of the Republic of Lithuania. It is a free 1-2 hour consultation on the management, maintenance, restoration, protection and use of the specific holding performed in the actual forest holding.

The main provider of agricultural advice in the country is LAAS. It is a network organization with advisory offices and professional advisers working in all districts of the country. In 2019, the Innovation Support Service was established in the Lithuanian Agricultural Advisory Service, the main objectives of which are to ensure constant cooperation with advisory, business, scientific and innovation institutions in Lithuania and abroad, to provide professional and responsible advice to agricultural entities, natural and legal persons on innovations, their trials and application in practice. The development of commissioned services in LAAS is significantly influenced by the Common and Lithuanian Agricultural Policy. The range of services is constantly changing; their development directly depends on the need for services.

According to the 2020 data, there are thirteen accredited advisory institutions in the country – scientific institutions, public institutions, private limited companies providing advisory services.

Suppliers of equipment, services and products also provide consultations to farmers. Compared to the advice provided by LAAS specialists, their consultations are of a narrower range and focused on a specific product or device they sell.

4.2 Public policy, funding schemes, financing mechanism, advisory service providers

Agriculture is almost exclusively a sector supported at European level, in contrast to most other sectors of the economy for which national authorities are responsible. It is therefore important to establish and implement a common public policy in the sector that ensures our food security and plays an important role in the use of natural resources and the economic development of rural areas. Support for farmers is essential in an unpredictable economic environment. It is a stable source of income independent of market fluctuations and changes. Recently, there has been an increasing emphasis on agricultural and environmental cooperation, as the agricultural sector has a significant impact on the EU environment and landscape. Regulation of agricultural activities is becoming one of the means to combat climate change, soil erosion, and conservation of endangered species. Farmers throughout the EU are encouraged to engage in environmentally friendly farming activities.

In 2004, after Lithuania's accession to the EU, the measures of the EU Common Agricultural Policy are administered by the National Paying Agency under the Ministry of Agriculture of the Republic of Lithuania. The activities and policy of the Lithuanian agricultural sector are determined by the common EU agricultural policy and the macroeconomic situation of our country. Although two large groups of economic entities can be distinguished, i.e. family farms, agricultural companies and enterprises, the country's agricultural sector remains fragmented, as 40 % of farms are smaller than 5 ha.

During the CAP period 2014-2020, it was planned to invest about 4.7 billion euros in the Lithuanian agricultural sector and rural areas. Prior to the start of this support period, key policy priorities were identified: job growth, sustainability, modernization, innovation and quality. At the same time, Lithuania has the opportunity to adapt direct payments and rural development programs to its specific national needs. In total, Lithuania's direct payments budget includes more

than 3.1 billion euros (according to 2018 data). Compared to the previous period 2007-2013, Lithuania has significantly increased its direct payments budget.

Agriculture is supported through the CAP. In Lithuania, as in the whole of Europe, its population is aging, therefore the involvement of new farmers in agriculture is extremely important. Support for young farmers is mandatory throughout the EU.

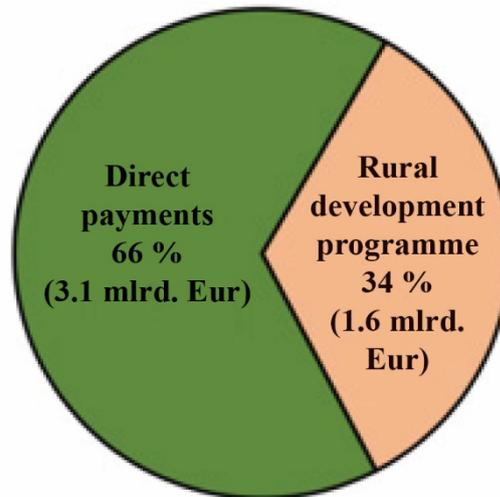


Figure 2 Distribution of CAP support in Lithuania

As the CAP period 2014-2020 is ending, there is a growing debate of the CAP future after 2020. The aim is to continue supporting agriculture under the CAP after 2020. One of the key objectives is to make the CAP simpler and more efficient in order to avoid unnecessary administrative burdens. The CAP importance for Lithuania is obvious – in period 2007-2020, 8.3 billion euros came as support for the agricultural sector. This support not only helps our country's economies to develop and modernize, but also to remain competitive in the European market.

In 2019, the White Paper on Lithuanian Rural and Agricultural Development was prepared and published by the Ministry of Agriculture of the Republic of Lithuania. The document describes the challenges, tasks and actions of the national policy until 2030. Rural and agricultural development strategy, development of competitive rural agriculture and other important issues are discussed. The solutions proposed in the document use technological and social innovations, and the latest applied scientific knowledge.

On 13 February 2015, the European Commission approved the Lithuanian Rural Development Program for the period 2014-2020. The Ministry of Agriculture of the Republic of Lithuania is responsible for the efficient and effective management of the Program and its implementation. The National Paying Agency under the Ministry of Agriculture of the Republic of Lithuania is the only accredited institution that administers support measures for agriculture, rural development and fisheries. The call for proposals is published by the National Paying Agency.

4.3 Human resources and methods of service provision

In Lithuania, the number of farms is significantly decreasing. This indicates a declining interest of the population in agricultural activities, which, compared to other activities, are more exposed to uncertainties related to climatic conditions, volatility and price fluctuations. In Lithuania, farms do not manage their risk sufficiently – in some years, especially when unfavourable climatic conditions or low purchase prices of agricultural products prevail, a large part of farms experience more than 30% decrease in net value added. Targeted advice from professional agricultural advisers can help plan farm activities, forecast and assess potential risks.

Currently, advisory services in the country are provided by 13 accredited institutions. Accreditation of advisory institutions and advisers is carried out by the PI Rural Business and Market Development Agency under the Ministry of Agriculture of the Republic of Lithuania. Accredited institutions include 4 public institutions, 6 science, training and study institutions, 1 state institution, and 2 limited liability companies. They employ 282 advisers. The readiness of an adviser to provide advice and training services is assessed on the basis of his / her education, advisory work experience and professional development. The advisory body and the adviser are accredited for a period of 3 years.

Agricultural advice, in particular on agricultural machinery or products, is provided by private advisers. They represent specific companies trading in agricultural machinery and products. Their advice is focused on marketed production. Consultations on the requirements of EU regulations and directives to ensure good agricultural and environmental condition, and similar issues are usually not provided by private advisers.

The total number of employees of the institutions participating in the survey is 1,177. The distribution of employees by number, gender and profession (advisers) is shown in the table below.

Table 7 Distribution of employees in institutions providing advisory services

Institution	Number of employees	Of which women	Number of advisers	Of which women
Institution 1	25	12	25	8
Institution 2	110	70	10	7
Institution 3	10	5	8	3
Institution 4	18	9	8	6
Institution 5	50	35	20	12
Institution 6	107	72	6	4
Institution 7	350	200	150	70
Institution 8	400	300	180	90
Institution 9	100	45	8	3
Institution 10	7	3	3	0

The table shows that the number of employees in institutions varies from 7 to 300 – 400. Institutions with a significantly higher number of employees than the number of advisers working in them mean that advising is not the main activity of these institutions. For example, the institution is engaged in scientific or study activities, but also provides advisory services to farmers.

Regarding staff turnover in the institutions, the six institutions surveyed said that the number of employees had remained the same over the last five years, two respondent institutions indicated that the number of employees had decreased over the same period, and two others said that the number had increased. One of the reasons for the reduction in the number of employees was the decision of employees to change jobs. The second reason was the reduced funding for R&D activities (R&D – research and experimental development), which were the main activities of the organization.

In terms of professional experience of advisers, the largest number of advisers have 10 years or more of professional experience, slightly fewer advisers have lower expertise, reaching 3-9 years. Those with only 1-2 years of experience and those with no advisory experience make up the smallest number. The distribution of the number of advisers is shown in the table below. Five out of ten institutions surveyed stated that their organization had a department, division or other structural unit responsible for strengthening staff competencies.

Table 8 Distribution of advisers by professional experience

Advisory experience (years)	0-3	3-10	more than 10
Number of advisers	23	85	128

Institutions were also asked to indicate the percentage of total advisers' time spent on learning / training. The results are presented in the table:

Table 9 Employee time allocated for training (%)

Institutio n 1	Institutio n 2	Institutio n 3	Institutio n 4	Institutio n 5	Institutio n 6	Institutio n 7	Institutio n 8	Institutio n 9	Institutio n 10
30%	30%	<i>not specified</i>	20%	<i>not specified</i>	5%	10%	<i>not specified</i>	40%	<i>not specified</i>

Advising takes place through direct contact with farmers, their visits to advisory offices or visits of agricultural advisers to farms or forest holdings, field days, seminars, discussion groups, and training using digital technologies (digital tools, apps, etc.).

Based on the survey data, it can be stated that the institutions use various methods and tools of advice. The most popular method of advising used by nine of the ten institutions surveyed is individual face-to-face communication with a client on the farm. The majority of institutions (seven) also indicated that they provided one-to-one telephone consultations. In addition, six institutions noted that the advice was provided through the Internet, various programs and mobile applications.

The year 2020 is different due to the global COVID-19 pandemic. All sectors, not just agriculture, have faced difficulties. In order not to lose customers, service providers had to take measures and try to adapt to the current situation. Advisory service providers are no exception. Recently, face-to-face communication with clients has been replaced by remote advising. In Lithuania, as in other countries of the world, consultations are provided, trainings and seminars take place remotely, organizing teleconferences using Skype, Skype for Business, Zoom Video Communications tools and various communication platforms such as Microsoft Teams and others. If necessary, agricultural advisers, following the

recommendations and safety requirements, go to farms, fields, and forestry specialists visit forest holdings, where they provide professional consultations.

4.4 Clients and topics / contents

Advising influences and shapes one or another attitude of farmers, helps to increase the competitiveness of farms, to promote the supply of high-quality agricultural products to the market, to increase the skills of farmers, and to deepen their professional knowledge.

According to the information provided by the surveyed advisory institutions, on average about 46 clients (farmers or agricultural institutions) apply for advisory services each year.

Based on other statistical surveys, advisory services and financial support tend to be used by younger farmers and forest owners with high or higher education having medium or large farms.

Similar trends can be observed when analysing the data provided by the institutions participating in this survey – advisory services are mainly used by younger farmers with small or medium-sized farms, as well as small or medium-sized enterprises. According to the statistical data of 2020, 60.94 % of the country's farmers are men, and 39.06 % – women. Four out of the ten institutions surveyed included women running farms among all their clients.

After 1991 land reform farmers mostly needed information on the management of farm enterprises. Later, there was a need to help understand the EU requirements, the specifics of business project preparation. If in the past there was enough advice on how farmers could develop their business profitably without harming nature, produce competitive products, survive and lead in a market economy, there has been a need for advice on precision and sustainable farming in recent years. Due to the digitalization process in agriculture, changes are taking place very rapidly, and due to the use of information technologies in agriculture, new ways of advising and knowledge transfer are emerging. A modern approach to modern agricultural technologies and advisory methods, effective communication with research and training institutions, and participation in the activities of international organizations such as the European Innovation Partnership (EIP) network are now crucial.

According to the information provided by the surveyed institutions, most of their advice is on plant production and animal husbandry. Consultations on forestry, vegetable growing and horticulture are in the second place, in terms of popularity.

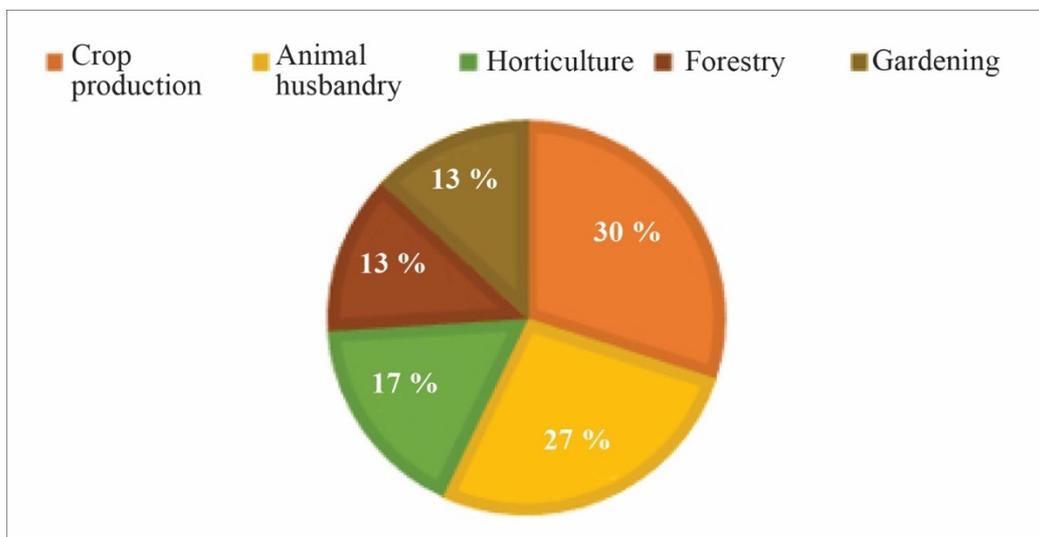


Figure 3 Distribution of advisory services by categories

Farmers address the institutions providing advisory services in the country also for advice on farm management, accounting, business economy, compliance with the requirements of good agricultural and environmental condition, application of technologies and other issues. Training services are also popular among farmers and forest owners, as farmers in the country, like farmers around the world, face challenges related to increasing farm competitiveness, adapting to climate change, implementing innovations, etc. LAAS is one of the largest providers of training services in the country, organizing classroom and distance learning courses. According to Dr. E. Makelis, Director of LAAS, “Farmers and their needs have grown. A new generation is coming. While evaluating this and following the examples of foreign advisers, we are looking for new ways to involve farmers in discussion groups, thinking about what they know and what they do not.”

In the near future, the role of organizations providing advisory services will remain to provide necessary information as clearly and widely as possible, to cooperate with scientific institutions in creating and implementing innovations, and to participate actively in the development of AKIS.

4.5 Linkages with other AKIS actors / knowledge flows

The activities of an adviser are based on constant cooperation with both clients – farmers and forest owners, and other advisers. Advisers are encouraged to participate in discussion groups where they have an opportunity to share their experience, learn from other advisers, participate in conferences, seminars and projects where not only new information can be obtained, but also contacts can be made at both national and international levels.

The links between the institutions involved in AKIS are illustrated in the diagram, which is described in great detail in sections 2.1 and 2.2 of this description. Institutions providing advisory services work closely with study institutions. For example, LAAS closely cooperates with VMU AA in various activities – they initiate and implement projects useful for agricultural development and farmers and cooperate in the development of future agricultural specialists together. Institutions providing advisory services also cooperate with scientific institutions, they participate in project activities with researchers, help farmers to transfer and implement the latest technological solutions on their farms, and apply innovations in practice.

In order to rationalize the development of innovations, disseminate new knowledge and accelerate the implementation and application of innovative products in practice, ensure more transparent cooperation and division of functions between the country's science, study and advisory institutions, in 2019 the methodology of inter-institutional cooperation was prepared by LAAS, VMU AA, the Lithuanian Research Centre for Agriculture and Forestry (LRCAF) and the Institute of Animal Science of the Lithuanian University of Health Sciences (IAS LUHS). Recognizing the importance of the latest research and innovation-based technologies, knowledge and innovation, all these institutions strive to provide farmers with the information they need in the most acceptable, fastest and cheapest way, and to provide better and more effective advice.

The institutions providing advisory services that participated in the survey were asked to indicate the intensity of their cooperation with other institutions (studies, science, public authorities, non-governmental organizations, etc.). The results are shown in the table below.

Table 10 Intensity of interinstitutional cooperation

Cooperation is carried out with	Intensity of cooperation		
	Strong	Medium	Weak
Study institutions		●	
Research institutions	●		
Authorities		●	
Farmers' organizations		●	
Non-governmental organizations		●	
Private organizations			●
EIP operational groups		●	

Based on the survey results, it can be seen that medium-intensity cooperation between different institutions of the country dominates. Cooperation is limited to what is necessary to ensure the quality of service provision and to perform all other functions performed by the institutions. In Lithuania, AKIS is fragmented, knowledge and innovations do not always reach farmers in the fastest and most efficient way. In recent years, however, the country's authorities and farmers have become increasingly involved in EIP action groups. In this way, farmers have an opportunity to work directly with researchers, business companies and advisers, can apply the latest technologies on their farms, receive scientific advice on how to make more effective use of innovation to increase farm output.

As the majority of the surveyed institutions are study and science institutions, they constantly cooperate with each other, implement joint projects and other joint activities, therefore the table of survey results shows that the cooperation between these institutions is strong.

4.6 Programming and planning of advisory work

Technological and structural changes are constantly taking place in agriculture. Farmers' decisions are influenced by the changing agricultural policy of the country, rural development goals, and the economic situation, which increases the need for information and advice. Agricultural advisory institutions encourage the advised farmers and other economic entities to seek knowledge and help to form decision-making skills.

The success of advising is determined by several factors such as competence and experience of an adviser, openness of a client, and mutual trust, but the most important factor is choosing and suitable application of a correct advisory method. The goal of institutions providing advisory services is long-term cooperation. The aim is to gain the trust of customers through competent work and regular communication. Specialists must take full responsibility for the advice and services provided, therefore they must constantly improve their qualifications, work closely with public authorities inspecting farms, constantly delve into farm requirements and the legal framework, and strive to ensure financial and economic security of clients' businesses.

Some institutions providing advisory services have administrative units responsible for enhancing the competencies of advisers. They are called differently in different organizations – human resource or human resource development departments, human resource services, training departments, etc. For example, LAAS has a Human Resource Development Division, which is responsible for identifying the need for training. In other words, this division collects information on which competencies need to be developed by the specialists. Then it plans and organizes relevant training sessions and seminars. The institution also has a Training Service Division, which is responsible for organizing training courses for advisers, farmers and forest owners.

According to the survey data, half of the institutions providing advisory services, which participated in the survey, have administrative units responsible for improving the competencies of specialists. The specialists of the institutions that do not have departments or services responsible for increasing the competencies of specialists improve competencies by participating in seminars, training courses, conferences, agricultural exhibitions both in Lithuania and abroad.

The table below shows the average number of days per year that advisers attend training on advisory topics.

Table 11 Number of training days a year

Institution	Number of training days (on average a year)
Institution 1	40
Institution 2	5
Institution 3	Not specified
Institution 4	80

Institution 5	Not specified
Institution 6	10
Institution 7	20
Institution 8	Not specified
Institution 9	5
Institution 10	30

The table shows that, on average, advisers spend 27 days a year on professional development. Despite the fact that some advisers spend more time on professional development and competencies, others – less, however, in order to keep up with constant changes and digitalization process, advisers are compelled to constantly deepen their knowledge, innovate to provide farmers and forest owners with quality advice. Farmers themselves are interested in innovations and innovative technological solutions, they visit exhibitions both in the country and abroad, communicate with farmers in other countries, therefore the specialists providing consultations cannot afford to lack behind.

The institutions surveyed were asked to indicate how much of their working time and what activities the advisers devote to. The results of the survey are presented in the table.

Table 12 Distribution of activities

Institution	Activities			
	Development of innovations	Consulting	Information dissemination	Training
Institution 1	20%	10%	10%	20%
Institution 2	10%	10%	10%	10%
Institution 3	not specified	not specified	not specified	not specified
Institution 4	20%	20%	20%	20%
Institution 5	not specified	not specified	not specified	not specified
Institution 6	5%	3%	37%	5%
Institution 7	10%	10%	10%	20%
Institution 8	not specified	not specified	not specified	not specified
Institution 9	40%	not specified	30%	30%
Institution 10	not specified	not specified	not specified	not specified

The data in the table shows that the distribution of time between different activities is quite similar. The remaining part of the time not indicated in the table is devoted to other activities not specifically mentioned.

The organizations have an incentive mechanism in their human resource development plan. Incentive procedures vary across institutions. In some institutions, advisers are paid salary bonuses depending on the number of contracts an adviser has entered into with clients over a period. In other institutions, the remuneration of advisers consists of two parts – a fixed part of the remuneration is paid, and the other part is earned by the adviser by providing services to clients, i.e. at the beginning of the year, the adviser plans how many services he intends to sell (to provide advice) and at the end of the year it is estimated how well he has performed. If the plan is fulfilled, the adviser receives the intended portion of remuneration. In some organizations, the adviser receives an incentive from each contract with the client. In still other organizations, advisers sell services to clients, and clients pay for the services provided. The adviser receives a portion of each payment for services from clients. Some of the institutions surveyed also mentioned the way of encouraging advisers with letters of thanks. In summary, the most popular way of incentive for activities is bonus pays.

4.7 Advisory organizations forming the FAS and evaluation of their FAS implementation

In Western European countries, farmer advising and education are supported by the state and considered one of the priorities. The provision on Lithuanian agricultural advising is prescribed in the strategic agricultural and rural development documents. Advising agricultural entities aims to increase the ability of farmers and other rural residents to benefit from EU structural fund subsidies and to improve environmental conditions. The goals and priorities of the advisory activities are determined by the changing agricultural policy of the country, goals of rural development, economic situation and needs of farmers related to these processes.

Advisory institutions and other institutions accredited by the Ministry of Agriculture of the Republic of Lithuania carry out advisory activities for farmers

and forest owners. Some advisory institutions provide advisory services to farmers in a comprehensive manner, while others focus their activities on the preparation of business projects and consulting on economic issues. High level of participation of farmers in submitting applications under various programs and measures shows that advising on the possibilities of EU support, on the implementation of projects and compliance with EU requirements is necessary. The success of support absorption depends on how farmers are informed about the requirements, therefore farmers need regular advice.

All EU countries have farmer advisory systems in place, which vary from country to country, depending on the country's economic and political situation, traditions and specific farm characteristics. In Lithuania, the advisory system is coordinated by the Ministry of Agriculture of the Republic of Lithuania. An institution under the Ministry is responsible for the accreditation of agricultural advisers. Institutions providing advisory services are responsible for information provision and organization of training to farmers.

5. Summary and conclusions

While summarizing the main structural elements of the agricultural and forestry sectors, it can be seen that the largest number of farms in Lithuania are from 1 to 5 ha of land. Farms with more than 500 ha of land make up the lowest number. In Lithuania, in terms of gender distribution, there are more farmer men than women and their age is over 41. In this context, the aim is to increase the number of young farmers, which will help to develop the agricultural sector and ensure continuous innovation. In terms of preparation for farming according to the education available, both men and women have more practical preparation for farming than the required vocational training in agriculture. In order to increase the number of specialists, i.e. the number of qualified farmers who would have the necessary knowledge for farm development and integration of innovations, institutions operating in AKIS organize qualification improvement courses and training sessions. One of such institutions is LAAS, which organizes various types of training courses taking into account the needs of farmers and today's market trends.

Regarding AKIS in Lithuania, the main communicators of information to farmers and forest owners are advisers who respond to ongoing changes in the agricultural sector and work with interactive tools to contribute to farm progress and convey professional, efficiency stimulating and innovation-friendly information. Consultations are provided by impartial and private advisers; impartial advisers do not represent one service or company, they provide advice that is necessary for the farmer, they do not seek to sell a specific service and take into account current needs of the farmer. Private advisers represent the business sector and provide a single service or a package of services, representing a particular company.

Effective co-operation of institutions interacting within AKIS can help to ensure the successful functioning of this system and the implementation of intended goals. It also determines what knowledge, innovations and necessary support farmers and forest owners will receive. It is important that a modern approach to modern agriculture and its opportunities are formed for farmers and participation in the activities of international organizations encouraged. In summary, it can be said that for farmers, the continuous acquisition of the latest knowledge provides a competitive advantage, helps to accept the challenges arising with the possibility of modernization, helps to improve qualifications and strengthen competencies.

In order to update the description of AKIS in Lithuania, a survey of institutions providing advisory services was conducted. The information obtained during the survey helped to identify the advisory services provided, client groups of advisory service providers, the nature of advice, etc. 10 accredited institutions providing advisory services participated in the questionnaire survey.

While taking into account the market analysis, it can be stated that consultations on forest issues are provided to forest owners by public authorities such as the Lithuanian State Forests, the State Forest Service, the Lithuanian Agricultural Advisory Service and private company advisers. Most of forest owners have no forestry education and have inherited or acquired forests for commercial purposes. The network of farmer advising is more developed, providing various types of consultations necessary for the development, profitable functioning and modernization of the farm. Great attention is also paid to raising the qualification of the farmer and his farm employees. One of the main advisory institutions in the country is LAAS, which provides complex services.

In order to keep the agricultural sector stable, funding schemes and public policy plays a very important role. The agricultural sector in Lithuania is supported by EU funds; agricultural policy is determined by the EU common agricultural policy. During the CAP period 2014-2020, support was provided to the Lithuanian agricultural sector in order to increase the modernization and stability of farms by encouraging young people to start farming. EU funding support also encourages farmers to contribute to the improvement of climate change, practice organic farming and sustainable use of necessary resources, and involve specialists from various sectors in farm activities in order to make the farm competitive and profitable. Within the country, the Ministry of Agriculture of the Republic of Lithuania is responsible for the formation and implementation of agricultural policy.

In Lithuania, institutions providing advisory services employ qualified specialists who can provide professional assistance to farmers, as advisers are accredited every three years. Accreditation ensures the ability of a specialist to provide high quality and competent services that meet the standards, which gives the farmer, as a client, more confidence not only in the institution where the required adviser works, but also in the adviser himself. After the survey, it was found out that in Lithuania, more women than men work in institutions providing advisory services, and they have many years of working experience. The analysis of service provision methods revealed that mostly individual consultations are provided to farmers,

less often – group consultations. The global pandemic is changing the situation in the labour market; institutions need to make new work organization decisions. Advisory services are no exception. Switching to remote services is taking place.

The survey results showed that the main clients of advisory services are young farmers. It can be assumed that they are motivated by a lack of experience in agriculture, and they seek to make the most effective decisions, not only with minimum time costs, but also with respect to finance. Young people are more flexible to innovation, change, and can therefore more easily accept the challenges of digitalization or robotics, which can often seem like a normal process. Older farmers have more experience, which also determines their willingness to rely on their experience in making various decisions. The main enterprise regarding which farmers apply for advice is plant production.

In Lithuania, the cooperation between the institutions participating in AKIS is of medium intensity. Institutions providing advisory services work closely with academic institutions as they train the necessary professionals who later become service-providing advisers. Another important aspect is that scientific institutions provide the latest research information, and transfer scientific and technological innovations. Strong cooperation with scientific institutions also ensures that the adviser can form a modern approach of the farmer to economic activities, make sustainable decisions, as today the farm does not cover only soil, water and air. Digitalization and robotization processes are beginning to “bring” robots, drones, autopilot tractors, etc. to farms, and advisers as well as scientific institutions are helping to speed up the adoption and implementation of these processes.

Professional qualification of advisers is of special concern in the institutions providing advisory services; a certain number of hours per year is set, which are allocated for participation in various training courses. Advisers are encouraged to participate in international project activities in order to acquire good practice from advisers from other countries, to strengthen their existing competencies with new knowledge and advisory methods. Both professional competencies and general ones are developed, which allows the adviser to provide comprehensive assistance to the farmer. According to the survey, the most commonly used form of incentive is a salary bonus.

Institutions providing advisory services in Lithuania receive funds necessary for their activities from the EU structural funds, the budget of the Republic of Lithuania and from those farmers who purchase the services. While assessing the



advisory system in the country, it can be stated that the help of the farm advisory system is effective and useful for farmers, it covers many areas of agriculture and helps the farm to expand and adapt to various environmental changes

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AKIS and advisory services in Luxembourg

Report for the AKIS inventory (Task 1.2) of the i2connect project

Date: December, 2020

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Executive summary

Luxembourg is characterized by a utilized agricultural area (UAA) of 131,592 ha, representing 51 % of its territory, which in turn can be divided into arable land (47.1 %), permanent grassland (51.6 %), and vineyards or other cultivated land (1.3 %). A total of 4.4 % of the UAA is organically farmed. In 2019, the sector encompassed 1,872 agricultural farms having an average farm size of 70.3 ha. In terms of farm type and economic size, most farms in Luxembourg are specialised in grazing livestock (1220 farms in 2019 equalling 65.2 % of farms). This can be further distinguished into 530 specialised cattle – dairying farms, and 363 specialised cattle – rearing and fattening farms. The agricultural sector employs 3,342 annual work units (AWU) of which 68 % were covered by family members. The contribution of agriculture to the GDP is low with 0.2 %.

AKIS (agricultural knowledge and innovation system) actors in Luxembourg can be divided into non-governmental, governmental advisory services, research institutes, farmer and farmer-based organisations, cooperatives and producer groups, and private sector. Eight public accredited advisory organisations (PAAO) exist in Luxembourg and their accreditation is in charge of the Ministry of Agriculture, Viticulture and Rural Development (MAVRD). Next to the MAVRD with its administrations (the Administration of Agricultural Technical Services (ASTA), the Rural Economy Department (SER), the Wine Institute (IVV) and the Administration of Veterinary Services (ASV)), the Ministry of Environment, Climate and Sustainable Development (MECSD) is also involved in the Luxembourg AKIS mainly with its administrations Nature and Forest Administration (ANF) and Water Management Administration (AGE). The Chamber of Agriculture (LWK) is mandated with the coordination of the PAAO.

Semi-structured interviews carried out with six experts of public authorities, PAAO, research and education organisations and farmer-based organisations and online surveys filled in by five of the eight PAAO were used as the basis in this study to characterise the agricultural advisory services and the AKIS situation in Luxembourg. The eight PAAO employ 44 advisors with a 20 % female quota. These PAAO are the Chamber of Agriculture (LWK), CONVIS, Institute for Organic Agriculture (IBLA), E'slecker Setzgrompergenossenschaft (Synplants), Nature Park Oewersauer, Centrale paysanne, Privatwënzer (OPVI) and Domaines Vinsmoselle.

The advisory system is modular in which farmers receive 50-100 % funding per module from the MAVRD. The primary source of funding for the advisory services of the PAAO are national governmental funds (public funds) and cost-recovery from farmers (fee for service financing). The PAAO pointed to difficulties with financing of their advisory services, due to low funding rates and the fact that overhead costs are not included in the calculation of the hourly wage. The PAAO further stated that the module system did not allow time for dissemination and personal advanced training of advisors. Funding possibilities provided by the MAVRD were described as unsatisfactory and alternative funding sources are needed.

The median number of clients per year of the PAAO is 65. They were characterised by the respondents of the online survey as farmers with large commercial farms (>100 ha) and farmers with small/medium-scaled farms. The most frequently applied advisory methods were identified as mainly individual advisory via telephone or face to face on the farm. A shift from individual face to face advisory on the farm to individual advisory via telephone or via digital apps was described as a result of the COVID-19 pandemic. The main topics covered are production technologies, followed by legal regulations and grant applications, agri-environmental questions and general farm management (n=5). The main areas of competences of the PAAO are crop production, followed by livestock production, farm machinery, vegetables, fruits and vines (n=5).

To meet the challenges of the new CAP knowledge and skills on environmental protection, knowledge on markets and farm viability, mitigation and adaptation to climate change and specific technological knowledge were described as important by 100 % of the PAAO (n=5). Experts added the future importance of digitalisation and a holistic consultancy on farms.

Within the different AKIS a very good cooperation in viticulture areas was observed, while cooperation in agriculture was described as weak. Experts' opinion is that the module system inhibits innovation and collaboration between the PAAO, as a competition situation is created. Nevertheless, PAAO collaborate in research or dissemination projects. A lack of possibilities to consult farmers according to their needs was criticised by the advisory experts, as every advisory activity needs to be imbedded in an existing and to the respective organisation accredited module.



The different experts all presented visions and possibilities on how to improve the current advisory system to meet future challenges. These included ideas on how to move towards a better cooperation between AKIS actors, a more holistic approach of advisory, a better adaptation to currently relevant topics and an innovation-promoting system.

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Abbreviations

AGE	water management administration
AKIS	agricultural knowledge and innovation system
ANF	nature and forest administration
ASTA	administration of the agricultural technical services
ASV	veterinary services administration
AWU	annual work units
CAP	common agricultural policy
CECRA	certificate for European consultants in rural areas
EIP	European innovation partnership
ERIN	environmental research and innovation department of LIST
FAS	farm advisory system
FEMAL	federation of agricultural and industrial machinery enterprises of the Grand Duchy of Luxembourg
FILL	Fördergemeinschaft Integrierte Landbewirtschaftung Luxembourg
GDP	gross domestic product
IBLA	institute for organic agriculture
IVV	wine institute
LIST	Luxembourg institute of science and technology
LSG	Luxembourgish seed growing cooperative
LTA	agricultural school
LWK	chamber of agriculture
MAVRD	ministry of agriculture, viticulture and rural development
MBR	Maschinen und Betriebshilfsring Lëtzebuerg
MECSD	ministry of environment, climate and sustainable development
OPVI	Privatwënzer
PAAO	public accredited advisory organisation
SER	rural economy department
Synplants	E'slecker Setzgromperengenossenschaft
UAA	utilised agricultural area

1. Main structural characteristics of the agricultural sector

The Grand Duchy of Luxembourg is located in central Europe. It shares its borders with Belgium to the north-west, with France to the south and with Germany to the east. With a surface area of 2,586 km², it is regarded as one of the smallest EU member states. Its average population has considerably increased over the past 10 years from 502,100 inhabitants in 2010 to 626,100 inhabitants in 2020 (STATEC, 2020a).

With a utilised agricultural area (UAA) of 131,592 ha in 2019 (MAVDR, 2020a), Luxembourg has a large percentage of rural area with a total of 51 %. The UAA is divided between arable land (61,959 ha; 47.1 %), meadows and pastures (67,884 ha; 51.6 %) and vineyards or other cultivated land (1,749 ha; 1.3 %) (MAVDR, 2020a). Furthermore, 4.7 % of the UAA are under biodiversity contracts, in the framework of the grand-ducal regulation of 11 September 2017 establishing a set of aid schemes for the conservation of biological diversity in rural areas, and are managed accordingly by the farmers (Gouvernement de Luxembourg, 2017a; SER, 2020a).

In 2019, 1,872 agricultural¹ holdings existed with an average farm size of 70.3 ha (MAVDR, 2020a). A total of 510 holdings cultivated more than 100 ha, 483 holdings cultivated between 50 ha and 99.9 ha, 174 farms had between 30 ha and 49.9 ha, and 705 farms laboured less than 30 ha of agricultural land (STATEC, 2020b).

In 2019, the sector counted a total active agricultural labour force of 3,342 of annual work units (AWU), of which 2,278 were family members. Of the remaining 1,064 non-family workforce, 794 were employees and 271 day-labourers (MAVDR, 2020a). The AWU of the agricultural sector in Luxembourg is steadily decreasing, from 3,726 in 2010 to 3,342 in 2019 (MAVDR, 2020a)

The majority of the workforce was between 51 and 60 years of age (908); 21 were below 20 years of age, 364 were between 21-30 years of age, 546 were between 31-40 years of age, 634 between 41-50 years of age and 553 were over 60 years

¹ For the purpose of increasing readability, the terms agriculture, agricultural holding, farm, farmers and farm manager used throughout the report also refer viticulture, wineries and winegrowers, unless specified otherwise.

of age (MAVDR, 2020a). The average age of the farm manager was 53 years in 2019 (SER, 2020a).

In terms of farm type and economic size, most farms in Luxembourg are specialised in grazing livestock (1220 farms in 2019 equalling 65.2 % of farms) (MAVDR, 2020a). This can be further distinguished into 530 specialised cattle – dairying farms, and 363 specialised cattle – rearing and fattening farms. Holdings specialised in horticulture (38 farms), specialised in crop production (175 farms), or specialised in granivore husbandry (32 farms) all play a subordinated role in the Luxembourgish agricultural sector (MAVDR, 2020a).

In 2019, 5,817 ha were organically farmed or in the progress of being converted to organic farming, which represented 4.4 % of the total UAA (MAVDR, 2020a). The number of organic producers (farmers, horticulturists, winegrowers, fruit farmers and beekeepers) increased from 96 in 2010 to 146 in 2019. Looking specifically at organic farmers, the number climbed from 54 to 82 over the same time period (MAVDR, 2020b). Similar to the overall focus of the agricultural sector, specialised cattle – dairying (14 holdings) and specialised cattle – fattening and rearing (20 holdings) are also the prevalent orientations of the organic farms (SER, 2020b).

The importance of the specialised grazing livestock sector is also reflected in the number of livestock held by the farms. In 2019, a total of 193,575 cattle was raised in Luxembourg, of which 53,947 were dairy cows and 25,819 were suckler cows (MAVDR, 2020a). The number of cattle raised by farms has increased over the past decade, with 105 farms in 2010 raising more than 300 cattle to 135 farms in 2019. Over the same time period, the number of farms with less than 50 cattle decreased from 347 farms to 251 (MAVDR, 2020a).

The dairy sector produced 421,300 t of milk in 2019 with an average milk yield of 7,806 kg/cow/year (STATEC, 2020c). In terms of meat production, 14,816 t carcass weight of large cattle and 225 t carcass weight of veal were slaughtered in 2019, while a number of 23,258 cattle were exported (MAVDR, 2020a).

Looking at the granivore husbandry sector, 84,065 pigs and 132,128 poultry (broilers and laying hens) were raised in 2019. In the same year, 14,962 t carcass weight of pigs were slaughtered and exported, 9,474 piglets were slaughtered and

1,562 live piglets were exported. Furthermore, 2,216 t of eggs were produced and 283 t carcass weight poultry meat (MAVDR, 2020a).

Looking at crop production in Luxembourg, 160,001 t of cereals were produced on 27,393 ha in 2019 (MAVDR, 2020a). The three most important cereal crops species were wheat (74,933 t), barley (35,356 t) and triticale (28,239 t) (MAVDR, 2020a). The focus in animal production on grazing livestock is also reflected in crop production with 28,545 ha being dedicated to forage plants in 2019. In this category of crops, silage maize was grown on 15,070 ha, making it the most widely grown crop in Luxembourg in 2019 (MAVDR, 2020a). In the same year, potatoes were grown on 601 ha yielding 15,330 t. In 2018, horticultural production was carried out on 167 ha producing a total of 1,914 t of vegetables (MAVDR, 2020a). On the 1,286 ha of vineyards, 76,047 hl of wine were produced in 2019 (MAVDR, 2020a).

The country's gross domestic product (GDP) per capita has increased over the past decade. In 2010, it was 79,160 €/capita and increased to 102,200 €/capita in 2019 (EUROSTAT, 2020a). The agricultural sector, however, only contributed 0.2 % in 2019 (EUROSTAT, 2020b). This share has been stable around the 0.2 – 0.3 % mark for the past decade.

2. Characteristics of AKIS

2.1 AKIS description

In the following chapter, the agricultural knowledge and innovation system (AKIS) in Luxembourg is described. The description includes the most relevant AKIS actors and information on knowledge flows. Main sources for chapter 2.1 were the semi-structured interviews, which were conducted with six experts from public authorities, public accredited advisory organisations (PAAO), research and education organisations and farmer-based organisations. These interviews were conducted in the framework of the project for the purpose of this AKIS inventory update and the key questions can be seen in the AKIS country reports guideline (Knierim et al., 2020). A review of grey literature and websites complements the text. The interrelationship between the different PAAO and AKIS actors is illustrated in a diagram presented in chapter 2.2 (Figure 1).

2.1.1 AKIS actors and knowledge flows

There are eight PAAO in Luxembourg: Chamber of Agriculture (LWK), CONVIS, Institute for Organic Agriculture (IBLA), E'slecker Setzgrompergenossenschaft (Synplants), Nature Park Oewersauer, Centrale paysanne, Privatwënzer (OPVI) and Domaines Vinsmoselle. These eight PAAO are described in the following and further characterised in chapter 4. The Ministry of Agriculture, Viticulture and Rural Development (MAVRD) is in charge of the accreditation of these organisations. Besides these non-governmental advisory services, the administrations of the MAVRD (the Administration of Agricultural Technical Services (ASTA), the Rural Economy Department (SER), the Wine Institute (IVV) and the Veterinary Services Administration (ASV)) provide governmental advisory services, and acquire and process information in their respective thematic field of competences. Furthermore, two research institutes (Luxembourg Institute of Science and Technology (LIST) and IBLA), an agricultural school (LTA), different unions & farmers associations, cooperatives & producer groups, and input traders complement the AKIS of Luxembourg. It is important to note, that the advisory function is not the sole role of these organisations. Besides the MAVRD, the Ministry of Environment, Climate and Sustainable Development (MECSD) together

with its administrations Nature and Forest Administration (ANF) and Water Management Administration (AGE) play a role in the AKIS of Luxembourg.

Public authorities

The public sector plays a central role in the provision and financing of advisory services. The **MAVRD** is the responsible administrative body which regulates advisory services of the PAAO. Similarities exist between its four administrations (ASTA, SER, ASV and IVV) in the provision of advisory services for farmers free of charge, as well as in the processing and dissemination of agricultural information and knowledge.

ASTA focuses on advisory and information services on plant and animal production, plant protection, climate change and sustainable agricultural practices in general. Implementation of agriculture specific legislation (e.g. on agricultural products, factors of production, plant protection and agricultural cooperatives and syndicates) is a further task area of ASTA, as well as promotion and control of agricultural products. ASTA produces data on agro-meteorology and runs control and testing laboratories. Finally, ASTA is also responsible for the conduction of maize and grassland variety trials (MAVDR, 2020c).

SER is functioning as a link between the common agricultural policy (CAP) and the national agriculture sector. They translate, elaborate and implement the direct aid schemes under the CAP in Luxembourg (MAVDR, 2020d). Further fields of responsibility range from accounting, over advisory services on investment, business development and first installation of young farmers, to processing agricultural information in general, e.g. agrarian statistics or reports on topical developments in the Luxembourgish agricultural sector (MAVDR, 2020e).

The **ASV** is under the responsibility of two ministries: The MAVRD and the Ministry of Health. In their function as an administration of the latter, they are responsible for the control of animal products and public health; in their role as an administration to the former, their role includes animal welfare, prevention of animal diseases, and marking and registration of animals (MAVDR, 2020f). ASV ensures compliance with laws and regulations specific to animal health and the well-being of animals (ASV, 2020).

One of the main roles of the **IVV** is to provide advisory services to winegrowers. It also offers lectures, seminars and further training courses covering significant issues and subject areas in viticulture and oenology. The aim is to acquaint winegrowers with the latest findings and development in these areas. Furthermore, IVV conducts applied research on its own trial fields in the areas of plant protection, fungus resistant grape varieties, development of environmentally friendly production processes, vine nutrition, viniculture, wine treatment and oenology (MAVDR, 2020g).

The **MECSD** with the two administrations **ANF** and **AGE** are responsible for different environmental programmes relevant to agriculture. One of the tasks of ANF, related to agriculture, is the protection of nature, natural resources, biodiversity and landscapes. ANF is in charge of the nationwide coordination of the biodiversity programmes, in which farmers can participate. However, the task of concluding biodiversity contracts (to ensure the participation of the farmers in these programmes) is the responsibility of the **biological stations** and **nature parks** (MDDI & MAVPC, 2018). **AGE** is in charge of the initiation of corrective and curative measures necessary to improve water quality and flood control in Luxembourg (AGE, 2020). The future implementation of these measures into agricultural practice will be performed in collaboration with water protection cooperations. Such cooperations are currently being developed under the coordination of a moderator. The advisors of LWK, CONVIS, Nature Park Oewersauer and IBLA will be involved in these cooperations to facilitate the contact with the farmers.

Since 1993, it is possible to found nature parks in Luxembourg. While there currently exist three nature parks, the **Nature Park Oewersauer**, Nature Park Our and the Nature and Geo-Park Mëllerdall, only the Nature Park Oewersauer is a PAAO with accredited agricultural advisors. As this nature park is home to the Upper Sûre reservoir, which provides drinking water for approx. 80 % of Luxembourg's inhabitants, it is of the utmost importance to promote a sustainable regional and rural development in line with water protection (Nature Park Oewersauer, 2020). Agriculture is one of the seven main fields of action of the nature park and the aim of the park's agricultural advisory services is to encourage agriculture in harmony with drinking water protection and nature. The main focus areas of this PAAO are current agricultural laws and regulation, creation of fertilisation plans, crop production, sensibilisation for environmentally friendly practices and water protection consultation (Nature Park Oewersauer, 2020).

Since 2015, an agricultural cooperation (LAKU) between the nature park, the drinking water provider and the farmers exists in the nature park, in the framework of which the agricultural advisor is also active and offers their support.

Research and education organisations

LIST is a public research institute. Within this institute, the Environmental Research and Innovation (ERIN) department plays a role in the Luxembourgish AKIS. The department is further structured into four units that focus their efforts on the major environmental challenges of the society, including climate change mitigation, ecosystem resilience, sustainable energy systems, efficient use of renewable resources, and environmental pollution prevention and control (LIST, 2020a). The main working areas in agriculture and viticulture are: crop protection, precision farming, food safety and quality, alternative crops and organic farming (LIST, 2020b). LIST collaborates with other AKIS actors (e.g. LTA, LWK, IBLA) in different national and international research projects. Nationally, it is mainly involved in agricultural European Innovation Partnership (EIP) projects, where research, advisory services and farmers are encouraged to work together. Furthermore, LIST cooperates with other organisations such as LWK and LTA to run a warning and advisory platform for the main pests and diseases occurring in the major crops in Luxembourg (LIST, 2020c).

IBLA is the competence centre for research and advisory services in the field of organic agriculture and viticulture in Luxembourg. It is a non-profit organisation and is recognised as an official research institute in Luxembourg. According to its motto "research for the practice", IBLA aims to have rapid transfer of its research results and knowledge into the practice through its inhouse advisory services, seminars, field visits of trials and various information brochures and leaflets. The focus areas of its activities are inter alia protection of natural resources, biodiversity, sustainability assessment, preservation and improvement of soil fertility, variety testing, animal welfare and optimisation of crop rotation (IBLA, 2020). IBLA is in charge of the national variety trials in organic agriculture (cereals, grain legumes, potatoes, field fodder and maize), this in close collaborations with LTA, ASTA and the farmers. IBLA is also one of the main PAAO and their advisory services consult on all questions relating to organic agriculture and viticulture and their methods. They help farmers and winegrowers before, during and after the

process of converting their holding to organic management. Furthermore, IBLA provides conventional farmers and winegrowers support in applying methods from organic agriculture and viticulture (e.g. mechanical weed control) to their holding. The institute is also the contact point for advice on legume cultivation. Furthermore, IBLA works with other AKIS actors (e.g. LTA, LIST, Vereenigung fir Biolandwirtschaft Lëtzebuerg, BIOG, CONVIS, LWK) in different national and international research and dissemination projects (IBLA, 2020).

LTA is the only agricultural school in Luxembourg. Vocational training is the responsibility of the Ministry of Education, Children and Youth and the relevant professional chambers. There is therefore a close relationship between the LTA and the LWK at the level of agricultural training. Besides the role of education of the young farmers, LTA is also responsible for the official variety trials of cereals, grain legumes and potatoes in conventional agriculture in Luxembourg. They also conduct trials on production technologies in crop and permanent grassland. LTA participates in different national and European research consortia. Thus, LTA has a bilateral knowledge flow and a link exists between it, the research institutes and the third sector of farmer and farmer-based organisations (LTA, 2020).

Third sector farmer and farmer-based organisations

LWK is the chamber of agriculture of Luxembourg. LWK is the official representative of farmers, winemakers and gardeners. It was created by the law of 4th April 1924 (Gouvernement de Luxembourg, 1924). LWK has an advisory role in the legislative area: the government must ask the LWK for its opinion on any draft of laws and regulations that affects farmers, winegrowers and gardeners. LWK also has the right to formulate legislative proposals itself on topics in its area of responsibility that must be examined by the government and submitted to the Chamber of Deputies (LWK, 2020). An additional task is the vocational training and further education: LWK is involved in the organisation of training and teaching in the so-called "green" professions (e.g. farmer, gardener). As a professional chamber, LWK is authorised to carry out and certify further training activities. Through the law of 27th June 2016 on support for the sustainable development of rural areas, LWK is in charge of the coordination of the advisory system in Luxembourg (Gouvernement de Luxembourg, 2016). This gives it a double function in the AKIS, as LWK itself is also one of the main eight PAAO. LWK is active

in crop production and plant protection advice. It creates fertilisation plans for farmers. Another of its advice domains is water protection and nature conservation. LWK also organises applied field trials, mostly demonstration fields, to promote knowledge transfer. In addition, LWK manages the Luxembourgish food label "Produit du terroir - Lëtzebuenger ..." and the campaign "Sou Schmaacht Lëtzebuerg" (LWK, 2020).

In Luxembourg three **farmer unions** exist: **Centrale paysanne**, Bauerenallianz and Fraie Lëtzebuenger Bauer. Besides the role as a farmer's union, Centrale paysanne is also a PAAO, focusing mainly on advisory services in investment, accounting and economic issues. It also provides support and advice to young farmers at the new installation of their holding (Centrale Paysanne, 2020). Furthermore, Centrale paysanne conducts on farm field trials, in cooperation with LTA, and publishes an agricultural newspaper, as does the Bauerenallianz.

The ecological agricultural advice was founded in 1987 and is a joint initiative of **Landjugend & Jongbauer** (a young farmers' association) and Oekozynter Pafendall (an environmental association) to conduct innovative projects for the development of sustainable agriculture (Oekozynter, 2020). While the ecological agricultural advice is no PAAO, it is still co-funded by the MAVRD. The main areas of activity include advising farmers on practices for the protection of drinking water sources, developing ideas for a sustainable agricultural policy, carrying out field trials in regards to protein strategy for Luxembourg, and the creation of suggestions for the national action plan for the reduction of pesticides in Luxembourg (Oekozynter, 2020). It is also involved in the project "Natur Genéissen" together with the nature conservation syndicate SICONA.

Further **farmers associations** could be named as AKIS actors, for example Vereenegung fir Biolandwirtschaft Lëtzebuerg, Fördergemeinschaft Integrierte Landbewirtschaftung Luxemburg (FILL), Fédération des associations viticoles, as they are also generally involved in the knowledge transfer.

A further important actor in the Luxembourgish AKIS are **cooperatives and producer groups**.

CONVIS is an animal production cooperative and offers different services such as herdbook keeping; organisation of performance tests; marketing, buying and selling of breeding, farm and slaughter cattle; organisation of animal exhibitions

and award shows; procurement, custody and reproduction of good breeding animals; safeguarding the interests of livestock breeding and production on a technical and social level (CONVIS, 2020a). Furthermore, CONVIS is one of the main PAAO and advises on all questions relating to livestock breeding, feeding, keeping and care. CONVIS' advisory services are also active in water protection areas and consult on grassland management. They create fertilisation plans for farmers and calculate a farm's energy and nutrient balances (CONVIS, 2020a). CONVIS is also involved in different national and international research projects, mainly in the domain of sustainability and animal production. They collaborate with national AKIS actors, for example with LTA and LIST.

Synplants is the association of seed potato producers with the purpose to promote the production of perfect seed potatoes and to process, store, collectively sell the resulting potatoes (Synplants, 2020). Synplants, as a PAAO, also offers technical production advice in its domain and a phytosanitary warning service in the framework of its advisory service.

OPVI regroups the independent winegrowers of Luxembourg with the objectives to take a stand on social and economic issues and to promote the quality of their wines (OPVI, 2020). OPVI is one of three PAAO in viticulture (OPVI, Domaines Vinsmoselle, IBLA). Its advisory service is specialised in vinification and is reserved for its members. The OPVI advisory service organises also knowledge transfer events.

Domaines Vinsmoselle is a Luxembourgish wine growers' cooperative and a PAAO. Its advisor is mainly active in viticulture, and focusses less on oenology. The main goal is the support in plant protection during the main winegrowing season and the implementation of measures to ensure good wine quality. Its advisory service is reserved for its members.

Maschinen und Betriebshilfsring Lëtzebuerg (**MBR**) is the machinery and operational aid ring in Luxembourg. Their main task is the mediation of services (machines, operational assistance) in agriculture, viticulture, forestry and landscape maintenance (MBR, 2020). As an AKIS actor, they play a role in offering training courses for farmers.

Further actors in this third sector are among others the Luxembourgish seed growing cooperative (LSG), the commercial cooperative De Verband, the organic

farmer's cooperative BIOG or the Luxemburgish milk producer's cooperative Luxlait. The main business of these actors is not supplying advisory service or creating innovation and knowledge. Nevertheless, they play a role in the Luxemburgish AKIS, as they indirectly bring information on different production processes and products to the farmers. The farmers are in close contact with their respective cooperation and in part dependent on decisions of the cooperatives.

Private sector (for profit)

Input traders as for example Barenburg, VERSIS, BAKO, Protvinges, FEMAL (Federation of Agricultural and Industrial Machinery Enterprises of the Grand Duchy of Luxembourg), feed retailers and dealers for milking parlours provide commercial advice to farmers and winegrowers, mainly with the intent to sell their products. Nevertheless, these actors can also be considered as innovation promoting actors, as some machine dealers, for example, are involved in research and dissemination projects assessing innovative new techniques in different agricultural domains. Agro-Projekt, an actor in stable construction advice for farmers, publishes the agricultural newspaper Alcovit.

2.1.2 Coordination Structures

According to the grand-ducal regulation of 17th may 2017 implementing the provisions of chapters 17 and 18 of the law of 27th June 2016 concerning support for the sustainable development of rural areas, the advisory service in agriculture and viticulture is governed by the MAVRD (Gouvernement de Luxembourg, 2017b). LWK is mandated with the coordination of the Luxemburgish advisory services. As mentioned above, this gives a double role to the LWK, as itself is a PAAO in Luxembourg. In the expert interviews conducted in the framework of the update of this report, some of the experts pointed out, that this double role is unfortunate, as there is no real separation of powers. LWK is also in charge of developing, coordinating and implementing a system of continuous training for agricultural advisers.



AKIS diagram

The diagram of AKIS actors in Luxembourg is presented in

. The different actors were described in detail in chapter 2.1.1

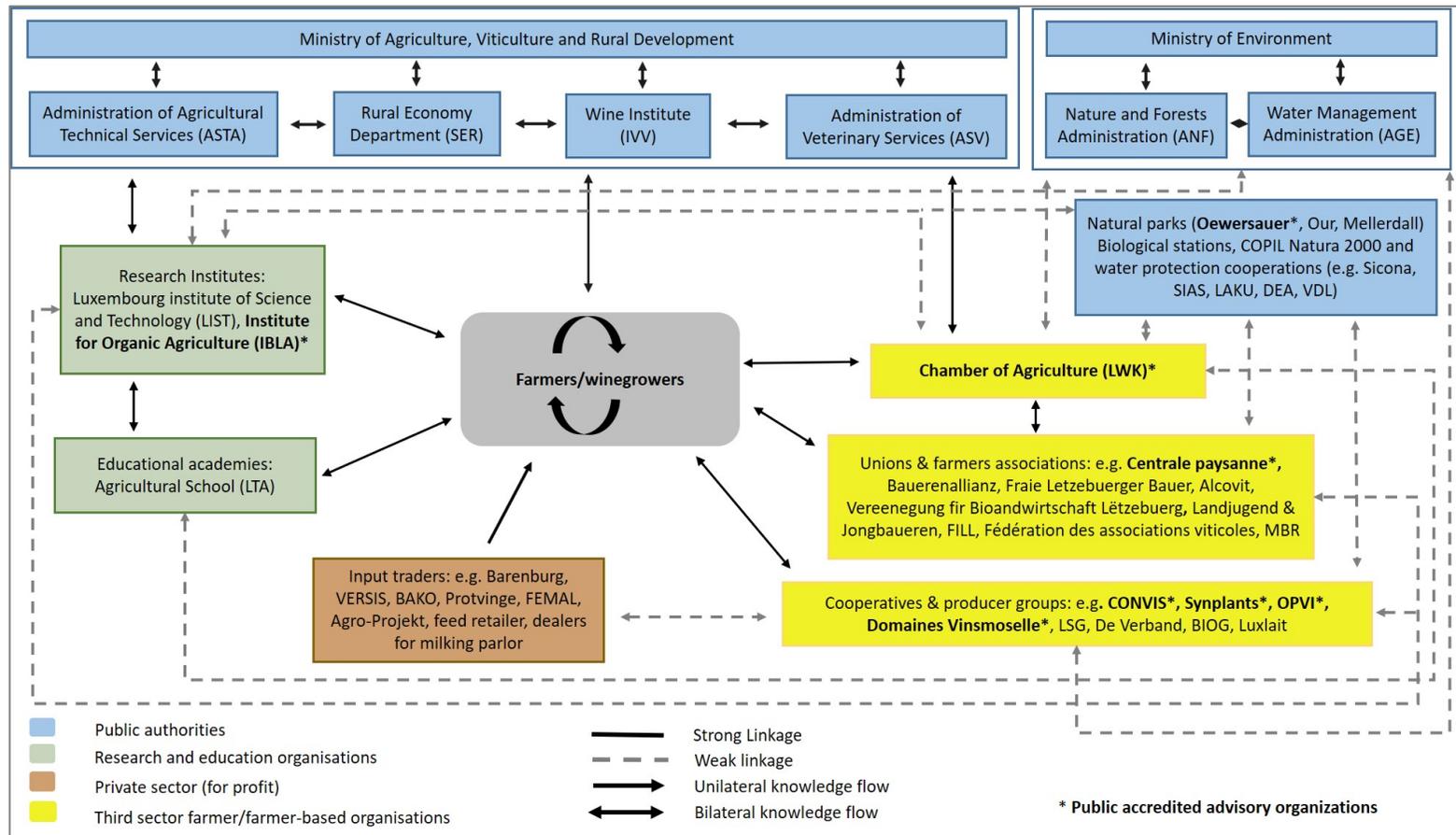


Figure 1: Diagram of AKIS actors in Luxembourg

3. History of the advisory system

This chapter focuses on the history of the advisory system of the PAAO in Luxembourg. Due to the absence of grey literature on the historic developments of advisory services in Luxembourg, the here-presented information was mainly derived from the internet pages of the respective PAAO organisations. The data is complemented with information gathered in the semi-structured interviews conducted in the framework of the project.

Some of the PAAO have a long history of providing advisory services to farmers. CONVIS, for example, was established in 1915 and LWK in 1924 (CONVIS, 2020b; LWK, 2020). Domaines Vinsmoselle was founded in 1921 (Domaines Vinsmoselle, 2020), Synplants in 1945 (Synplants, 2020) and Centrale paysanne in 1955. The other four PAAO are younger organisations founded in the last 10-20 years; e.g. OPVI exists since 1996, the Nature Park Oewersauer since 1999. The extension service for organic agriculture was founded in 1999 and was integrated into IBLA at its establishment in 2007. It is important to note, however, that not all the PAAO offered advisory services since their foundation.

All the PAAO are individual organisations, which have as a part of their mission the advisory service. They are accredited for specific responsibilities and areas of activities by the MAVRD. The previous legal rules and funding scheme are described in detail in the first AKIS report of Luxembourg by Paul et al. (2014). The Commission Regulation (EU) No 702/2014 of 25th June 2014 brought about major changes in the funding scheme of the PAAO; agricultural advisory services could no longer be funded by a direct payment of up to 80 % of their costs (European Commission, 2014). Since 2016, the Luxembourgish advisory system is organised in a module system. This change means, that it is no longer the organisation, or more specific the agricultural advisor position, which is financed, but rather the service the organisation renders, in form of modules. The farmers can book different advisory modules with the PAAO and receive financial support to cover between 50-100 % of the costs for advisory module. It is important to note, that during the switch from the old system to the new one, the priority of the Ministry was to maintain the same level of funding for the respective advisory services with their advisors employed. The existent foci of the different PAAO were formulated into different advisory modules for which the respective PAAO were then accredited. However, according to all the experts that were interviewed in the

framework of this project, no evaluation was done beforehand on what the actual knowledge needs of the farmers and winegrowers were. Further details of the actual regulation and the current funding scheme is described in chapter 4.2.

4. The agricultural advisory services

4.1 Overview of all service suppliers

In Luxembourg, there currently exist eight PAAO:

- LWK
- CONVIS
- IBLA
- Synplants
- Nature Park Oewersauer
- Centrale paysanne
- OPVI
- Domaines Vinsmoselle

A first description of these organisation and their specific roles in the Luxemburgish AKIS were given in chapter 2. In order to further characterise the different PAAO, a quantitative online survey (further details on the survey can be seen in the AKIS country reports guideline (Knierim et al., 2020)) was sent to the eight PAAO. Five of the eight PAAO participated in the survey (n=5) and the data was descriptively analysed. The insights for the chapter at hand are mainly derived from this. It is completed with information gathered from the review of documents and homepages. The results were further complemented with insights from the above-mentioned semi-structured interviews. In the following chapters, the sample size n indicates the number of PAAO that replied to a specific question of the online survey.

4.2 Public policy, funding schemes, financing mechanisms, advisory service providers

The MAVRD is in charge of the accreditation of the PAAO and their individual advisors for the different advisory modules (Article 10 of the grand ducal regulation of 17th May 2017 (Gouvernement de Luxembourg, 2017b)). The content of the advisory modules, funding rates and maximal funding height as well as minimum qualifications of providers are fixed in the ministerial regulation of the 28th February 2020 (Gouvernement de Luxembourg, 2020).

Table 1 summarises the most important information: title of the module, funding rate, maximum aid amounts and accredited PAAO for each module. The five PAAO, that participated in the online survey, confirmed, that the primary source of funding for their advisory services are national government funds (public funds) and cost-recovery from farmers (fee for service financing). The way the funding scheme works, is that farmers receive 50-100 % funding from the MAVRD for advisory modules they book at one of the eight PAAO. The specific funding rates are defined in the ministerial regulation of the 28th February 2020 (Gouvernement de Luxembourg, 2020). In order to ease the administrative burdens for the farmers, the share of the module costs subsidised by the MAVRD is directly paid by the ministry to the respective PAAO. In return, the PAAO need to indicate the total cost of the advisory module, the share funded by the MAVRD and the farmer's share, which they still need to pay, on the invoice. Two of the five organisations mentioned, that the funding of their advisory service is complemented by contributions from member fees.

In all expert interviews with PAAO, difficulties of financing their advisory service were reported, mainly due to the fact, that the funding rates for the different advisory modules are too low and overhead costs are not included in the calculation of the hourly wage. A further problem is the fact, that normal wage adaptation occurring in every organisation, is not considered. Bureaucracy was mentioned as an additional burden. Furthermore, in the old funding schemes, advisors were able to dedicate a part of their time to innovation support activities for teaching and training, for information/dissemination and for further development of their own knowledge and skills. This was found to be very difficult, nearly impossible, under the new funding schemes, as organisations do not have the possibilities to finance these activities anymore.

Table 1: Advisory modules, funding rates, maximum rate of aid and PAAO (1: CONVIS, 2: Centrale paysanne, 3: Domaines Vinsmoselle, 4: IBLA, 5: Lwk, 6: Naturpark Oewersauer, 7: OPVI, 8: Synplants) Modified according to MAVDR, 2020h.

Module		Funding rate	Maximum rate of aid	PAAO
Environmental and resource protection in plant and fodder production				
1.	Fertilisation plan	80%	840€ per holding and year	1,5,6
		100%	1.050 € per holding and year, when module 2 is claimed	1,5,6
			125 € per member of a community biogas plant	1,5,6
2.	Water protection zone	100%	1.100 € per holding and year	1,5,6
3.	Sensitive areas (Natura 2000, nature reserves, biotopes)	100%	1.100 € per holding and year	5,6
4.	Greening	80%	68 € per holding and year	5,6
5.	Integrated agricultural advice (according to agricultural law)	80%	1.500 € per holding	5
6.	Energy and nutrient balances	80%	840 € per holding and year	1
7.	Grassland advice	80%	520 € per holding and year	1
8.	Legume cultivation	80%	520 € per holding and year	4
9.	Arable crops (group advice max. 6 participants)	50%	280 € per holding and year	4,5
10.	Seed potatoes: Plant protection warning service	100%	900 € per holding and year	8
11.	Seed potatoes: advice on production technology	50%	1.450 € per holding and year, maximum of € 40 per hectare of seed potatoes	8
Livestock farming				
12.1	Advice in dairy farming: feeding advice	50%	600 € per holding and year	1
12.2	Advice in dairy farming: milk quality and milking technology	50%	260 € per holding and year	1
12.3	Advice in dairy farming: reproduction	50%	260 € per holding and year	1
13.	Advice on suckler cow husbandry	50%	600 € per holding and year	1
14.	Advice on pig breeding	50%	1.500 € per holding and year	1

Organic agriculture					
15.1	Organic agriculture – Pre-transitional initial consultation	100%	840 €	per holding (for conventional holdings)	4
15.2	Organic agriculture – Pre-transition, intensive	100%	1.500 €	per holding (for conventional holdings)	4
16.	Organic agriculture – Transition	100%	1.500 €	per holding and year (for holdings under conversion)	4
17.1	Organic agriculture	80%	1.500 €	per holding and year (for certified organic holdings)	4
17.2	Methods of organic agriculture	80%	520 €	per holding and year (for conventional holdings)	4
Basic requirements / Compliance with standards					
18.1	Cross compliance - complete analysis	80%	1.500 €	per holding and year	5
18.2	Cross compliance - update or partial analysis	80%	340 €	per holding and year	5
Viticulture					
19.	Viticulture - basic module	80%	100 €	per holding and year	3
20.	Viticulture - special module	80%	1.280 €	per holding and year	3
21.	Oenology – Wines & AOP (protected designation of origin)	80%	940 €	per holding and year	7
22.	Oenology – “Crémant de Luxembourg”	80%	1.060 €	per holding and year	7
23.1	Organic viticulture – Pre-transitional initial consultation	100%	840 €	per holding (for conventional holdings)	4
23.2	Organic viticulture – Pre-transition, intensive	100%	1.500 €	per holding (for conventional holdings)	4
24	Organic viticulture – Transition	100%	1.500 €	per holding and year (for holdings under conversion)	4
25a.1	Organic viticulture – soil fertility	80%	1.500 €	per holding and year (for certified organic holdings)	4
25a.2	Organic viticulture – soil fertility	80%	520 €	per holding and year (for conventional holdings)	4
25b.1	Organic viticulture – plant health	80%	1.500 €	per holding and year (for certified organic holdings)	4
25b.2	Organic viticulture – plant health	80%	520 €	per holding and year (for conventional holdings)	4
Diversification and economical advice					
26.	Special crops - strategic advice	100%	1.500 €	per holding (for certified organic holdings)	5
		80%	1.500 €	per holding (for conventional holdings)	5
27.	Special crops	80%	1.500 €	per holding and year (for certified organic holdings)	5
		50%	1.500 €	per holding and year (for conventional holdings)	5
28.1	Economical advice: Investments > 150.000€	100%	840 €	per holding and year	2

i2connect

INTERACTIVE INNOVATION

28.2	Economical advice: business development concept	100%	1.500 € per takeover by a young farmer / winemaker	2
28.3	Economical advice: Accompanying newly installed young farmers / winemakers	100%	480 € per holding and year (max. 5 years)	2

Innovation development can, in part, be promoted through projects in the framework of the agricultural EIP funding scheme as defined in the law of 27th June 2016 concerning the support for the sustainable development of rural areas (Gouvernement de Luxembourg, 2016). The EIP funding scheme aims to promote innovation projects in agriculture implementing knowledge transfer and networking between research, advice and agricultural practice. In Luxembourg, it is financed by national funds. While some of the PAAO currently participate in EIP funded projects, most of the experts from the advisory domain stated in the semi-structured interviews, that they are not willing to participate in further national EIP calls: the length of the funding decision process and administrative burdens were mentioned as reasons as to why not.

Dissemination and knowledge transfer activities can also be funded in the framework of the law of 27th June 2016 (Gouvernement de Luxembourg, 2016). Project proposals need the assessment and evaluation of the LWK; however, it can itself submit proposals. Some of the experts pointed out, that this double role of the LWK is again unfortunate, as no separation of powers can be guaranteed.

Some experts described these three funding possibilities for the advisory services as cumbersome with a lot of administrative obstacles that do not cover the real costs. This is the reason why the PAAO also seek alternative funding sources, mainly not coming from the MAVRD.

4.3 Human resources and methods of service provision

The eight PAAO employ 44 advisors in total; 12 women and 32 men (MAVDR, 2020i). Thus, 27 % of officially recognised advisors are women.

A total of 38 advisors were employed by the five PAAO partaking in the survey, representing 86 % of total recognised advisory staff for agriculture and viticulture in Luxembourg. The number of advisors ranged between 1 and 15, while the share of woman advisory staff was between 0 to 50 % (n=5). Advisory staff numbers stagnated in two PAAO over the past five years, while they significantly increased in the other. The increase of staff number in some of the PAAO can be explained by the higher demand for advisory services in their specific domains (e.g. organic agriculture and agriculture in water protection areas).

The survey revealed that all advisors in the PAAO (n=5) possess an academic degree. This can be explained by the fact that the ministerial regulation of the 28th February 2020 requires officially recognised advisors to hold at least a bachelor's degree or equivalent (Gouvernement de Luxembourg, 2020). The percentage of staff possessing a master's degree ranged from 50 to 100 % (n=5); one advisor holds a PhD. Out of the 38 advisors employed in the five PAAO of the survey, 29 % had 0-3 years of professional experience, 32 % had between 3-10 and 39 % had more than 10 years. None of the PAAO (n=5) had a trainer or training unit responsible for developing staff capacity. Depending on staff or organisation requirements, some of the PAAO relied on further training offers from foreign organisations (mainly for new advisors). On average, advisors were able to dedicate 2 to 5 days per year on further training related to advisory knowledge and skills (n=3).

None of the organisations have mechanisms to reward good performance or to promote the development of advisors' skills (n=5). Advisors allocate a majority of their time to targeted advisory services (30-85 % of their total working hours, (n=3)). Between 3 and 30 % of their time was allocated to innovation support activities, 0-30 % to teaching and training and 2-20 % to information/dissemination (n=3). Advisors spent on average 5 % of their time on developing their own knowledge and skills (n=3). None of the advisory organisations nor their advisory staff hold an advisory certification. During the semi-structured interviews, the experts stated that financing of teaching and training is difficult. Since 2018, the MAVRD has co-financed an annual training workshop on soft skills for all accredited advisors based on CECRA (Certificate for European Consultants in Rural Areas). This was appreciated by the advisory experts not so much for the soft skills learned, but rather for the networking effect of such training days. These workshops allow the individual advisors from the different PAAO, who in their day to day work do not have much interaction, to get to know each other and to exchange ideas.

In Figure 2, the most frequently used advisory methods are presented (n=5, multiple choice was possible). All organisations used individual consultation by telephone as an advisory method, followed by individual face to face advice on the farm; and group advice via demonstrations or exchange visits with four mentions each. Individual face to face advice outside the farm; individual advice via digital apps; group advice outside the farm; group advice on the farm; mass media advice via internet; and mass media advice via printed publications, TV,

radio, newsletters; were other advisory services mentioned by two organisations each. One organisation mentioned the use of group advice via webinar.

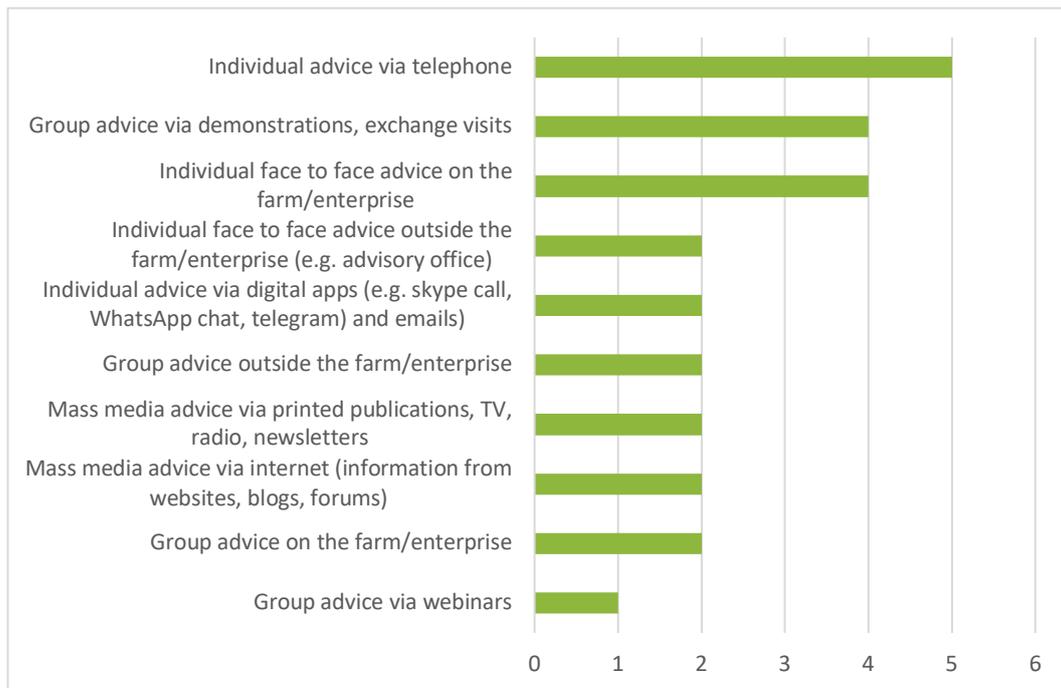


Figure 2: Advisory methods used most frequently from the advisory organisations (n=5, multiple choice was possible)

Regarding the three major advisory methods (individual, group and mass media), individual was the method used in 80-100 % of the advisory activities of four advisory organisations, whereas one organisation used this method in only 15 % of the cases. This organisation has a stronger use of the group advisory method with 80 %. Mass media is used by four organisations in 1-10 % of their advisory activities.

The COVID-19 pandemic in 2020 brought about a change in the advisory methods used in all PAAO (n=5). A shift from individual face to face advisory on the farm to individual advisory via telephone or via digital apps was described. Group advise decreased in the first part of the year 2020. In the second part of the year group advice was resumed, but under strict hygienic measures (social distancing, masks and barrier gestures).

4.4 Clients and topics

On average 194 farmers annually used the advisory services of the PAAO (n=4). However, there were large variations, with one PAAO providing advice to 600 clients. The median of the remaining three PAAO was 65 client contracts per year.

Respondents were asked about the primary target group to which they provide advice to. Figure 3 shows the primary target groups of the PAAO (n=5). Most of the PAAO provide advice to farmers with large commercial farms (>100 ha) and farmers with small/medium-scaled farms, followed by young farmers with three mentions. Agricultural advisors/consultants and part-time farmers were mentioned twice each, while producer groups, and small and medium enterprises were each mentioned once.

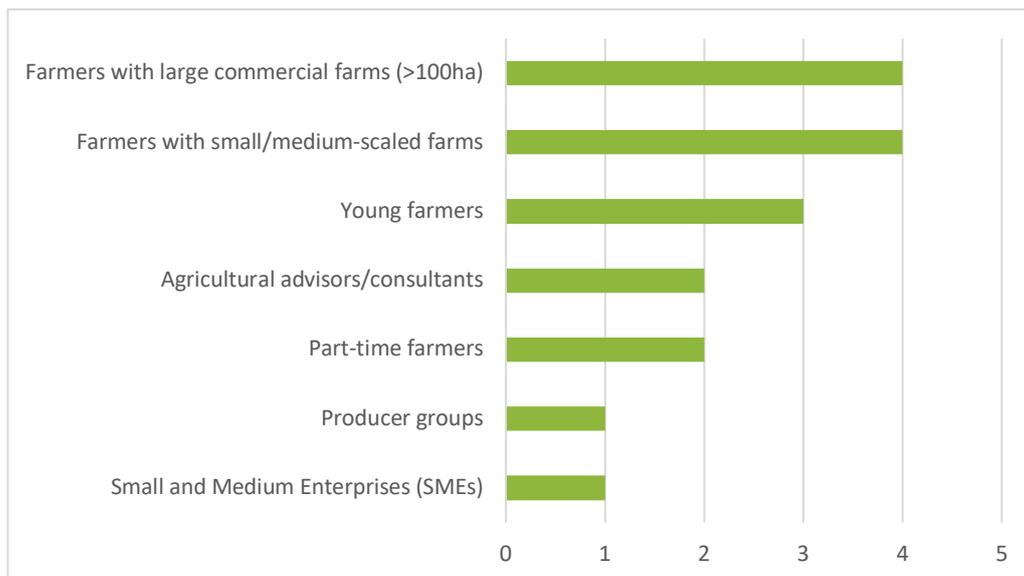


Figure 3: Primary target groups of advisory organisations (n=5, multiple choice was possible)

The cross-cutting advisory topics most demanded by farmers are shown in Figure 4 (n=5). The answers show an emphasis on production technologies, support with grant application and compliance with regulation and standards, agri-environmental stewardship measures and nature conservation, and entrepreneurship and farm management. In contrast, topics of rural development support and diversification, tax and legal device, accounting/bookkeeping or use of digital equipment and decision support systems play no role.

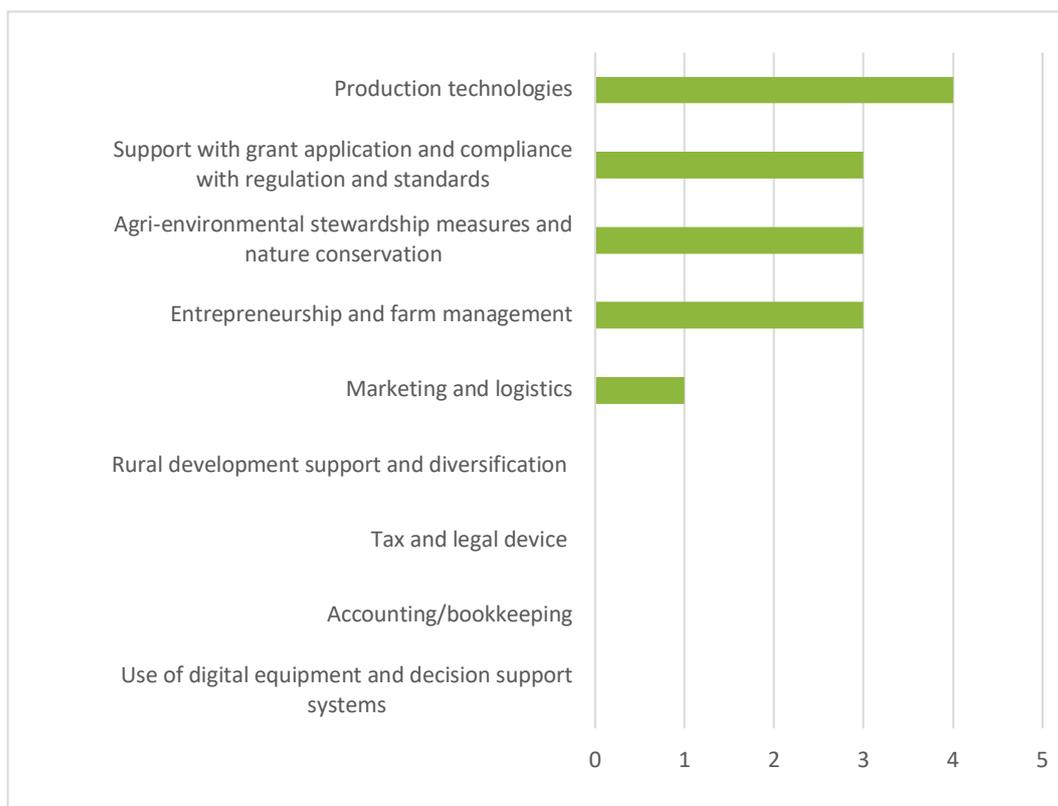


Figure 4: Cross-cutting advisory topics demanded by the farmers (n=5, multiple choice was possible)

Regarding the advisory topics provided mostly by the PAAO, crop production was mentioned four times, followed by livestock production, farm machinery, vegetables, fruit and vines with two mentions each (Figure 4, n=5, multiple choice was possible). Building/construction design and herbs were named each once. Additional mention (open entries) not fitting into the predetermined categories of advisory topics was sustainability monitoring (named once).

To the question, if certain topics are outsourced to external consultants, one of the five PAAO answered yes; mainly for highly specialised consulting areas (e.g. fruit production).

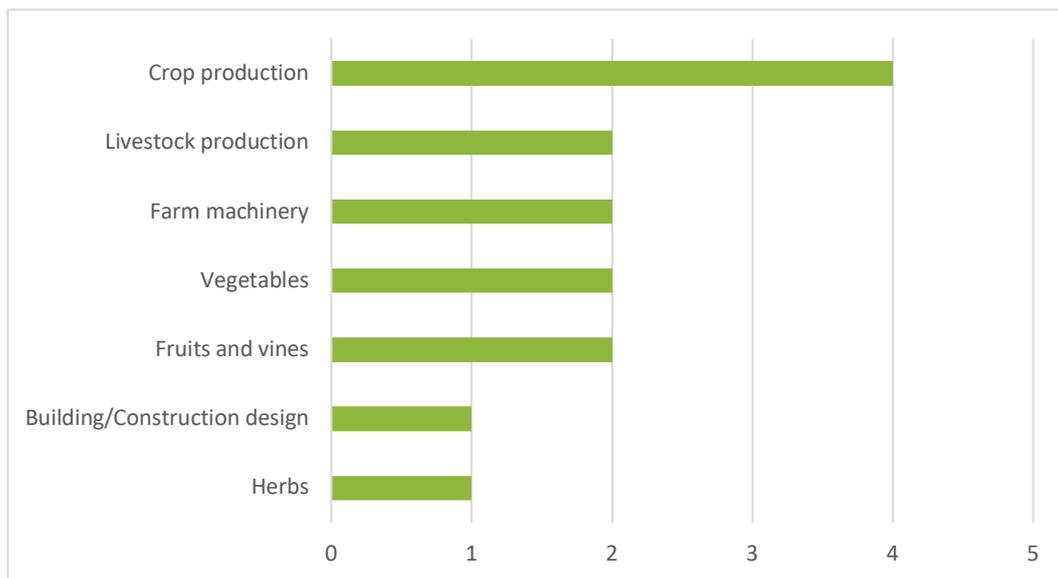


Figure 5: Advisory topics provided by the advisory organisations (n=5, multiple choice was possible)

To meet the challenges of the new CAP necessary technical knowledge and skills needed by advisors were identified by the responding organisations (Figure 6). All PAAO (n=5) perceived ecology and environmental protection, knowledge on markets and farm viability, mitigation and adaptation to climate change and specific technological knowledge (e.g. farming practices, production technologies) as important. Developing farm management strategy, skills related to subsidy application/grants, and diversification of sources of income were each mentioned four times, while increasing the value added of farm production was mentioned three times. Networking was mentioned as the most important methodological and communication skill in order to meet the challenges of the new CAP (n=5).

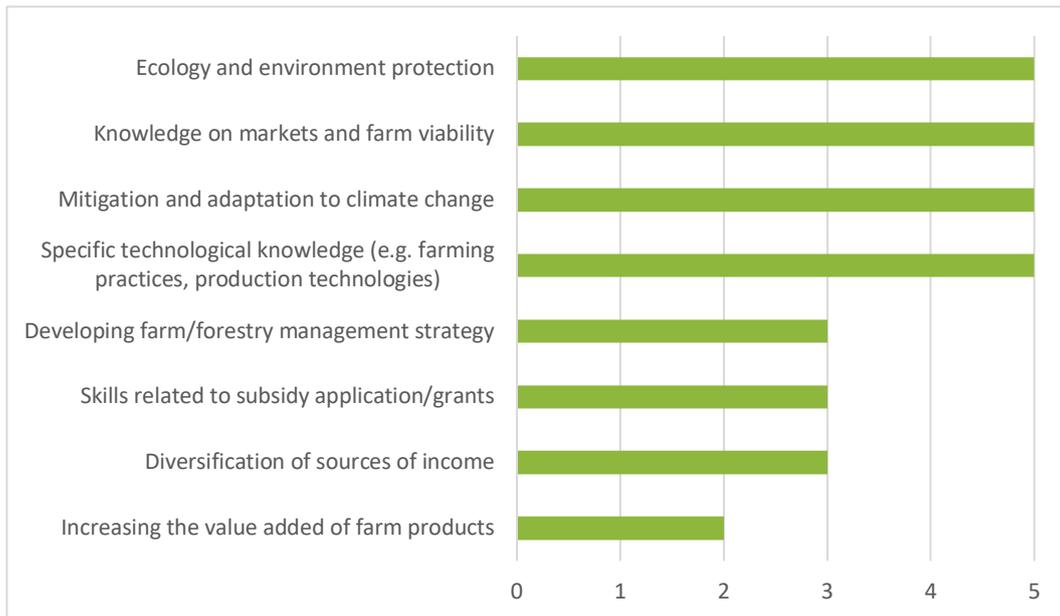


Figure 6: Technical knowledge and skill needs of advisory to meet the challenges of the new CAP (n=5, multiple choice was possible)

The intensified focus on environmental topics and the herewith coming regulations were also mentioned in the expert interviews. Another topic that came up is the digitalisation and the pertaining challenges farmers have encountered in recent years and are likely to encounter in the future. Furthermore, experts identified a holistic consultancy approach to become more and more important. Currently most of the advisors in many of the PAAO are highly specialised to their domain.

4.5 Linkages with other AKIS actors/knowledge flows

Some linkages and knowledge flows between the different AKIS actors were already described in chapter 2 and illustrated in Figure 1. The PAAO (n=5) could indicate the strength of these relationships on a 4-level scale: no, weak, medium or strong cooperation. The degree of cooperation with universities ranged from no cooperation (one mention), over weak cooperation (three mentions) to a medium cooperation (one mention). The cooperation with research institutes was characterised by four PAAO as medium and by one as strong. A strong cooperation with public authorities was indicated by three PAAO. For one PAAO this cooperation was medium and for one weak. Linkage with farmer based and professional organisations and advisory services is medium (two mentions) to

strong (three mentions). The link with private companies was rated as medium by one PAAO and as weak by two, while the remaining two PAAO did not cooperate with private companies. With upstreaming industries, the linkage also varies from no cooperation over weak to medium. For downstreaming industries most of the advisory services only have a weak linkage.

In terms of cooperation between the different PAAO, the semi-structured interviews with the experts indicated, that a good collaboration exists between the three viticulture PAAO Domaines Vinsmoselle, OPVI and IBLA. They also collaborate closely with the public administration IVV and the linkage is strong. Furthermore, they all cooperate in different research and dissemination projects.

In contrast, in agriculture, the collaboration and cooperation between the different PAAO is not as strong. In the expert interviews it was stated, that one reason is the history of the different advisory services and their different domains of competences (e.g. crop vs. livestock production). However, some experts were also convinced, that the situation was further aggravated with the implementation of the module system, as the various PAAO are now in a competitive situation. While in viticulture, the three concerned PAAO worked out the content of the modules together and in cooperation with the public authorities, a separate meeting was held between the different agricultural PAAO and the MAVRD.

This does, nevertheless, not mean, that no cooperation between the agricultural PAAO exists. They work together in different EIP or other research and dissemination projects. However, the focus of the cooperation in such projects is often on other AKIS actors and less on the other PAAO. A positive example of collaboration among the PAAO is a grassland focus group, where LTA, ASTA, SER, CONVIS and IBLA work closely together, some already for over 20 years.

The organic sector was mentioned by the majority of the experts as a positive example of a strong network among different AKIS actors. All the actors, from farmer's associations, cooperatives, producer groups over advisory organisation and research institute have a strong relationship and collaborate closely not only in agriculture, but also in viticulture. The information and dissemination flow to the farmers and winegrowers was described as direct and fast; the producers are well integrated and at the centre of this network.

4.6 Programming and planning of advisory work

As mentioned in chapter 4.2, the details pertaining to the advisory module system (e.g. funding rates) are defined in the ministerial regulation of the 28th February 2020 (Gouvernement du Luxembourg, 2020). The perception of the experts was that the module systems inhibits innovation, whereas the old systems promoted networking, innovation and cooperation among the AKIS actors and in particular the dissemination of knowledge to the farmers. They see the module system as too rigid and inert. To promote innovation a system has to be reactive. The experts from the advisory domain criticised a missing bottom up strategy and communication from authorities. Meanwhile, experts from public authorities described that they pursue a bottom up approach. Thus, different point of views regarding the definition of a bottom up approach exist and can inhibit the communication, collaboration and mutual trust between advisory organisations and public authorities. The PAAO experts did not feel sufficiently supported by public authorities. Some experts stated, that the actual and future challenges of the farmers and the agricultural sector were not known by the authorities or differed from the priorities set at public and political level.

Furthermore, the same experts regretted that some advisory topics cannot be addressed in the rigid framework of the module system. The experts from the advisory domain criticised a lack of possibilities to consult farmers according to their needs; every advisory activity needs to be imbedded in an existing and to the respective organisation accredited module. The majority of the experts from the advisory domain had visions of how the advisory system could be better organised in order to promote better cooperation of the AKIS actors, a more holistic approach of advisory, a better adaptation to currently relevant topics and an innovation-promoting system. However, none of them felt heard by the authorities. Experts from public authorities announced in the interview the upcoming launch of an “Innovation HUB” as an innovation platform with the target to link different actors in the domain of agriculture. The aim is to encourage collaboration on innovative solutions to face the existing and future challenges of the sector.

4.7 Advisory organisations forming the FAS and evaluation of their FAS implementation

As defined by the European Commission, “the farm advisory system (FAS) helps farmers to better understand and meet the EU rules for environment, public and animal health, animal welfare and good agricultural and environmental conditions” (European Commission, 2020). According to EU regulation Nr. 1305/2013, FAS has to provide specific information and services in order to be eligible for European financial support (European Parliament, 2013). The information provided by the Luxemburgish FAS and the modules through which it is implemented in Luxembourg are described by the European Commission (2020) as the following:

- *Obligations at farm level resulting from the statutory management requirements and the standards for good agricultural and environmental land conditions (“cross-compliance”). In Luxembourg this element is included in module Nr. 18, that was not booked by any farmer since the beginning of the module system.*
- *Agricultural practices beneficial for the climate and the environment and maintenance of the agricultural area (“greening”), represented in the modules Nr. 1, 2, 6, 15, 16, 17, 23, 24 and 25.*
- *Measures at farm level provided for in rural development programmes for farm modernisation, competitiveness building, sectorial integration, innovation and market orientation as well as for the promotion of entrepreneurship, being implemented in modules Nr. 26 and 18.*
- *Requirements for water protection, efficient and sustainable water use. This element is treated with modules Nr. 1 and 2.*
- *Use of plant protection products and integrated pest management, implemented in modules Nr. 2, 9, 10, 11, 19 and 20.*

Looking at the list above, it becomes clear that the FAS in Luxembourg is currently not fulfilling all its obligations, as no module Nr. 18 has yet been booked. This information was also confirmed during the interviews with the experts from the public authority domain. However, all advisory organisations stated, that they advise farmers on how to adapt their farms to comply with the cross-compliance requirements by EU-FAS, even if they do not do it in the framework of module Nr. 18. This highlights the problem with the rigidity of the module system: advisors will do their best to react to the farmers’ needs, even if they might not be

accredited to cover a specific topic or module, or if a farmer is not interested in booking a whole module to get the needed answers and advice.

With regard to an evaluation of the FAS in Luxembourg, none of the expert knew whether, when and how this would be done. Most of the experts did not even know that FAS existed and what it meant.

5. Summary and conclusions

It needs to be noted, that the description of the Luxemburgish AKIS presented in this report is based on information from officially available sources, the information provided by the PAAO through the online survey and the personal appraisal of the interviewed experts. The latter especially showed that opinions on the challenges, viability and future direction of the advisory system in Luxembourg differed between the different actors, and the report aimed to objectively highlight these different points of views.

5.1 Summary and conclusions on sections 1 – 3

For a relatively small country like Luxembourg, the agricultural sector is very diverse and its AKIS well positioned and good connected. The Luxemburgish AKIS includes actors from the categories public authorities, research and education organisations, private sector (for profit) and third sector of farmer/farmer-based organisations. In Luxembourg eight advisory organisations are recognised as PAAO. The MAVRD is in charge of the accreditation of these organisations. Besides the PAAO, the AKIS of Luxembourg is composed of two research institutes, an agricultural school as well as different unions & farmers associations, cooperatives & producer groups, and input traders. The linkage of all these actors with the farmers and winegrowers is strong. Nevertheless, the network between the different AKIS actors and especially between the eight PAAO could be stronger. As already noted by Paul et al. (2014), PAAO do not sufficiently cooperate. The PAAO of viticulture make an exception as they have a good and close cooperation, whereas the PAAO of agriculture have no substantial cooperation in their specific day-to-day advisory activities. The best linkage between actors is achieved within research and dissemination projects, such as variety trials, on-farm field trials or EIP projects. At the heart of these projects and the therewithin created networks are the primary producers. Outside of such projects, each actor pursues its own objectives; there is a lack of coordinated collaboration and knowledge flow between actors to promote innovation and capabilities to meet future challenges of the agricultural sector.

5.2 Summary and conclusions on section 4

While the MAVRD is in charge of the accreditation of the PAAO and their individual advisors for the different advisory modules, the LWK is mandated with its coordination. This gives it a double role, as itself is a PAAO in Luxembourg. In the expert interviews, it was pointed out, that this double role is unfortunate, as there is no real separation of powers. The content of the advisory modules, funding rates and maximal funding height as well as minimum qualifications of providers are fixed in ministerial regulation. Experts opinion is that the modules system inhibits innovation and collaboration between the PAAO, as a competition situation is created.

The eight PAAO employ 44 accredited advisors: 12 women and 32 men. The advisors all meet at least the minimum qualification requirements (Bachelor's degree or equivalent). Time spend for teaching and training of the advisors is limited, mainly due to the difficulties with financing of such activities. There exist some possibilities to receive public funding through the MAVRD for further training. The LWK is also in charge of the coordination of these programmes. This results again in issues with regard to separation of powers, as it is also eligible to receive funding through these channels. The soft skills training co-financed by the MAVRD was appreciated by the participants, mainly because of the networking opportunity they provide for the advisors of the different PAAO, who have little contact in their daily work.

Most frequently individual advice was used as an advisory method. Due to the COVID-19 pandemic a shift from individual face to face advisory on the farm to individual advisory via telephone or via digital apps was described. Clients of the PAAO are mainly farmers with small/medium-scaled farms to large commercial farms (>100ha).

With regard to advisory topics, a focus on production technologies could be determined, mainly regarding crop production. Given that more than 50 % of the Luxembourgish UAA consists of meadows and pastures and that the main farm type is specialised grazing livestock farms, it is surprising that the focus of advisory in Luxembourg is not on livestock and grassland production.

As further challenges ecology and environment protection, knowledge on markets and farm viability, mitigation and adaptation to climate change, and specific

technological knowledge (e.g. farming practices, production technologies) were named. The intensified focus on environmental topics and the herewith coming regulations were also mentioned in the expert interviews. Another topic that came up is the digitalisation and the pertaining challenges farmers have encountered in recent years and are likely to encounter in the future.

In the new module system implemented in 2016, the financing of the advisory services is switched from direct payments of the PAAO and the accredited advisory to service based financial system: farmers can take advantage of a catalogue of modules for which they receive between 50-100 % financial support to cover the costs. The content of the advisory modules, the funding rates and the maximal funding amount as well as the minimum qualifications needed of providers are defined in a ministerial regulation. This change has led to financial difficulties for the PAAO as funding rates for the different advisory modules are too low and overhead costs are not included in the calculation of the hourly wage. Furthermore, the new system has led to a higher bureaucratic burden for the PAAO and its reduction was mentioned as a future challenge. The rigidity of the new system has also led to difficulties in organising dissemination and knowledge transfer activities for farmers, due to the lack of funding possibilities within the module system. The instruments to fund research and dissemination project were described as not practical due to long decision processes and administrative burdens.

A lack of possibilities to consult farmers according to their needs was criticised by the advisory experts, as every advisory activity needs to be imbedded in an existing and to the respective organisation accredited module. When the content of the modules was initially formulated, the aim of the MAVRD was to maintain the existent amount of funding for the respective PAAO in an effort to continue to support them, rather than focusing on farmers' knowledge needs. The different experts all presented visions and possibilities on how to improve the current advisory system to meet future challenges. These included ideas on how to move towards a better cooperation between AKIS actors, a more holistic approach of advisory, a better adaptation to currently relevant topics and an innovation-promoting system.

6. Acknowledgement of partners, information sources and gaps

Main information sources are the semi-structured expert interviews and the results from the quantitative online survey. The semi-structured interviews were conducted with six experts from public authorities, public accredited advisory organisations, research and education organisations and farmer-based organisations. The interviewees were guaranteed anonymity, which is why no further details on their identity (name, workplace, etc.) are given and no direct citations are used. The latter could also point to the identity in the small agricultural sector of Luxembourg.

Five of the eight PAAO participated in the survey. This corresponds to a response rate of 62.5 %. These five PAAO employ 38 of the 44 accredited advisors of Luxembourg. It can, thus, be concluded that a fair representation of PAAO in Luxembourg was achieved and relevant insights were won.

As was stated by Paul et al. (2014), grey literature on specific topics (e.g. the history of the advisory system) was and still is very limited. Therefore, the main sources of information, apart from the survey and the expert interviews, is gathered from the homepages of the AKIS actors, especially in regards to the history for chapter 3.

A more complete picture of the AKIS and the current advisory system could have been achieved, would the farmers also have been questioned on their views. The report at hand highlights the challenges the PAAO encounter; however, it does not touch on how well the farmers feel supported. Do they receive the necessary assistance and are their advisory needs covered?

The authors would like to take this opportunity to thank all the respondents of the online survey and the experts for their time and the participation in the study. The authors extend a further thank you to Sangeun Bae (University of Hohenheim) for her support and the great coordination the AKIS inventory update.

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Appendices

Annex 1: List and contact of organisations forming AKIS

English Name	Name and address	Website	Organisational status
Administration of Technical Agricultural Services (ASTA)	Administration des Services Techniques de l'Agriculture 16, route d'Esch, L-1470 Luxembourg; B.P. 1904, L-1019 Luxembourg	https://agriculture.public.lu/de/dienststellen/asta.html	Public
Rural Economy Department (SER)	Service d'Economie Rurale 115, rue de Hollerich, L-1471 Luxembourg B.P. 2102, L-1021 Luxembourg	https://agriculture.public.lu/de/dienststellen/ser.html	Public
Wine Institute (IVV)	Institut viti-vinicole 8, rue Nic Kieffer, L-5551 Remich B.P. 50, L-5501 Remich, Luxembourg	https://agriculture.public.lu/de/dienststellen/institut-viti-vinicole.html	Public
Veterinary Services Administration (ASV)	Administration des services vétérinaires 7B, rue Thomas Edison, L-1445 Strassen B.P. 1403, L-1014 Luxembourg	https://agriculture.public.lu/de/dienststellen/asv.html	Public
Nature Park Öewersauer	Naturpark Öewersauer 15, route de Lultzhausen, L-9650 Esch-sur-Sûre	www.naturpark-sure.lu	Public/NGO
Nature Park Our	Natur Park Our 12, Parc, L-9836 Hosingen	www.naturpark-our.lu	Public/NGO
Nature and Geopark Mëllerdal	Natur- & Geopark Mëllerdall 8, rue de l'Auberge, L-6315 Beaufort	www.naturpark-mellerdall.lu	Public/NGO

Agricultural School (LTA)	Lycée Technique Agricole 72, avenue Salentiny, L-9080 Ettelbruck B.P. 76, L-9001 Ettelbruck	www.lta.lu	Research and Education
Institute for Organic Agriculture Luxembourg (IBLA)	Institut fir Biologesch Landwirtschaft an Agrarkultur Luxemburg 27, Op der Schanz, L-6225 Altrier	www.ibla.lu	Research and Education
Luxembourg Institute of Science and Technology (LIST)	Luxembourg Institute of Science and Technology 5, avenue des Hauts-Fourneaux, L-4362 Esch-sur-Alzette	www.list.lu	Research and Education
Chamber of Agriculture (LWK)	Chambre d'Agriculture 261, route d'Arlon, L-8011 Strassen	www.lwk.lu	FBO
Centrale Paysanne Luxembourgeoise	Centrale Paysanne Luxembourgeoise 44, rue de la Gare B.P. 48, L-7501 Mersch	www.centralepaysanne.lu	FBO (agrl. trade union)
Independent Farmer's Association (FLB)	Fraie Lëtzebuerger Baureverband 27, rue des Tisserands, L-6792 Grevenmacher	https://www.facebook.com/FraieBauer/	FBO (agrl. trade union)
Farmer's Alliance	Bauern Allianz Address not found	https://www.facebook.com/BauernAllianz/	FBO (agrl. trade union)
CONVIS	CONVIS s.c. 4, Zone Artisanale et Commerciale, L-9085 Ettelbruck	www.convis.lu	FBO (Agrl. association)
Independent winegrower's association	Organisation Professionnelle des Vignerons Indépendants Asbl (O.P.V.I.) 115, route du Vin, L-5416 Wormeldange	www.privatwenzer.lu	FBO
Domaines Vinsmoselle	Domaines Vinsmoselle	www.vinsmoselle.lu	FBO

	12, route du Vin, L-5450 Stadtbredimus BP 40, L-5501 Remich		
Young farmers association	Lëtzebuenger Landjugend a Jongbaueren a.s.b.l. 5, avenue Marie-Thérèse, L-2132 Luxembourg	www.jongbaueren.lu	FBO
Seed potatoe association (SYNPLANTS)	E'slecker Setzgromperegenossenschaft 46, Burewee, L-9748 Eselborn	https://www.facebook.com/Synplants-316706642209170	FBO
Machinery and operational aid ring (MBR)	Maschinen und Betriebshilfsring Lëtzebuerg 12A, Cité Morisacker, 7735 Colmar-Berg B.P. 19, L-7701 Colmar-Berg	www.mbr.lu	FBO
Luxemburgish seed growing cooperative (LSG)	Luxemburger Saatbaugenossenschaft 5, rue François Krack, L-7737 Colmar-Berg	http://www.lsg.lu	FBO
Commercial cooperative De Verband	De Verband 3, rue François Krack, L-7737 Colmar-Berg	https://www.de-verband.lu	FBO
Federation of winegrower's associations	Fédération des Associations Viticoles 23, route de Trèves, L-6793 Grevenmacher B.P. 57, L-6701 Grevenmacher	No website	FBO
Organic farmer's association BIOG	Bio-Bauere-Genossenschaft Lëtzebuerg (BIOG) 13, rue Gabriel Lippmann, L-5365 Munsbach	www.biog.lu	FBO
Luxemburgish milk producer's cooperative Luxlait	Luxlait 3, Am Seif, L-7759 Roost / Bissen	https://www.luxlait.lu	FBO
Agricultural cooperation Upper Sûre (LAKU)	Landwirtschaftliche Kooperation Uewersauer (LAKU)	www.naturpark-sure.lu/projects/laku/	FBO

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	15, rue de Lultzhausen, L-9650 Esch-Sauer		
Association for Organic Farmers	Vereenegung fir Biolandwirtschaft Lëtzebuerg 13, rue Gabriel Lippmann, L-5365 Munsbach	www.biovereinigung.lu	FBO
Association to promote integrated agriculture (FILL)	Fördergemeinschaft Integrierter Landbau Luxembourg 115, rue de Hollerich, L-1741 Luxembourg	No website	FBO
Ecological Movement	Mouvement Ecologique asbl 6, rue Vauban, L-2663 Luxembourg	https://www.meco.lu/de	NGO
Environmental association Oekozenner Pafendall	Oekozenner Pafendall asbl 6, rue Vauban, L-2663 Luxembourg	https://www.oekozenner.lu/de	NGO

AKIS and advisory services in *Malta*

Report for the AKIS inventory (Task 1.2) of the i2connect project

Date: November, 2020

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Executive summary

The present report provides a comprehensive overview of the Agricultural Knowledge and Information System (AKIS) in the Republic of Malta, with a focus on local Farm Advisory System (FAS). It has been conceived as an update of the report for the AKIS inventory drafted in the framework of the PRO-AKIS project in 2015 (Cristiano and Proietti, 2014) and has therefore the ambition to describe the changes induced by national and European policy in matter of agriculture, rural development and knowledge systems.

Agriculture has a marginal role in the overall Maltese economy, but it is an essential feature of local landscape and environment, although the more intensive productions (i.e.: pig breeding and horticulture) still struggle with the sustainability of their practices. The productive basis is essentially made by small farms whose holders' population is progressively ageing. Moreover, there's a general lack of sound agricultural training, often replaced by a "learning by doing" approach that is not conducive to a prompt acknowledgment of the innovations.

Nevertheless, over the last years, European rural and agricultural policies have widely contributed in reshaping the local agriculture, thanks to the entry of young farmers and new farmer-based organisations that are more oriented towards entrepreneurship, full-time working and innovation.

On the other hand, local AKIS is still not completely structured in order to comply with the needs of local agriculture, being them focused on the enhancement of competitiveness and sustainability of small old-fashioned farmers or on innovative approaches to agricultural practices and markets pursued by younger ones.

AKIS in Malta is in fact characterised by a little number of actors with a low level of coordination and a lack of systemic vision. Farm advisory services are provided by few private, mostly farmers'-based organizations and one governmental body (AgriConnect), which present different degree of integration and approaches within the local AKIS and a clear distribution of competencies on advisory topics.

Besides major public actors, that however are the main providers for CAP and RD matters, also farmer's cooperatives and the producer's organizations act as advisors, with a field of competences more shifted toward products marketization

and technical assistance and mean of production. However, farmers mostly rely on external experts for specialized advisory services.

As a matter of fact, the main FAS provider is a public subject directly belonging to the Ministry of Agriculture, Fisheries and Animal Welfare (MAFA), and research and innovation in the field of agriculture is tightly in the hands of the main superior education actors (University of Malta & the Malta College of Arts and Technology), which, however, belong to the Ministry of Education.

The policy frameworks on the matter are equally lacking complementarity, as they are articulated in three main areas (**Research and Innovation; Education and lifelong learning; Agriculture and environment**) scarcely integrated the one to each other. Recent efforts are being put into place in order to favour policies integration, by adopting, through public consultations, a more participatory approach that is shaping the regulatory framework.

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Abbreviations

AECMs	Agri-Environment Climate Measures
AKIS	Agricultural Knowledge and Innovation System
AIR	Annual Implementation Report Malta
ARPA	Agriculture and Rural Payments Agency
BICREF	Biological Conservation Research Foundation
CAP	Common Agricultural Policy
EIP	European Innovation Partnership
EC	European Commission
ETC	Employment Training Corporation
ETC	Employment Training Corporation
EU	European Union
EAFRD	European Agricultural Fund for Rural Development
ESIF	European structural and investment funds
FAS	Farm Advisory System
FASC	FAS Consortium
FAO	Food and Agriculture Organization
GVA	Gross Value Added
HEI	Higher Educational Institutions
HES	Higher Education System
KPH	Koperattiva Produtturi tal-Halib Ltd (Milk Producers Cooperative Ltd)
IMF	International Monetary Fund
MAFA	Ministry of Agriculture, Fisheries and Animal Rights
MCAST	Malta College of Arts and Technology
MCST	Malta Council for Science and Technology
MECP	Ministry for the environment, climate change and planning
MFED	Ministry for Education
MEI	Ministry for Economy and Industry
MSDEC	Ministry for Sustainable Development, the Environment and Climate Change
NAC	National Aquaculture Centre
NAP	National Agricultural Policy
NCFHE	National Commission for Further and Higher Education
NGO	Non-Governmental Organization

NRDN: National Rural Development Network

OG: Operational Group

RIS3: Research and Innovation Strategies for Smart Specialisation

SLC: Sustainable Living Complex

SME: Small Medium Enterprise

SPED: Strategic Plan for Environment and Development

RDP: Rural Development Programme

TRAKE: Transdisciplinary Knowledge and Exchange centre

UoM: University of Malta

UUA: Utilized Agricultural Area

1. Main structural characteristics of the agricultural and forestry sector

The Maltese archipelago is a small cluster of islands located in central Mediterranean. Its overall area is about 243 square kilometres, dwelled by 493.559 people (Eurostat, 2019). It is therefore very densely populated: 2006 inhab/km². Such a high degree of population reflects on land use, which is composed by the 24% of artificial land (vs 4,1% EU 27 average: Eurostat 2015). Anyway, cropland is the largest land use (26%), followed by grassland (23%) and shrubland (14%).

The economy is mainly based on services, tourism related ones above all (they account of the 24% of the total value added produced by the tertiary sector), while agriculture and manufacturing have progressively reduced their importance in local economy. Nevertheless, according the International Monetary Fund (IMF), Malta economy has benefited of a series of bold fiscal and labour reforms that in the last decade made it one of the most fast growing economies in the EU, to the point that its social and economic indexes overperform EU average (tab. 1).

Table 1. Malta: main social and economic indicators and indexes

	2019		Ten years variation	
	Malta	EU 27	Malta	EU 27
Population	493.559	446.824.564	19,2	1,4
Gross domestic product (million euro)	13.277	13.939.075	101,2	21,2
Per Capita GDP (euro)	26.901	31.196	68,8	25,2
Employment rate (15 - 64)	73,4	68,5	17,2	5,2
Unemployment rate (15 - 74)	2,3	6,7	-1,4	-3,1

Source: Eurostat

Information on the agricultural and forestry sectors

Due to limited land availability, agriculture has always been a marginal sector of the Maltese economy, although the island has been capable of get to self-sufficiency in certain key fresh products (e.g. milk, fruit & vegetables), local food sector is largely dependent on imports, especially of cereals, that are not grown locally. As a matter of fact, according to Eurostat (2019) vegetables and

horticultural products are the most important productions in the Archipelago, accounting for the 70% of the value at basic prices of the overall crop productions (EU 27 average is 26%). Fruits, the second most relevant production, represent just the 12% of the total output, a value perfectly aligned to the European average. On the side of animal outputs, the most significant production is milk (26% of overall animal productions) followed by pig meat, that accounts for the 20% of the total. The whole agricultural output is about 120 million euros, as to generate a Gross Value Added (GVA) corresponding to just the 0,9 % of the total national GVA (tab. 2). The marginality of the figures related to the agriculture reflects the little contribution of the sector to the national workforce: only the 0,9% of the workers in Malta are employed in agriculture, forestry and fishery.

Given the nature of the main productions, essentially very intensive and resources demanding, agricultural practices have to deal with serious sustainability issues as they rely on poor water and energy supplies and require the constant provision of production factors that local productive system can't provide. For instance, the fodder used by indoor pig farming comes exclusively from abroad. Therefore, local primary sector faces essential challenges for the Maltese environment: the reduction of impacts on water resources and on soil depletion, for instance, and at the same time it is expected to provide a series of environmental services to the benefit of a very urbanized population.

Despite the scarce economic and social relevance, in Malta agriculture has traditionally a central role in shaping and managing landscape, supporting the effective capture and use of rainwater, protecting biodiversity and contributing to landscape quality and cultural heritage on the islands (MALTA RDP, 2014).

Table 2: Structural and economic indicators of Maltese Agriculture

	Malta	EU27
UAA (ha)	11.180	156.662.970
<i>Whereof: organic</i>	24	11.445.112
Holdings	9.100	10.282.790
UAA/Holding	1,23	15,24
Livestock units (LSU) (thousand)	32	118.089
<i>Whereof: Bovine</i>	11	57.457
<i>Swine</i>	10	31.917
<i>Sheeps and Goats</i>	2	7.471
Workers in Agriculture, forestry and fishery (thousand)	2,3	7.903

<i>Whereof: Agriculture</i>	<i>1,7</i>	<i>9.152</i>
<i>Forestry</i>	<i>0</i>	<i>475</i>
<i>Fishing and aquaculture</i>	<i>0,6</i>	<i>167</i>
<i>% on total workers</i>	<i>0,93</i>	<i>4,06</i>
Gross Value Added (million €)	106	220.725
<i>% on Total GVA</i>	<i>0,90</i>	<i>1,83</i>

Source: Eurostat National Accounts (2019) and Farm structure survey (2016)

Unfortunately, the nature of the holdings, with small and scattered parcels, beside making local agriculture poorly profitable, jeopardizes farmers' endeavours towards more sustainable practices, despite the financial efforts put into place by the RDP. The scarce development of organic farming is a case in point, as it is practiced in small farms that struggle to obtain a premium price for their productions, moreover, their products are likely to be contaminated from activities on neighbouring conventional parcels.

Innovations adoption is hindered by the nature of farming activities, that are carried out by a progressively ageing population and are essentially part time (according to the last census of agriculture 64.9% worked less than 25% of one (1) annual work unit in agriculture). Moreover, farmers, have a "training by doing" approach to farming (around 90.15% of the 11,713 sole holder managers declared that they were exposed to agricultural training only from practical experience) that doesn't stimulate the undertaking of more structured education/formation paths.

Forestry itself has no economic meaning in the Archipelago, as a forestry-related industry doesn't exist.

2. Characteristics of AKIS

2.1. AKIS description

The AKIS in Malta is characterised by a little number of organisms with a low level of coordination and interactions among them and a lack of systemic vision.

The governance of the system is fragmented into a relatively large number of Ministries and ministerial bodies (cfr. § 2.4) that still design strategies and implementation tools with a basically sectorial approach; while consultative and participatory methods were endorsed over the last years the renewing the policy frameworks and better address farming needs. The achievement of an overall view of the different tools and their use is difficult even for the institutional actors themselves, also in consideration of frequent responsibility shifts between Ministries.

Research, education and vocational training are mainly concentrated within two public organisms, which also contribute to the definition of R&I and education programs at national level. Both have remarkably improved their activities in the last years. However, despite some efforts in strengthening relationships with other AKIS actors, there is still a gap between the Maltese research and education world and the agricultural and rural community, which is particularly evident in the lack of qualified advisory services on the island.

Extension and advisory face the contraposition of a sole ministerial setting organization, funded under Measure 2 of the RDP 2014-2020, with an increasing number of private farmers-based organizations (farmer cooperatives, farmers' movements/associations/networks, NGOs) providing various types of advisory and services, often employing skilled professionals from other European countries.

Relationships between government bodies and the agricultural community are only defined around the RDP implementation activities. In general, knowledge flows are mainly driven by traditional methods of knowledge transfer, while circular and interactive models of knowledge flows are hardly implemented.

2.1.1. AKIS actors and knowledge flows

The AKIS' actors have a different propensity to engage into system-oriented relational dynamics and can be grouped as follows.

Education

Agricultural education and training in Malta are under the responsibility of the Ministry of Education and are implemented by the two main higher educational institutions (HEI): the University of Malta (UoM), Division of Rural Sciences and Food Systems within the Institute for Earth Systems, and the Centre for Agriculture, Aquatics and Animal Sciences within the Malta College of Arts, Science and Technology (MCAST).

The **University of Malta** (UoM) is the highest teaching institution on the island. It offers a one-year diploma course on Agriculture, that allow students to gain knowledge and experience on rural sciences and food systems. Diploma graduates may be employed as laboratory or agricultural officers with Government, industry or co-operatives, or further their studies by following a bachelor's degree. Veterinary courses are not provided by the UoM. Tertiary education in Malta is publicly funded and free, and eligible students receive a maintenance grant as well as an allowance for academic-related expenditure.

MCAST is a vocational education and training institution. Set up in 2001, the college offers 170 full-time (addressed to full-time students or apprentices) and over 300 part-time vocational courses (tailor-made courses for the individuals) ranging from certificates to degrees, preparing students for careers in different sectors of the economy of for higher education (Appendix 1). The college collaborates closely with local industries to make sure that students get hands-on experience as well as gain the necessary contacts and exposure to the sector they wish to work in.

The Ministry of Education also provides for adult education through the **Employment Training Corporation (ETC)**, who holds courses concerning specific professional training. Courses are taught both during the day and in the evening. Because the ETC is a government service, most of the courses are free.

Research

The main actors within the Maltese research area are still UoM and MCAST and both are well embedded within international research networks and present a good degree of participation in H2020 and ERASMUS+ projects (i.e. FOWARIM, SIM4NEXUS, ESMERALDA).

The Department of Rural Sciences and Food Systems within the UoM Institute of Earth Systems is the leading research institute. The Department carries out research in agricultural sciences with particular reference to the needs of Maltese

agriculture whilst still providing professional advisory and extension services to the local farming community.

Within **MCAST**, the Applied Research Department is responsible for research activities; while the Centre for Agriculture, Aquatics and Animal Sciences launched the Malta Small-Scale Fisheries Network with the aim of seeking possible strategies for the development of small-scale fisheries within the framework of the blue economy.

Malta Aquaculture Research Centre (MARC), set up in 1988 with the aim to help the development of fish farming as a new industrial activity in Malta, is the only research facility for hatching marine species for mariculture.

The Maltese Government has been investing heavily in buildings and equipment for research in the public sector in recent years, with strong support from the ESIF. UoM and MCAST have benefitted from such investments, aiming to build their teaching and research capacity. Major examples include, in the last funding period, the Life Science Park, and in the current period the Sustainable Living Complex (SLC) and the Transdisciplinary Knowledge and Exchange centre (TRAKE), both located at UoM. Besides, some Ministries and other governmental bodies (Malta Enterprise, MECP) vaunt a good degree of participation in H2020 projects. Besides, some semi-public research (Water Services Corporation - WSC) and non-governmental organisations (namely, Biological Conservation Research Foundation (BICREF) and Malta Organic Agricultural Movement (MOAM)) show a certain pro-activeness as they participate to about 50 H2020 projects, different topics. While, there's a very few evidences of private companies embedded in research activities.

Extension, advisory and innovation support services

In Malta there are few organizations established with the specific purpose of providing agricultural advisory services; while the cooperatives and producers' organizations (figure 1) are key players of the AKIS and have ever had a significant role in fostering knowledge and enhance skills of their members (Attard et al., 2012; Buttigieg and Zahra, 2009; Cristiano & Proietti, 2014).

All in all, the extension and advisory services in Malta are of two types: public (AgriConnect) and private bodies.

Some private companies are focused on innovation support services (TR Association and Atriga Consulting in § 4.1) and are also embedded in European research and vocational projects (i.e. LIVEUR, NOMAD H2020). Few of them, also, belong to other sectors (i.e. digital solutions, communication) and are increasingly intercepting the primary sector particularly to support of innovation paths.

Extension and advisory suppliers are more widely described in chapter 4.1.

Farmers' based organizations

Agricultural cooperatives have a long history in Malta, being set up since the Cooperative Societies Ordinance in 1946. They represent the most important reference point for farmers, for the organization of the sales on the markets, and a crucial hub of knowledge flows within AKIS Malta (§4.1).

BOX 1 – Koperattiva Produtturi tal-Halib Ltd (KPH)

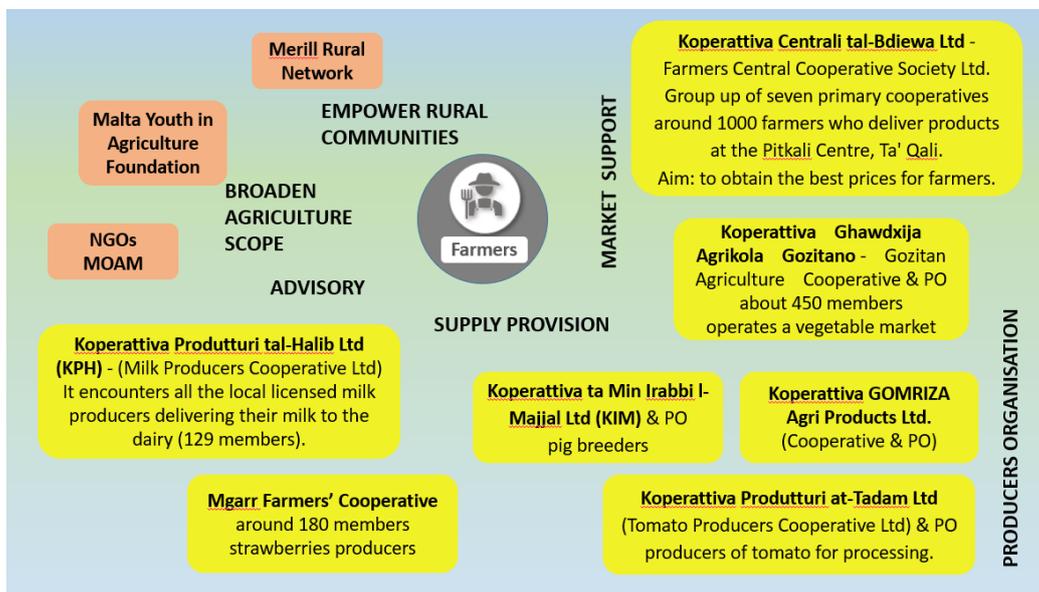
Milk Producers Cooperative Ltd was partner of the FASC Consortium and it is one of the most important Cooperative in Malta. It was established in 1958 and encounters all the local licensed milk producers delivering their milk to the dairy (129 members). It offers its members benefits and services including the importation of all cereals and other feedstuffs and provides equipment and consumables, artificial insemination and cattle breeding services, farm insurance, training, farm support and advisory services to help members to upgrade their farm facilities and operations and to improve quality and efficiency. It also produces and sells compound feeds for dairy, beef, pigs, poultry and rabbit livestock sectors. To reach these objectives over the years KPH invested heavily and developed a strong vertical structure integrating the producer, the agroprocessor and marketing mechanisms. (Cristiano & Proietti, 2014)

BOX 2 – Mgarr Farmers' Cooperative was set up in 1947 and has around 180 members. It is one of the most important cooperatives of fruits and vegetables in Malta and it is member of the farmers center cooperative (FCC). Along with the main function of supporting members for wholesale market and retailing operations, it provides advisory services, dissemination and training on day-to-day farm activities, quality schemes, farm management plan, sustainable agriculture and rural development measures' applications. The cooperative is strongly embedded in local system and, also, abroad. Frequently, it acts as connector between its members and specialized consultancy providers from abroad.

[\(https://www.facebook.com/pages/category/Agricultural-Cooperative/Mgarr-Farmers-Cooperative-Society-Ltd-376242049053409/\)](https://www.facebook.com/pages/category/Agricultural-Cooperative/Mgarr-Farmers-Cooperative-Society-Ltd-376242049053409/)

Some cooperatives are also Producers organisations. Most of them, particularly livestock breeders, are represented by a cooperative or Producers Organisation (figure 1).

Figure 1: Some of the most relevant farmers cooperatives in Malta



In the last two decades, new farmers-based organisations have been set up that include, in particular, young farmers or farmers that want to improve agriculture sustainability. Among them, the **Malta Youth in Agriculture Foundation**, that has been set up in 2004 to support young farmers, and the **Merill Rural Network** (<http://www.merill.com.mt/content/network>), which brings together a number of farmers, breeders and artisans, to empower rural communities by fostering rural tourism and the creation of a circular (and sustainable) economy.

BOX 3 – The MaYA Foundation experience

MaYA Foundation is an independent organisation set up by some MCAST students and it is devoted to promoting sustainable agriculture with a focus on the new generation of farmers in the Maltese Islands. The foundation has been set up to face the challenges of a small-scale agriculture in a European context and to build bridges between young farmers, government entities and the general public, thus giving agriculture a broader scope. Among the others, MAYA Manifesto includes:

- Lobbying in favour of young farmers at a local, EU and international level;
- Assisting in the setting up of a taskforce to tackle agroalimentary fraud;
- Tackle land management issues;
- Engage in national educational and awareness campaigns;
- Liaise between stakeholders to improve supply-chain management;
- Encourage capacity building to manage better EU and national funds;

<https://www.maya.org.mt/about>

Other actors

Over the last years, new private actors, such as NGOs, Local Action Groups (LAGs) and private companies, have emerged, providing a range of technical advices. Among them, **Malta Organic Agriculture Movement** is an NGO operating in the

field of organic agriculture since 1999 and it is member of the International Federation of Organic Movements (IFOAM). It plays a significant role in Maltese agriculture as the promotion of organic agriculture, both towards local consumers and farmers, includes defining the specific national organic agriculture standards and the product certification on organic agriculture.

The only network-oriented organization is the **National Rural Network of Malta 2014-2020**, which, however, does not seem so proactive within the Maltese AKIS. Some **input providers** are well established in Malta (i.e. seeds, fertilizers, tractors, plants, greenhouse structures) and they are well connected especially with the farmers'-based organizations and, additionally, most agricultural cooperatives are engaged in providing farm inputs requirements. Due to the emerging needs for farm mechanization and new fertilization practises the suppliers are becoming more active in the Maltese AKIS.

Nowadays, financial services are operating in Malta to a very little extend to support the agricultural community; while, in the past, APS Consult Ltd., which, linked to the government, had set up to provide agricultural advisory services it does not seem offering specific services anymore.

Finally, an characterizing component of the Maltese AKIS is the presence of some foreign players, coming mainly from the Mediterranean area (i.e. CHIEAM), that as it emerges from the narratives of the interviewees, can almost be considered as internalized actors of the local AKIS, as they are strongly integrated within it.

In fact, they play a fundamental role in coping with the gap of specialized skills, research and in-put providers and, over the years, they have established and consolidated bilateral relations with the different local actors, through favouring their operativity.

Knowledge flows

The knowledge flows within the AKIS are affected by a low degree of system-perspective and of farmers' positioning, while the actors have a low perception of themselves as part of it. Moreover, the relations among the actors are essentially informal or project led.

There is a persistent disconnection between government bodies and the agricultural community, while interactions within the latter are more frequent mainly thanks to the presence of proactive farmer-based organizations and young farmers.

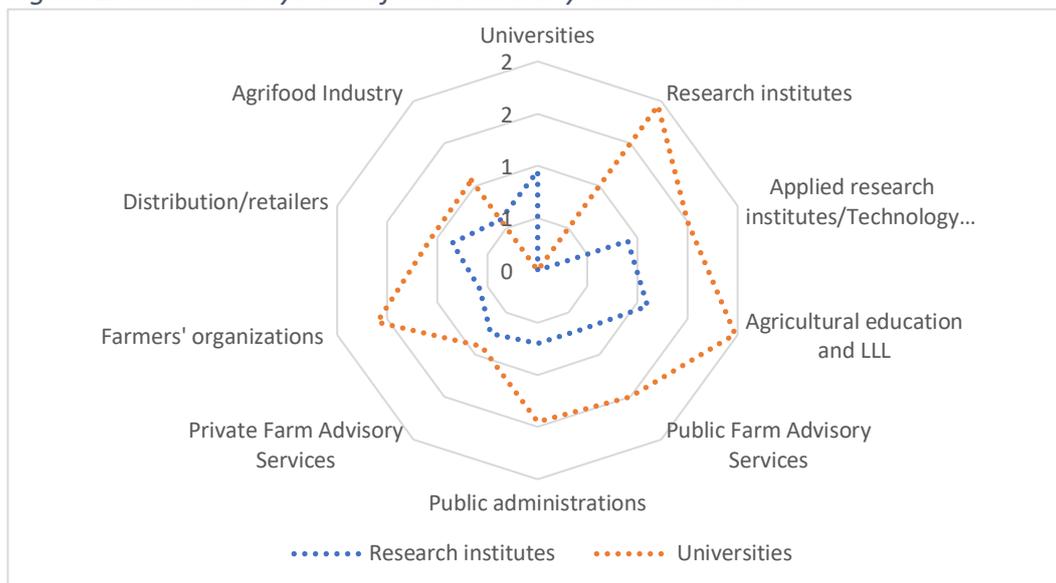
Still, the farms present a low R&D absorption capacity (EC, 2019) which is mainly due to low degree of interaction between the productive and research/university worlds, as it was confirmed by the interviewed (figure 2).

In fact, the circular and interactive models of knowledge flows for innovation are hardly implemented, while the relationships between the research, the academic and the agro-food world are mainly driven by traditional methods of knowledge transfer or by merely academic exercises. The only divergent opinions were expressed by two actors working on multi-actor innovation processes within international partnerships (i.e. H2020).

MCAST seems to be well-connected within the local AKIS and, to a certain extent, it acts as a mediator between the multitude of internal and external knowledge players. In fact, it shows an increasingly farmer-oriented and systemic approach aimed at solving practical issues of local agricultural development, such as the management of water resources and the valorisation of local products. This approach is well reflected in both research and vocational training (M1 of the RDP) activities which are bridging it closer to the farmers, but, also, to the governmental bodies, industry and other private training institutes.

Besides, there are some sectors of local agriculture, like organic farming and viticulture, that are shifting toward multi-actor approaches in service provision and training, in order to get to a comprehensive approach to farming sustainability.

Figure 2: Relational system of the University and Research



Source: Our elaborations based on interviews

The current advisory providers in Malta have a low capability to bridge research and knowledge needs of farmers and this, certainly, does not help the

implementation of more collaborative and multilateral approaches to knowledge flows within the local AKIS.

Furthermore, the absence of knowledge networks and infrastructures weakens the capacities of the AKIS actors to engage in whatever exchange of knowledge among them. On this regard, despite some informative sessions concerning RDP measures, the interviewed did not even mention the current NRN nor attribute to it real capacities to foster knowledge flows within the AKIS of Malta.

Besides, as mentioned, the Malta's AKIS is characterized by a relevant bulk of consolidated relations with external actors which, however, involve bilaterally different local actors.

2.1.2. Policy framework at national level

The policy framework and instruments concerning the Maltese AKIS are characterized by dispersion over a multitude of national acts and funding instruments issued by different responsible and implementing bodies (i.e. MCST, MAFA, ME and MSD), without cooperating and any clear view for complementarities. This, as it emerges from the interviewed and other relevant sources, makes difficult the acquisition of an overview of the different instruments and their use to the same institutional players, implementing bodies and potential beneficiaries (European Commission, 2019).

Indeed, over the most recent years, some efforts have been made to foster greater inclusiveness of the multitude of stakeholders, like the relevant local authorities (ministries and government agencies), the academia, the research and the private business representatives, through open consultations aimed at defining the different policy acts (i.e. NAP, 2018). These consultative processes included, also, the EC, DG Research & Innovation (EC), which, through a 'Policy Support Facility' (PSF) exercise in view of reforming the Maltese R&I system and the policy framework for the next 6 years.

However, the connection between the general policy framework and the specific one for agriculture and rural development seems to be very weak. Moreover, there's a lack of stable national funding schemes for basic and applied public research instruments which could approach bottom-up research in the local public research sector.

The general current policy framework for the AKIS in Malta is articulated around three areas which, however, appear untied one to each other and are

implemented without any apparent coordination: (1) **Research and Innovation**; (2) **Education and lifelong learning**; (3) **Agriculture and environment**(figure 3).

Figure 3: Policy framework of the AKIS in Malta



Source: Authors' elaboration

The **National Research and Innovation Strategy 2014-2020 (NRIS)** is built around three pillars which in principle should design the path for a major embeddedness of research and innovation activities in Malta's economic and social tissue. The strategy integrates the Smart Specialisation Strategy (RIS3) which includes aquaculture as a one of the identified areas of specialisation and as a smart specialisation niche in itself (i.e. digital innovation).

The policy framework on **education and lifelong learning** includes several legislative acts which, as a whole, cover a broad range of issues, while only few addressing the enhancement of skills and capabilities in agriculture and rural development.

Concerning **Strategies and action plans on agriculture and environment**, an evolutive path can be observed over the years that has led to a shift of knowledge transfer and innovation focus from the cross-compliance and environmental issues towards the improvement of agricultural production and the enhancement of capacities and innovation to resolve crucial local issues (i.e. water scarcity, livestock breeding emissions, land use and soil matter management) along with

the more balanced and integrated development of rural with the urban areas in Malta.

Chronologically, the first framework implementing the current policy is the RDP 2014-2020 that, as it is stated within the same programme, represents a step forward from the farm modernisation focused under the RDP 2007-2013 since its greater focus on knowledge exchange and innovation to improve the productivity and sustainability of the Maltese agricultural sector. And, it sets out some key policy drivers and targets which will furtherly ground the subsequent frameworks (Strategic Plan for Environment and Development (SPED) and National Agricultural Policy (NAP)).

The design of the measures regarding knowledge exchange and vocational training (M1), cooperation for innovation (M16) and advisory services (M2) is well focused to streamline their support to the functioning of the local AKIS. Indeed, these measures would had represented a good level of financial support for R&I activities, but, as at end of 2019, they show a very little uptake and no realised expenditure (Table 3).

Table 3: Support to Knowledge transfer, innovation and modernization in Malta's RDP

Knowledge transfer and innovation in agriculture, forestry and rural areas	Target 2023	Committed 2019
Measure 1 "Knowledge transfer and information actions"	2.640.000 Euro	285.000 (Euro)
	7.200 trained (units)	3.000 trained estimated
Measure 2 "Advisory Services, farm management and farm relief"	230 (Nr of beneficiaries advised) 2.500.000 euro	1 (Nr)
Measure 16 "Cooperation"	105 Number of beneficiaries 1.975.000 Euro	5.925.049 (Euro)
	4 Operational Groups (OGs units)	0 (n. OGs)
T1: percentage of expenditure under Articles 14, 15 and 35 of Regulation (EU) No 1305/2013 in relation to the total expenditure for the RDP	8,19%	0

Measure 4.2 “Support for investment in infrastructural related to development, modernisation or adaption of agricultural forestry”	625.000 Euro 25 operations	2.374.269 (Euro)
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Source: Our elaboration on AIR 2019 of RDP Malta

In 2015, in continuity with the RDP 2014-2020, it was established the **National Strategic Plan for Environment and Development (SPED)** that represents a common framework for environment, agriculture and rural development. This founding regulation is inspired by a holistic spatial planning approach for the balanced and coordinated development of urban, rural and maritime activities.

The “**National Agricultural Policy for the Maltese Islands 2018-2028**” (NAP) places R&D as a strategic objective and engages six policy issues (Higher educational institutions, Research and innovation, Idea incubators and product Development, Smart agriculture and IT development, Internationalisation and Extension services) in view of its major role to be played in steering Maltese agriculture towards innovation and specialisation.

In financial terms, during the period 2014-2018, data concerning research and innovation in the agricultural field show an increasing trend of both expenditure and employment in HES (table 4). On the contrary, the drop of spending in the private and public sectors led to the reduction of the Global Expenditure in Research and Development (GERD) in agriculture (-233%). In 2018 the total expenditure on agriculture science was about 1,3% on the total in R&D, while the employment counted about 2,8%.

Table 4: Total expenditure on R&D on Agricultural science by sector

Sector	2014		2018		Variation 2014 to 2018	
	GERD	Employment	GERD	Employment	GERD	Employment
Government Sector (GOV)	731	34	413	30	-77%	-13%
Business Enterprise Sector (BES)	462	18	168	10	-175%	-80%
Higher Education Sector (HES)	332	6	411	30	19%	80%
Total	1.525	58	993	70	233%	-13%
% of GDP	0,02		0,01			

*Global Expenditure in R&D

Source: Eurostat

National funding

Over the last years, a list of several direct grants and R&D tax credits have been established to addresses specific R&I priorities as set by the policy makers. Farmers and rural operators are among the potential end users of these instruments but only very few of them are actual beneficiaries.

Recently, specific grant schemes and bodies have been established to support both R&D translation into innovation and skills development in enterprises, including the use of advisory services by SMEs (table 6).

Box. 4-- Scheme for the Provision of Proposals aimed at a Holistic Approach to the Sustainable Management of Livestock Manure and Slurry within a Circular Economy

Project name: **Mobile Separator System with Recycling for Nine Livestock Farms in Gozo**

Entity: Farm Owners Group & Services Ltd.

Funding: €131.739

Abstract: The project focuses on resorting to a mobile manure press separator for solid-liquid separation of livestock manure for different livestock farms so as to best address the pressing concern of space issues while, at the same time, taking advantage of short distances.

Project name: Assessing cutting edge pig slurry treatment technologies for Malta within the principle of a circular economy.

Beneficiary: C&F Enterprises Ltd/Cavalier Trust Services Ltd;

Funding: €149.333

Abstract: The project will test a series of technologies for the treatment of pig manure specifically designed for small holdings, in order to make its disposal more environmentally friendly.

Project name: Proposal for the Treatment for Livestock manure and slurry by means of Pyrolysis and De-nitrification of water

Beneficiary: PT Matic Environmental Services Ltd.

Funding: €149. 152

Abstract: the project aims at issuing upscale solutions to the livestock manure challenge of the Maltese Islands, in order to make them more compliant with the water Framework Directive.

European research funding

Maltese organizations have a significant participation in EU policy programmes, specifically, on agriculture, aquatic and environment topics (table 5).

Table 5: Participation of Maltese organizations to EU research programmes

Framework Programme	FP7		H2020	
	Participation	EU Contribution (000.eur)	Participation	EU Contribution (000.eur)
Innovation in SMEs			23	247
Food security, sustainable agriculture and forestry, marine and maritime and inland water research	198	21.085	19	3.604
Climate action, environment, resource efficiency and raw materials			15	2.876
Research infrastructures			13	926
Total	198	21.085		

Source: Horizon Dashboard (visualized on 30.11.2020)

Maltese public bodies, particularly, promote the participation to regional initiatives in the Mediterranean areas so that, currently, Malta is partner in two EraNet projects: ERANET-MED (overall budget: 2,9 million euro) and ARIMNET II (overall budget 2,3 Million euro). ERANET-MED targets renewable energy and water resources while ARIMNET II is focused on the field of agricultural research.

2.1.3. Coordination Structures

The governance of the overall R&I in Malta, including of the smart specialization strategy, appears fragmented and weak in coordination as it is dispersed across

several governmental bodies and agencies which act separately and without a clear leadership.

Particularly, in principle, the formal organizational chart of the bodies governing the overall R&I strategy looks well designed to promote cross-governmental and cross-agency cooperation, along with well-grounded and collaborative R&I strategic designing, because of the inclusion of the representatives of the quadruple helix (MCST, 2018). However, this picture does not include Ministry of Agriculture, Fisheries and Animal Rights (MAFA), neither it is applicable to some innovative sectors (ICT, blockchain, etc.) which, in turn, are under the responsibility of other agencies/ministries (i.e. Malta Information Technology Agency). In fact, this research shows little evidence of coordination mechanisms or, at least, of interaction between MAFA and the governance structures of the national R&I strategy for sharing objectives and planning.

Currently, institutional bodies playing key functions of policy design, source mobilization and legitimacy which are theoretically tasks for the AKIS coordination bodies, are distributed among the following bodies.

The **Ministry for Agriculture, Fisheries and Animal Rights (MAFA)** was only established in January 2020 and until that the matter of agriculture was delegated to the Ministry of environment. The recent establishment of a **Rural Affairs Department** within the MAFA, is surely a symptom of the new attention of the Maltese Government to rural development policies and it is made up of two interlinked Directorates, the **Agriculture Directorate** and the **Plant Protection Directorate**. The first aims at both assisting and supporting local farmers, but also works towards the development of policies and the implementation of national and EU legislation within the sector. The directorate has the in-house FAS structure denominated Agriconnect. On the other hand, the Plant Protection Directorate works as a regulating body to prevent the introduction and dispersion of pests and diseases harmful to plants.

Agriculture and Rural Payments Agency (ARPA) is appointed by MAFA and has a crucial role in implementing the projects specifically foreseen for agriculture and environment the National strategy of digitization specifically.

The **Ministry for the Environment and Climate change and Planning (MDSEC)** had under its portfolio the Parliamentary Secretariat for Agriculture, Fisheries and Animal Rights until 2019. It is responsible for land use planning and environmental regulation in Malta.

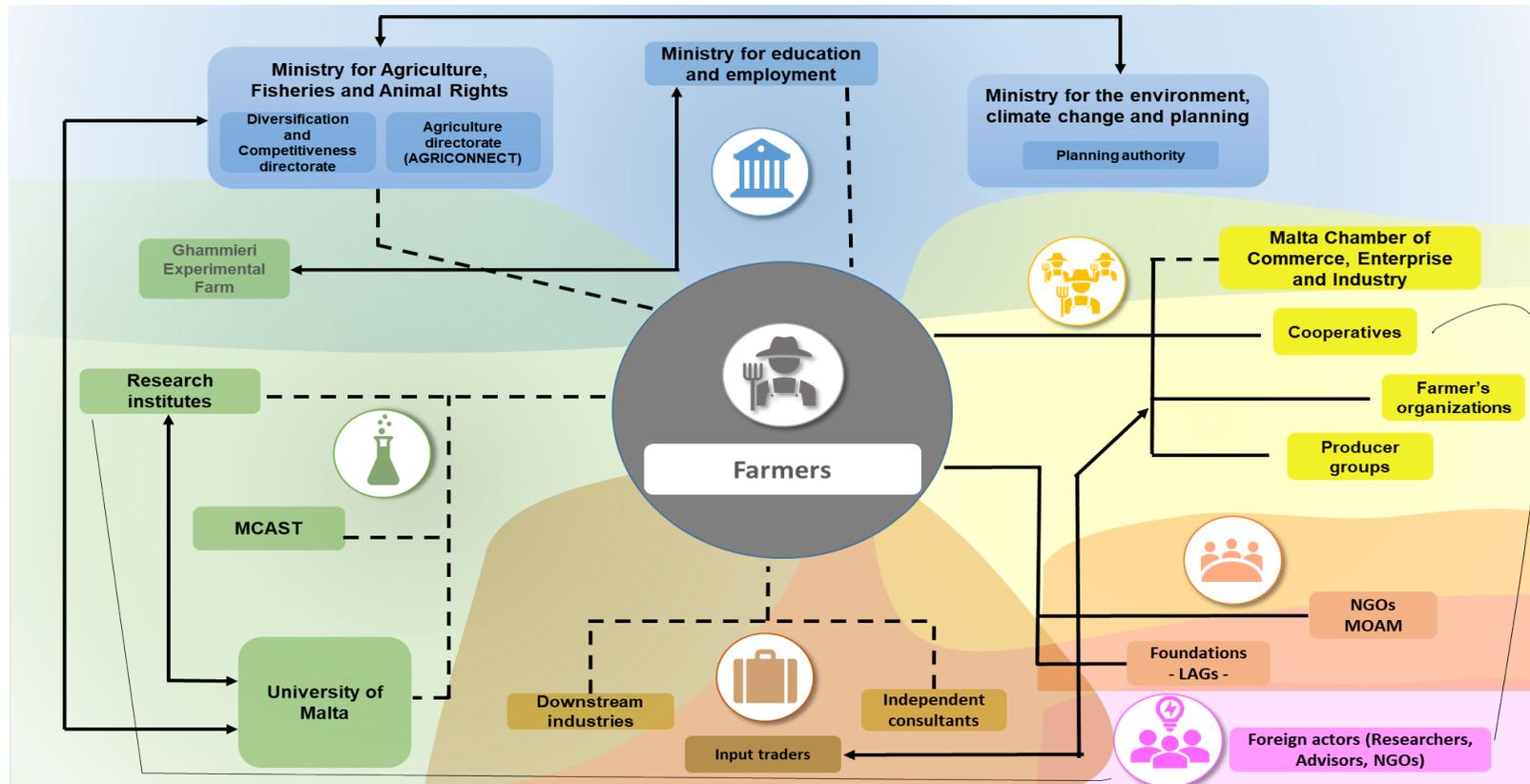
Research and Innovation were, until very recently, formally part of a larger portfolio of the **parliamentary secretary for Financial Services and Digital Economy** under the Ministry for Finance and Financial Services. However, it seems that also other ministries carry out innovation-oriented activities. At time of writing this report, the activities should be taken over by the recently established **Ministry for Research, Innovation and the co-ordination of post Covid-19 Strategy**

The **Ministry for Education (MFED)** is responsible for education at all levels for higher education institutions and for employment policy.

The **National Commission for Further and Higher Education (NCFHE)**, under the Ministry of Education and officially established in 2012, is the regulator of further and higher education in Malta. It provides accreditation and ensures the quality of further and higher educational institutions, programmes or courses and provides recognition of national or international qualifications.

Another important entity of the MFED is the **Malta Council for Science and Technology (MCST)**. It is a central player in the country's R&I system as it functions as research-funding agency and has a key role in supporting internationalisation of the Maltese R&I system. MCST acts also as contact point for H2020.

2.2. AKIS diagram



3. History of the advisory system

In the pre-EU era, in fact, FAS were essentially based on public providers, where the responsible Ministry (MSDEC) itself or other public bodies supplied farmers with extension services.

With the accession to EU, the need to comply with the CAP and the specific regulations on extension and advisory services required a complete restructuring of the FAS, that brought to a tentative complete rearrangement, with downsizing of the State-provided services by shifting toward a semi-public model by a greater involvement of private entities who were well-embedded at territorial level (Cristiano and Proietti, 2014).

Also, during the programming period 2007-2013, the RDP allowed Maltese farmers, for the first time on the Islands, to get access to the financial opportunities for the use of advisory services. It moreover spurred a novel approach to FAS that brought to the assignment of new functions to farmers' cooperatives and the entry of Producers Organizations – POs in the field of advisory services. After the initial reluctance of some, POs were crucial in simplifying the process of transition toward a common market and acted as an intermediary between the farmer and the FAS providers in terms of service demand and supply (Attard et al., 2009).

Unfortunately, some programmatic choices prevented the setting up of a structured network of independent advisors, with consequences that still reverberate on local FAS, nowadays. Namely, the establishment of the “FAS Consortium” as the sole beneficiary of measure 115 (Setting up of advisory services) of the RDP 2007-2013, although exemplary of the “new deal” of the Maltese FAS, may have discouraged further independent private initiatives. The Consortium, a public-private partnership made of MSDEC itself and the two main Maltese cooperatives, was set up to help farmers on cross compliance and the production of fertiliser plans, but it is no longer operational due to a lack of financing. (ATRIGA consult, 2018).

Besides, across the time, the cooperatives and the producer organizations have demonstrated to be crucial in the provision of both training and advisory services. Particularly, through participating to the RDPs they have enlarged the domains on which they historically provided services to farmers to matters more related to rural development, such as quality of products, consumer policies, organic

agriculture, cross compliance and global management of the farmers (Cristiano & Proietti 2014).

With the current programming period 2021-2020, a new attention to FAS has brought to a wider restructuration of the governance of the services in charge of rural development affairs, with a passage of competences from MSDEC to the Ministry of Agriculture, Fisheries and Animal Rights (MAFA). Anyway, a tendency in keeping the local FAS centralized in a top-down model still persisted, in the attempt of providing local farmers. Today the most prominent FAS providers in Malta both belong to MAFA.

4. The agricultural and forestry advisory service(s)

4.1. Overview of all service suppliers

Farm advisory services in Malta are provided by few private, mostly farmers'-based organizations and one governmental body (AgriConnect), which present different degree of integration and approaches within the local AKIS and a clear distribution of competencies on advisory topics (Appendix 2) .

Indeed, two main types of advisory support are required in the Country, also in view of reducing reliance on external experts: generalist 'animators' with broad competence in the areas of Malta's identified development needs; and specialist advisors to offer targeted help to particular sectorial activities.

Malta has the Malta Veterinary Association includes about 60 Veterinarians. While, no associative bodies reunion the agronomists and agrotechnicians.

The public bodies are basically represented by AgriConnect and few other governmental departments, under the authority of the MAFA, that operate through their own civil servants.

Agriconnect has been set up within the Agriculture directorate and it is the sole organisation completely funded by Measure 2.1. of the RDP. It makes available a free of charge advice basically on issues related to the implementation of the RDP and Cross Compliance.

Plant Health Directorate (PHD), within the Agriculture and Fisheries Regulation Department assists farmers and the general public on a number of phytosanitary issues.

Eventually, the National Rural Network (NRN), set up under measure 20 of the RDP 2014-2020, acts as information provider, mainly by organizing informative events for the potential beneficiaries of the RDP measures. During 2019, numerous events were realized, mainly at the headquarters of the most active cooperatives of Malta, to meet the farmers (i.e. Mgarr Farmers' Cooperative, FCCS Cooperative).

The private bodies are mainly represented by producers' organizations (POs) and cooperatives, whose role in fostering knowledge and enhance skills of their members is traditionally recognized (Buttigieg and G., Zahra, E. 2012; Cristiano and Proietti, 2014). As a matter of fact, farmers tend to rely on farmers'-based organisations (producers' organizations and cooperative) for day-to-day support on farming practices and even to search for more qualified advisors when needed (Attard et al., 2009; NAP, 2018).

Besides, over the last two programming periods of EU Funds and in relation to

Box 5: [TR Associates](#) is an Innovation minded company, established in Malta in 2008. The main mission is bringing open innovation to the marketplace in the different areas of the applications (urban and rural development , ageing society, education, Intelligent transport, e-Business, green technologies), based on the large partnership of the local stakeholders, incorporated academia, government, associations and industry. Its mission also is to explore and achieve policy and business goals related to research and innovation, to generate new projects (small and large scale) under the framework of the different European and national programmes, calls and tenders. Continuously enhancing its innovation capabilities in the fields of solutions, products and services,

As partner of the H2020 project LIVEUR, TR Associates acts to generate new methodologies and technologies to approach rural and peri-urban territories weakness and strengths in Malta by a “model of social farming” and follow the entire short food supply chain for the sustainable eco-production.

Source: www.tr-associates.webs.com/

specific matters, other types of service suppliers have been emerged on the scene of maltese AKIS, spurred by both the new approach to innovation promoted by national and European policies and by the changes in the needs of local farmers that. Such a renewed offer goes beyond the provision of traditional services and, includes the provision of a pluralistic advisory service more incline to perform innovation support functions (e.g.: TR Associates in the box;

Atriga Consulting), through creating bridges between European research and the dynamics of territorial development in Malta, along with a variety of technical and specialized advices (business plan, application forms, renewable energies, innovation brokering, digitalization, etc.).

In addition, **Malta Organic Agriculture Movement (MOAM)** provides training courses, sharing practices and disseminating ideas, as well as running educational programmes and activities to educate the public about organic food.

Instead, there are no advisory infrastructures, while, as emerged by the interviews, a new digital hub will be established with the purpose of collecting farming data and providing tailored advisory services.

4.2. Public policy, funding schemes, financing mechanisms, advisory service providers

The Maltese policy framework on the farm advisory suppliers is basically defined by the Rural Development Programme 2014-2020 (RDP), the Guidance Notes for Measure 2 Advisory services, farm management and farm relief service (MEAE, 2019) and the recent National Farm Advisory Services Regulation (L.N. 99 of 2019) (Appendix 3).

Measure 2 (M2) is devoted to enlarging the range (number), scope and methods of farm advisory services and to ensure the setting up of a body of local expertise that, by reducing reliance on external experts, should be able to act as animator, to support farmers in implementing RDP programme and offer targeted help to particular sectorial activities. Also, the advisors, while providing technical advice on cross-compliance and environmental issues, they have to support farmers in understanding the purpose, principles and objectives of more sustainable agricultural practices. All advisory services receiving a grant from Measure 2.1 have to be offered fully free of charge to end beneficiaries up to €1,500 per event and one-to-one advisory support covering the provision of information and creation of awareness on Cross Compliance obligations and benefits of AECMs must be available to farmers with no charge, for one year.

The recent National Farm Advisory Services Regulation (L.N. 99 of 2019) set the rules for their setting up and functioning. This disciplines the rules for the recognition and registration of farm advisory service providers, the advisory areas and specific topics, the monitoring and control rules and the setting up of the Farm Advisory Service Registration Board, in charge of these procedures. This law sets out rules to implement the measure 2 of the RDP 2014-2020 but, as a matter of facts, the regulation was published only five years after its entering in force. It is applicable to the recognition of all the eligible legal or natural persons who would like to apply for to be recognized to provide advisory services in Malta under the RDP.

The current sole public services provider (AgriConnect) relies on the CAP (measure 2 of the RDP) and the government funding. While other national funding schemes are applied to the cooperatives and the producer's organizations, along with the contributions paid by the respective members and by the common marketing organization (CMO) funding schemes (applied only to POs). Cooperatives are also supported by the central cooperative fund (CCF) which is feed by the cooperatives themselves with a contribute of 5% of the surplus of each financial year. On the

other hand, over the current programming period, both the cooperatives and POs are hardly accessing to RDP's funding. In very few cases, some advisory companies are financed through the fees paid by farmers for the provision of specific consultancies or finance advisory by mean of other in house activities.

4.3. Clients and topics and Methods

Topics and methods of advisory are clearly defined by the specific policy framework (cfr. 4.2) on the farm advisory suppliers (Appendix 3). This regulation marks a shift from an advice basically focused on cross compliance, as endorsed by the previous law (L.N. 113 of 2010), to a more holistic range of advisory topics and innovative methods which, in principle, should better address the needs of local farming system.

The composition of the clients' portfolio reflects the different nature of services providers and targeted supply chains. In the cases of the members of cooperatives and PO/PGs, the groups and the number of clients vary depending on the sector and dimension of the holdings, through covering all categories of farmers.

Ever since the EU accession, an entrepreneurial approach and a greater sensitiveness towards more sustainable, productive and competitive farming standards have been gaining space in farmers' business plans.

As a matter of fact, farmers are becoming more and more aware of the benefits of the use of advisory services has been, as proved by the increasing demand for specialized advisory. This trend goes along with the entering of young farmers who, often linked to MCAST and with a background of strong training experiences also at international level, demonstrate a more entrepreneurial approach to farming activities.

The main target groups of private advisory companies are represented by the few of large-medium-small commercial farms who can afford paying for such services, or Producers group, while part time farmers rarely turn to their services, but when they do it's mostly on very specific matters. In these cases, the topics covered are highly variable ranging from cross-compliance, renewable energies, waste and water management, rural development and economic efficiency. Private advisors could support farmers on very specific topics, according to their expertise: on rural tourism, for instance.

The governmental organization targets its services to all the categories of farmers, included those who are more likely to struggle with Eu regulations, RDP measures and agricultural activities in general (small and young farmers, part time farmers

and semi-subsistence farmers). Also, private advisory services and SMEs are reached.

Both AgriConnect and the private organizations deal with support on grant applications and on rural development funding opportunities, advisory services provided by the governmental institution focus on Agri-environmental stewardships, as well. The private organizations, additionally, offer specific advice on taxes and legal matter, production technologies, use of digital equipment and decision support systems, along with fisheries and aquaculture.

Individual consultancy remains the most used advisory methods, both face to face (on site but also at the desk) and via digital apps (skype, WhatsApp...). The governmental organization, in addition, offers mass media advice via internet (information from websites, blogs, forums). The NRN provides information through mass media and organize meetings and information seminars for stakeholders, as part of awareness and information campaigns. Besides, on group advisory and peer-to-peer learning is only used by NGOs, Cooperatives and POs. Although the pandemic status forced providers to change advisory methods, the public provider has intensified face to face meeting outside their offices, while the private organizations has shifted to digital.

4.4. Human resources and methods of service provision

In Malta, human resources and methods of service provision, along with the level of qualification of the respective personnel, are differentiated across the types of organization playing as advisory providers (Appendix 2). Besides, the number and qualification of the extension staffs of private providers vary depending on the organization of the entity and the number and dimension of clients. In general, the number of the employees is between 1 and 5 and on demand, particularly the cooperatives and POs, hire full-time specialists and subcontractors (Cristiano and Proietti, 2014).

Human resources of both the surveyed organizations, including AgriConnect, are strongly oriented toward advisory services: 12 out of 13 employees are advisors. In just one case, a private organization has allocated one working unit to back office duties. Besides, in contrast with the past (Cristiano and Proietti, 2014), an average of 50% of the employees are females, a quota that is close the one referred to the sole advisors (42%), given their prevalence in the working structure. There's a preponderance of female workers in the team of the private

organization, both among the advisors (+50%) and the overall employees' number (+ 56%). As reported, also, by the three respondents there's not been any significant change in the number of employees in the last five years.

The direct survey and the interviews confirm some general and relevant differences in overall training and competences of the employees which. The public advisor's staff reached the bachelor's degree has the highest qualification, while in the private organizations at least one employee holds a master degree; moreover public respondents don't require to their employees to have completed a further qualification to work as an advisor. One private actor, on the other hand, just requires a relevant amount of experience.

Also, advisors' working experience varies from a subject to another, with a strong prevalence of junior advisors in the public organization, where more than the 90% of the advisors has less than three years' experience. On the contrary, the private providers' staff is more experienced, since half of it has more than ten years of experience and a further 43% has been working in the position for at least the last 3 years .

Advisory certifications are not common among respondents' staff: no advisor hold one in the private organization, while just two people in in the public entity staff have a certification in "soil management".

4.5. Linkages with other AKIS actors/knowledge flows

The research highlights the existence of clearly different relational systems and knowledge flows between the public, the private and the farmers'-based advisory organisations. This derives from the nature and variety of both the range of services provided and the respective clients, along with the roles applied within the local AKIS. As it is evident from figure 4, governmental extension supplier presents a more institutional-driven relational system with stronger liaisons with other public bodies and an average degree of cooperation with the University, the research and the farmers' based organizations; while relations with private organizations, such as the downstream and upstream actors and the private consultants, are rated as weak.

For the private consultancy organizations, it is reported an average degree of interconnection within AKIS, as it is not based on structured links and mainly characterized by discontinuity. Relationships with agricultural organizations are more often due to sporadic contractual advice from cooperatives and POs, when necessary (Cristiano and Proietti, 2014). This also leads to the emergence of a

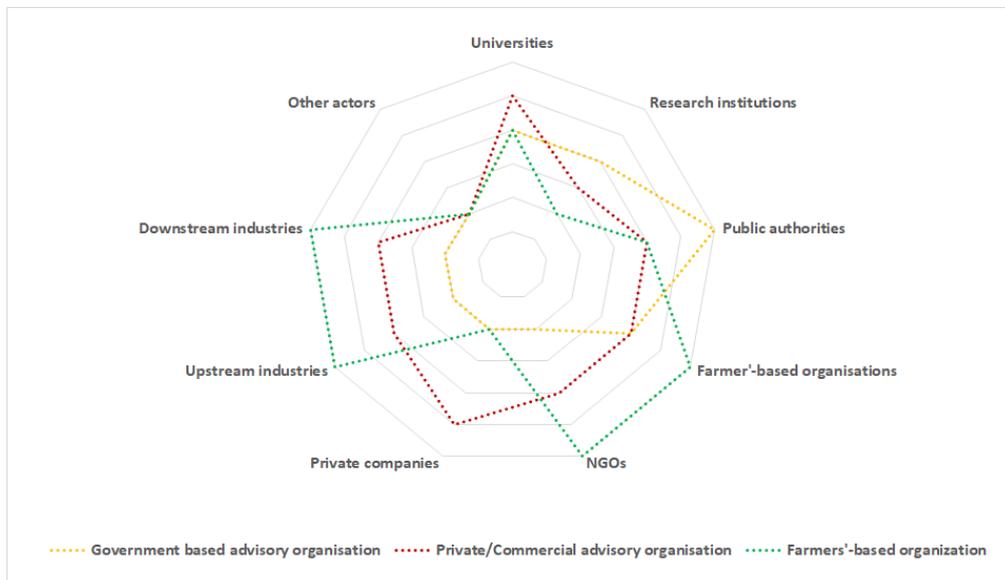
general individualistic approach to consultancy, so that the average level of collaboration between private advisors is considered as “medium”.

The most variegated and well-connected relational system belongs to the farmers’-based organizations which, evidently, have strong degree of association with the upstream and downstream actors and with the NGOs, apart from being well-integrated one to each other. While, the relations with the public authorities, the private companies and the University, are less significant but still good.

In fact, these organizations have the capacity to provide reliable and adequate advisory as well as scientific support also due to, on one hand, the out-sourcing of technical expertise, which belongs mostly to the private advisory companies and on the University, and on the other hand, to the government’s facilities, which, for example, still provides veterinary laboratories services and research back-stopping (Cristiano and Proietti, 2019).

Eventually, all the advisory suppliers report weak, yet existent, link with EIP Operational Groups (OG) and EU projects actors. Programming and planning of advisory work

Figure 4: Relational system of the Farm advisory services (FASs)



Source: Our elaboration based on the interviews

4.6. Programming and planning of advisory work

Obligations toward recipients of the advisory service are clearly stated by the agreement between FAS entity and the end-beneficiary of measure 2.1: service providers have the contractual obligation of delivering services according to a

strict schedule with one farm visit within four weeks from the signing, to provide one to one information on:

1. Cross Compliance standards and obligations applicable to the end-beneficiary.
2. Opportunities and benefits of Agri-environmental measures.
3. List of Agri-environmental measures for which the end-beneficiary can apply.

And then the service provider is required to grant continuous support related to Cross Compliance and Agri-environment obligations as required by the end-beneficiary via telephone or online services (email, website, social media) for one year straight.

In general, all the types of advisory providers keep records of the advisors work, through specific reports on the activities conducted and their results, while the planning of the work is applied by the majority of them in collaboration with the clients but to a different extent. Besides, in the cases of associative bodies, there's no evidence of the use of work plan and the provision of services is done upon specific request (Cristiano and Proietti, 2014).

Particularly for two out of three the organizations that took part to the survey it emerges that they don't have a training unit devoted to the development of workers' professional skills, although employees of the governmental advisor benefit of a yearly average of 5 days of training per year. As for the advisory activities in which workers are engaged, workers of the public organization are mostly employed in dissemination activities (50% of their working time), then in training activities (20% of working time). An amount equal to the 30% of working time is devoted to participation in training programs. Private actors range of activities partially overlaps with their public counterparts, but are somehow more variegated, including innovation support activities (facilitation, networking...) and targeted consultation services. These two actions, together with information dissemination amount to the 75% of the total working time.

4.7. Advisory organisations forming the FAS and evaluation of their FAS implementation

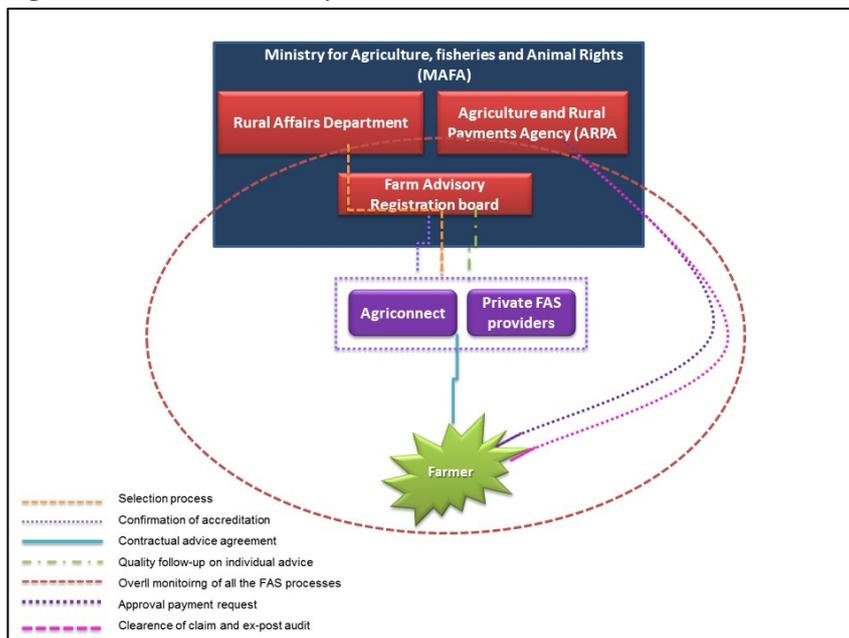
Since its institution, the FAS in Malta has been financed by the RDP (measure 115 and 2) and it's been regulated by the two national sequential laws applicable respectively to the current and the previous programming period (L.N. 113 of 2010 and L.N. L.N 99 of 2019). The Farm Advisory Service Registration Board (FASRB) is the responsible body to assess applications for recognition and inclusion of the entities which meet the requirements set by the law and it is composed by

representatives from the Ministry responsible for agriculture, and the Paying Agency, which is responsible for the register (figure 5).

The recognition of the FAS advisory bodies is due to the FARSB. The procedure for presenting the application form can be initiated through internet by any entity (company, association, co-operative, trade union, partnership) or any other recognised legal form that wants to act as FAS. Apparently, the assessment process until the approval of the application should last about 37 days and the FAS services can be delivered as soon as it finishes.

At the time of its first institution (2011), the model defined for the FAS was a public-private partnership (FAS Consortium) operating within the competent Ministry.

Figure 5: *Maltese FAS implementation model*



Source: Our elaboration

This solution, as arisen during the stakeholder consultations for the ex post evaluation process (RDP 2004-2006) and the design process of the RDP 2007-2013, had been pursued in view of encouraging the setting up and the development of private service suppliers, in terms of topics and quality, through addressing the needs of the farmers. As a matter of fact, the implementation of that FAS was successfully supported by a well-focused governmental information campaign. Besides, the FAS Consortium had expanded its range of services, followed by a good rate of take up, by offering, at a reduced price, a combined package which included the cross-compliance service and the advice for the definition of a

fertilizer plan, just obligatory by a newly national law. In general, the implementation of the FAS had certainly some positive effects mainly referring to the increased appreciation by the farmers of the value of the EU-subsidised advisory service and of the potential damage that non-compliance with environmental obligations can cause, which reflected in a greater use of the measure.

All in all, at the end of that programming period, according the ex-post evaluation of the 2007-2013 RDP, the implementation of measure 114, although some initial delays and difficulties, had a certain success both in achieving a good level of adhesion by the farmers and in leveraging their competitiveness, by different terms (increase of market shares, better compliance with EU regulations, increased production efficiency and also the quality of their products).

However, according to the Ministry, still over the past few years, a substantial number of Maltese farmers have experienced significant difficulties in attaining and maintaining compliance with the requirements of the Common Agricultural Policy.

So that, by turning back to a national public extension model, recently there was established AgriConnect to properly address these flaws. However, but there's still a need for a strengthening of the competencies of its employees, essentially civil servants with scarce experience on advisory.

Given the lack of actuation data, it is not yet possible to assesses the results, but the good performances obtained by supported farmers during the last programming period could very likely be duplicated with the present RDP still in force.

5. Summary and conclusions

5.1. Summary and conclusions on sections 1 – 3

Malta is a small country characterized by an agriculture which has a strong identity value for local communities but has always had little relevance for the country's economy, so that, in practice, only after EU accession it has acquired a political dignity.

The Maltese agricultural policy, therefore, is still going through its youthful period, in which, only recently, it has gained its own ministry, although, by inheriting competences and legislative framework, that, until now, have been distributed among several governmental bodies with little concertation and where, if anything, agriculture was considered only as instrumental and ancillary to other more relevant policies (e.g. environment).

The previous programming period represented a phase of “running after” to the EU Common Agricultural Policy model, but without a proper governance system and national strategy to support it.

This research highlighted that the current phase is a "structuring" step of Malta's agricultural strategy, its implementation model, governance, infrastructure and actors animating its AKIS. A work-in-progress phase characterised by policy decisions that are not always consistent with the past (e.g. renationalisation of advisory services), involving investments (e.g. digital hub), legislation (e.g. on consultancy), definition of governance roles (e.g. recent establishment of the Ministry of Research) and implementation of policies (e.g. Agriconnect), which are apparently shaped by more transparent and also participatory institutional review processes (with the EC during the peer-review) and consultations with the main local stakeholders (e.g. NAP). This path has started a new deal of Maltese agricultural policy and its AKIS, which seems to be characterized by a greater attention to agriculture, including its better conjugation with urban areas, and its tailor-made definition with respect to the context and local development needs and specificities.

However, it is still possible to perceive una certain tension to be compliant with the CAP and this, apparently, is shaping the national model of FASs.

Besides, current AKIS in Malta is characterized by a little number of actors with a low level of coordination and a lack of systemic vision which should led to pull existing resources and structure a common local knowledge base. This is mostly due to the lack of effective guidance, demand articulation, strategic visioning and operational organization of R&I bodies and flows by the Ministry of Agriculture.

MAFA, although showing a proactiveness in embracing participatory reform processes, is currently focused mostly on programming functions dealing with local needs assessment for R&I, designing and implementing the national agricultural policy and mobilizing the specific instruments and funding targeted to address the innovation and modernization of the farming systems.

In fact, the function of research and training guidance (definition of R&T programmes, which are also relevant for agricultural and rural development) over the two main public actors of HES is usually exercised by UoM and MCAST themselves, together with the Malta Council for Science and Technology (MCST) and the other institutional bodies, without any evidence of interinstitutional coordination with MAFA. So that, curiously, any research and training programme which is relevant for agricultural and rural development might be defined outside the competencies of the MAFA and, usually, based on the intermediation and requests of the HES to the competent Ministry of education.

In this context, the agricultural knowledge and innovation system (AKIS) in Malta widely lack attention by both the institutional and the rural operators. Hardly it is mentioned by the national strategic and regulatory texts and it is not even conceptualized nor internalized by the local agricultural community.

Also, the coordination structures of the Maltese AKIS are affected by an inherent disconnection among the actors who are responsible for some key functions of the system: knowledge development, research guidance, mobilization of resources and creation of legitimacy.

Two other important components of the country farming systems, namely aquaculture and water resource management, are currently characterized by evolutionary dynamics which are more greatly promoted by the current public, research and higher education institutions, through relevant, and relatively greater, investments in research, infrastructures and international relational systems. However, apparently, the AKIS relating to the different farming systems of inland and coastal areas of Malta are not well-integrated one to each other and the potential for synergies has not been fully exploited.

All that highlighted above is reflected in an AKIS where multi-actoriality is being defining but, still, within the limits of the local capacities that have been matured so far and with little investments.

This AKIS is still far from being defined an ecosystem of innovation but it is somehow resilient, since it is able to compensate the gap of key local capacities and skills within the external relations, and to take advantage of them to speed

the development of local agricultural systems, by ensuring a certain level of dynamism and keeping up-to-date with research and innovations already underway in other member states. An AKIS which is, local but not fully indigenous, since it is open to external actors and knowledge flows which ensure its functioning.

Indeed, the interviews let emerge that the new generations of farmers, researchers and administrators, have a certain system thinking and fervor in visioning, managing and implementing the rural development policy, along with relevant capacities to unravel and benefit from international relations.

All this promisingly fuels the AKIS through capitalizing the capacities and internalizing those local evolutionary dynamics otherwise not yet exploited, encouraging the maturation of a more widespread systemic vision and thinking by local actors and involving their respective knowledge for the development of the Maltese agricultural sector.

5.2. Summary and conclusions on sections 4

Within an evolving agricultural system still influenced by old policy decisions that are no longer consistent with the current national strategies and needs of agricultural communities, Malta has not yet defined its own model for structuring and delivering the FASs.

All in all, the FASs are certainly suffering by lack of providers, capacities and infrastructures. As a matter of fact, there is a lack of a technical expertise and a definitive and exhaustive legislative framework allowing the systemic reorganization of advisory services, the planning of their capacity development, the provision of guidelines and rules concerning professionalism, skills and abilities needed to enter the profession. Currently, the specific regulations for the FAS concerns access to and the provision of advisory services relating to the implementation of RDP intervention measures.

The recent transition to a re-nationalisation of services, through the identification of an exclusively governmental body, represented a somehow disruptive decision against the recent past (programming period 2007-2013) in which a semi-privatisation approach had been applied to ensure a major use of advisory services and to foster compliance with the new EU rules.

This decision is somehow surprising because, apparently, it is not in line with the positive results coming from implementation of the de-centered model of FAS (relevant rate of use of the measure by farmers, adoption of more sustainable cultivation methods) applied during the last programming period. Besides, the re-

nationalization of the FASs, evidently, has not taken into account the turnover of that administrative staff who, in the past, had the needed technical skills to provide extension services. As a matter of fact, the current team of extension services officers is composed mostly of civil servants that have limited business management and no technical specialisation. Surely, this does not help its fully integration within the local AKIS while, very likely, discouraging farmers from using advisory services.

The coming back to a nationalised model of advisory services, combined with a low relevance of the sector itself and the low propensity of farmers to use private, free-based advisory services are undoubtedly at the basis of the current state of agricultural services which are underdeveloped in terms of numbers, plurality, skills and methods. In addition, the re-nationalization of the FASs appears to have not considered the current lack of stable funding, which would ensure its maintenance and, most of all, its development over time.

Overall, the picture on the state of the consultancy services shows a transitional phase. Accordingly, the governmental body is expected to be able to implement the FAS services and to deliver a wider range of services under Measure 2 of RDP, addressing the real needs of farmers, as well as to implement the digital hub and new training programmes to strengthen the skills of advisors.

On the other hand, within private and farmers'-based advisory organizations, there seem to be a certain dynamism, that can be observed in a wider pluralism of providers and services provision, methods and topics. This dynamism, which the new public management seems somehow to observe rather than manoeuvre, is largely fostered by interconnections with different sectors (e.g. digital) and in the context of external relational systems, including European research partnerships. Despite this, the agricultural community still complains the lack of technical skills and farmers are mostly dependent from abroad.

Besides, while, as highlighted by interviewees, it seems that in Malta, “there’s not a real push to make this a professional sector”, indeed, certain intensification of collaborations between farmers and research, based on projects, research application and education/training, has been captured by this research and these are certainly contributing to increase knowledge base, create new entrepreneurial behaviors and develop common visions and knowledge for the development of local agricultural systems and practices.

All this, very likely, could lead to a systematization of all available capacities in the perspective of defining a more tailor-made FASs model that can support the



growth of skills and plurality and service infrastructures, responding to the needs of local farming systems.

6. Acknowledgement of partners, information sources and gaps

NAME	ORGANISATION	DATE
Sammut Anthony	Mgarr Farmers Cooperative Society Ltd	July 2020
Tunde Kallai	TR Associates	July 2020
George Attard	University of Malta	August 2020
Donald Aquilina	Independent expert	August 2020
Malcom Borg	Institute of Applied Sciences, in charge of the Centre for Agriculture, Aquatics & Animal Sciences (CAAAS) – MCAST	August 2020
Stephanie Vella	E-Cubed Consultants Limited	August 2020
Marco Dimech	Ministry for Agriculture, Fisheries and Animal Rights	August 2020
Zona Ivanovic	Agriconnect	August 2020

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Appendix 1

MCAST courses related to agriculture issues

Courses for full-time students or apprentices	
Certifications	Topics
Introductory Certificate	Animal Husbandry and Horticultural Skills
Certificate	Horticulture and Animal Care
Award	Agribusiness
Diplomas	1. Animal Care 2. Fish Husbandry 3. Horticulture
Advanced Diplomas	1. Animal Management and Veterinary Nursing
Bachelor's degrees	2. Fish Management 3. Horticulture
Part-time, tailor-made courses for individuals	
Certifications	Topics (among the others)
Certificate of Achievement (MCAST accredited qualification level rated)	1. Applied Sciences 2. Agriculture
Certificate of Performance (MCAST attendance course with a performance assessment)	3. Aquatics and Marine Animals 4. Business Management and Commerce 5. Community Services
Certificate of Attendance (attendance only)	6. ICTs

Source: MCAST

Appendix 2

Overview of the organisations providing advisory services

Provision of service				Source of financing								
Status of the organisation	Type of organisation	Number of organisations	Number of advisors	Public funds			Farmers			Private	NGO	Other (specify)
				EU funds	National funds	Regional funds	Farmers' levies	Farmers' contribution	Billing services	Other products (inputs, outputs)	foundation	
Public authorities	Advisory department of the Ministry of agriculture	1	12	X	X							
Research and Education	University	1	0	X	X							
	Research Institute	3	n.a.									
	Other education bodies (MCAST)	1	n.a.	X	X							
Private sector	Upstream industries											
	Downstream industries											
	Independent consultant											
	Private agricultural advice company	3	n.a.	X		X			X			
	Farmers' owned advice company											
	Other (specify)											
Farmer based organisations	Farmers' cooperative	18	n.a.	X				X				
	Chambers of agriculture											
	Farmers' circles/groups	19	n.a.	X	X			X				
	Other											
NGO		3	N.A.	X							X	

Appendix 3

Advisory areas and topics (combined disposal of L.N. 99 of 2019 and RDP 2014-2020)

Advisory Area A - Cross Compliance	Advice on Obligations at farm level resulting from the statutory management requirements (SMR) and the standards for good agricultural and environmental condition of land (GAEC).
Advisory Area B – Agri-Environment Climate Measures (AECMs)	Advice on agricultural practices beneficial for the climate and the environment as laid down in Chapter 3 of Title III of Regulation (EU) No 1307/2013 concerning ‘Payment for agricultural practices beneficial for the climate and the environment’.
Advisory Area C – Rural Development Programmes	Advice relevant for the RDP’s Measures, regarding the farm modernisation, competitiveness building, sectoral integration, food quality schemes, innovation and market orientation, as well as for the promotion of entrepreneurship and diversification.
Advisory Area D - Advisory Measures on Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy	Advice relevant for: (a) measures required to implement Community legislation for the protection of water; (b) measures deemed appropriate for the purposes of Article 9 of the Directive; (c) measures to promote an efficient and sustainable water use; (e) controls over the abstraction of fresh surface water and groundwater; (f) controls, including a requirement for prior authorisation of artificial recharge or augmentation of groundwater bodies; (g) controls for point source discharges liable to cause pollution; (h) for diffuse sources liable to cause pollution, measures to prevent or control the input of pollutants.
Advisory Area E – Use of Plant Protection Products	Advisory service should concern farm level requirements at the level of beneficiaries as defined by Member States for implementing Article 55 of Regulation (EC) No 1107/2009, in particular the requirements referred to in Article 14 of Directive 2009/128/EC

<p><i>Advisory Area F - Measures for use of Integrated Pest Management</i></p>	<p>Advice relevant for measures to promote low pesticide-input pest management, giving wherever possible priority to non-chemical methods, so that professional users of pesticides switch to practices and products with the lowest risk to human health and the environment among those available for the same pest problem. Low pesticide-input pest management includes integrated pest management as well as organic farming according to Council Regulation (EC) No 834/2007 of 28 June 2007 on organic production and labelling of organic products.</p>
<p><i>Advisory Methods and tools</i></p>	<ul style="list-style-type: none"> ▪ laboratories services (veterinary), ▪ basic skill schemes, ▪ specialized training in key sectors, ▪ farm visit and short-term management exchange schemes, ▪ training for trainers / advisors; ▪ “Rural resource hub” through which provide advice and expertise in different area of rural business, ▪ innovation partnership, ▪ marketing research, ▪ study visits abroad.

AKIS and advisory services in *Montenegro*

Report for the AKIS inventory (Task 1.2) of the i2connect project

Date: December, 20

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Executive summary

Montenegro doesn't have an established AKIS system yet. Unfortunately, this is still in the thinking phase, so far they have not even started with analyses related to AKIS. They hope that in the near future conditions will be created to work on this activity.

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1. Main structural characteristics of the agricultural and forestry sector

One of the difficulties in dealing with the subject is the fact that there is no unified definition of rural areas at EU level. For the purpose of international comparisons, OECD's definition of rurality is frequently used. If OECD methodology is used, then the entire Montenegro territory could be considered rural. Analysing the three regions of Montenegro (northern, central and coastal) according to the OECD methodology, the Northern region, covering 11 municipalities, belongs to predominantly rural regions (59,7% of the population lives in local rural communities), while the coastal (41,7%) and central (20,4%) belong to intermediate regions.

Sectors of tourism and agriculture play an important role in Montenegrin economy. The significance of the agriculture sector is noticeable in its high proportion in the overall GDP. Montenegrin GDP in 2012 was EUR 3.148 million, and the agricultural sector (together with forestry and fisheries) made EUR 232 million or 7,4% of GDP.

Employment data in the sector of agriculture published regularly by MONSTAT refer only to business. In the year 2012 2.505 employees were employed in agricultural enterprises and co-operatives. In November 2011 MONSTAT published the data on employment at 48.824 family agricultural holdings, employing 98.341 working persons.

The number of 46.473 annual working units in agriculture is one of the best proofs showing that agriculture is important not only for the economy but for the whole Montenegrin society. The structure of the total working persons by educational attainment is:

- No education 3,87%
- Unfinished primary education 5,79%
- Primary education 27,9%
- Any secondary school finished by half of members 53,33%
- Post-secondary or higher education 9,11%

Prevalence of subsistence and semi-subsistence agriculture, high unemployment rate, hidden unemployment and poor labour force mobility characterise rural areas. The only competitive advantages of rural areas are low labour costs and high-quality natural resources. Development of entrepreneurship is limited by factors such as underdeveloped infrastructure, lack of skilled labour, limited access to markets and financing, lack of investment support and low entrepreneurial potential.

Extensive agriculture is still an essential driver of the rural economy and a major source of employment in rural areas. However, it needs to modernise and raise its productivity, which will lead to surpluses of agricultural labour. The solution lies in diversification of the rural economy in order to reduce the income risks of rural households.

To improve the quality of life and encourage young people to remain in rural areas, a more diversified rural economy is required. The main challenges in achieving this goal continue to be investment in rural infrastructure, knowledge-based agriculture integrated with the food industry, better human capital, good environment for entrepreneurs and improved social services. Agri- and eco-tourism based on rich cultural, historical and natural heritage also appear to be a good opportunity.

The structure of agricultural land is unfavourable in terms of the size of agricultural holdings. The average size of utilized agricultural land per holding in Montenegro is 4,6 ha (Agricultural Census 2010). 72% of agricultural holdings have up to 2 ha of land. The used agricultural land is divided further with a negative impact on the structure of agricultural land. The farm structure is dominated by small family farms, which produce mainly for their own consumption. Other factors hampering the development of agriculture are: poorly developed market structures, inadequate infrastructure, low share of market production, lack of knowledge and skills and failure to meet food safety standards.

If we take the ratio of available agricultural land and the number of livestock units, it is possible to conclude that the population density per ha in Montenegro is low, only 0,23 LU/ha. The average EU 27 in 2010 was 1 LU/ha, which is 78% higher than in Montenegro. We can also conclude that ecological and environmental preservation is very high.

The low level of organisation of agricultural holdings (the reason being negative experience with socialist cooperatives called “zadruga”), the absence of involving them in the higher forms of organisation and other forms of co-operation directly affects the level of competitiveness and market positioning.

Land is one of the most important natural resources. In some areas of Montenegro there is a problem of soil acidity. A high degree of acidity is found in about 159.000 ha or in about 30% of the overall agricultural area. A particularity of the Montenegrin terrain is such that the terrain is dominated by slopes above 10° (65%), while only 7% of the territory has a slope of less than 5° where intensive use of land in agriculture is possible without significant erosion. Nearly 35% of land suffers due to a lack of water. Irrigation is applied to only 15-17% of the land. Unused agricultural land has a significant potential to increase and improve agricultural production, as less than 43% of agricultural land has been brought to purpose.

One of the disadvantages constitutes also the fact that only around 51% of the territory of Montenegro is covered by cadastre which is a reason why it is necessary to complete it and to update it regularly. The land market is undeveloped.

The dairy sector has the biggest share in the value of agriculture and it is not adequately developed. Only 15% of primary milk production reaches dairy processing plants. The remaining is used for feeding calves, or processed into various types of households in autochthones products, for example, cheese like “kajmak”, and used for their own use or sale. So the objective of the sector is to increase the value added of products. The main problem in this sector is the lack of integration and organisation.

Meat production in Montenegro covers just 36% of needs. Coverage of 100% of domestic needs is achieved only in the production of sheep and goat meat. There are around 320 agro-industrial enterprises in Montenegro, of which 20% work in the meat industry. Over the past few years MAF has started providing financial support to Montenegrin companies to introduce HACCP (*Hazard Analysis Critical Control Point*).

The Fruit, Vegetable and Wine sector is highly fragmented, because of the fact that the production is fragmented into thousands of rural households and the lack

of specialised production of several types of products which are not competitive for marketing. Several companies are engaged in the processing of fruit and vegetables, but they have small capacities. It is noticed that consumers demand domestic products. The expectation is for an increase in production, especially of fruit and vegetables.

Organic farming is a holistic system of agriculture and food production that combines best environmental practices, high level of biodiversity, conservation of natural resources, the application of high standards of animal welfare and production methods that meet the needs of those consumers who prefer products produced with the use of natural substances and processes. Organic farming has an important role because, on the one hand, it satisfies a consumer demand for organic products, and, on the other hand, it provides public goods that contribute to environmental protection and animal welfare. Thus, organic farming has a great importance for the development of rural areas, as it gives a chance to the development of family farms and small producers, contributes to the income of the agricultural holdings, as well as to the exploitation of resources in tourism.

Rural tourism can be a significant development challenge in rural areas. Currently, the touristic offer is still insufficient. Montenegro offers well-preserved natural, cultural and historical heritage, together with high-quality food and relative proximity to the EU tourist markets. However, modern, active rural tourists demand high-quality services, comfortable accommodation and a variety of recreational and cultural activities. A number of obstacles are still hampering the development of rural tourism: poor infrastructure, underdeveloped brands of regional products (souvenirs), low accommodation capacity and quality, poor tourist attraction signposting, lack of management of tourist destinations, etc.

Forests represent Montenegro. They are one of the main sources of income, of heating energy and of employment for a large part of the rural population. Around half of the forests in Montenegro are state-owned; another half is in private hands. The share of private ownership has been increasing in the last years. Forest quality is strongly related to ownership – private forests are mainly young, poorly tended or degraded.

The most important threat to forests is climate change, with an increased risk of drought, fire, and biotic pests. This threat is expected to increase in the future.

Budget for agriculture: Montenegro in comparison with countries in the region set aside funds for agriculture of about 1% of the total budget (4% Serbia, Macedonia 4.89% and Croatia in the pre-accession period 4%), while in the EU countries for the agriculture is less than 4% of the total budget is allocated. Having in mind the support provided through different agro-budget lines, it can be seen that in the course of the last ten years the share of the agro-budget in the total budget of Montenegro has decreased from 3% in 2001 to less than 2% in 2005 and onwards. Close to 22% of the budget is related to direct support measures (Table 7) for the livestock and crop production. Since 2011 the measures, within rural development component, were close to the mil. EUR 7 dedicated to the improvement of the competitiveness of primary agriculture and processing, as well as environmental protection and improving living conditions in rural areas.

2. Characteristics of AKIS

2.1. AKIS description

Montenegro doesn't have an established AKIS system yet. Unfortunately, this is still in the thinking phase, so far they have not even started with analyses related to AKIS. They hope that in the near future conditions will be created to work on this activity.

3. History of the advisory system

The role of farmers organisations: during the transition the old cooperative system from socialist times more or less fell apart. Later on, many donors projects, aimed mainly at modernising agricultural production, favoured and even conditioned the association processes of farmers. At present, the real impact of various farmers and producers associations on agricultural and rural development policies is relatively low, but it is in progress. Most of them however play a significant role in transfer of knowledge, various advisory services and promotion of agricultural products.

In Montenegro, there are two advisory services (departments) for livestock and crop production. Until 2018, these services functioned within the Biotechnical Faculty (formerly the Institute). Since 2018, the services have been renamed in departments and have been put under the Ministry of Agriculture and Rural Development directly. This change made weaker the relationship between advisors and faculty scientific staff. The advisory service is public, but it also existing two private advisory services.

In advisory service they have the similar problems as in Slovenia: duplication of tasks between different and similar institutions, very slow transfer of knowledge to end users, and often this knowledge is hidden and does not reach the user, and so on.

4. The agricultural and forestry advisory service(s)

4.1. Overview of all service suppliers

Regarding the potential and institutions that should be included in establishing the AKIS in Montenegro, these are:

1. Agricultural producers – farmers,
2. Ministry of Agriculture and other ministries,
3. Two departments for advisory service: in livestock and crop production. Both are public under the state,
4. Two private advisory services,
5. Seven agribusiness centres,
6. Two faculties (state and private),
7. Four secondary agricultural schools,
8. Associations of agricultural producers,
9. Non-governmental sector, etc.

4.2. Clients and topics

Regarding the potential and institutions that should be included in establishing the AKIS in Montenegro, these are:

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6. Two faculties (state and private),
7. Four secondary agricultural schools,
- Associations of agricultural producers,
9. Non-governmental sector, etc.

4.3. Linkages with other AKIS actors/knowledge flows

In Montenegro are capacities for establishing AKIS. Because of situation (most of institutions are public) the role of Ministry of Agriculture and Rural Development should play the main role to connect different actors in knowledge transfer chain and establish AKIS. One of the proposals is to establish department for AKIS inside ministry with role for establishing and coordinating AKIS in Montenegro.

4.4. Programming and planning of advisory work

Advisory service in Montenegro is part of ministry of agriculture and it is financed by budget, with annual working plan.

5. Summary and conclusions

In Montenegro there are opportunities and preconditions for the establishment of AKIS system. There are a lot of subjects that need to be included and it will be a difficult job, but they think that they will be able to realize it. Of course, they count for help from i2Connect project and some countries from this project and region. The opportunity is also the preaccession period and accession to EU.

Advisory services should shift from providing technical advice to farmers toward a more innovative, demand-driven knowledge and information transfer. Modern advisory services should meet the needs of a wider rural population (consumers, entrepreneurs, farmers, the poor, etc.) and also help rural people to adopt new policy principles and rules.

In Montenegro are capacities for establishing AKIS. Because of situation (most of institutions are public) the role of Ministry of Agriculture and Rural Development should play the main role to connect different actors in knowledge transfer chain and establish AKIS. One of the proposals is to establish department for AKIS inside ministry with role for establishing and coordinating AKIS in Montenegro.

AKIS and advisory services in *The Netherlands*

Report for the AKIS inventory (Task 1.2) of the i2connect project

Date: November, 2020

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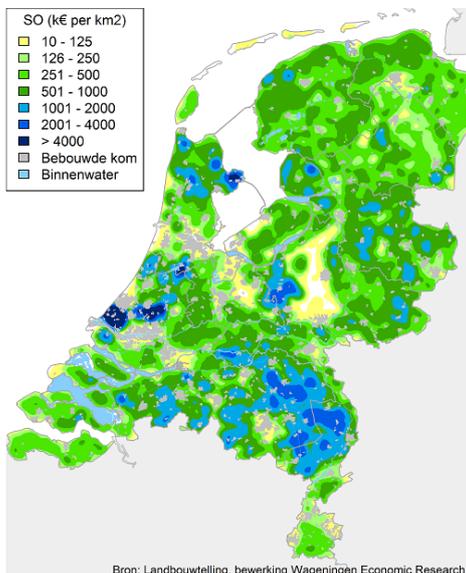
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1. Main structural characteristics of the agricultural and forestry sector

The agricultural sector in the Netherlands is worldwide praised for its strength. Knowledge, experience, knowhow and innovation have made it possible to develop an intensive and efficient agricultural production system. Although in the past decades, much focus has been on fostering sustainability with respect for planet, people as well as profit, one of the biggest challenges remains to continue developing a resilient, integral sector. In glasshouse horticulture NL is top in innovation, and in many other sectors NL is among the most innovative.



one of the biggest challenges remains to continue developing a resilient, integral sector. In glasshouse horticulture NL is top in innovation, and in many other sectors NL is among the most innovative.

Agriculture in Netherlands is on a high level of intensity, even more than €4.000.000/km² in horticulture region Westland, plant breeding in Enkhuizen, and up to €4Mln/km² in intensive animal husbandry regions.

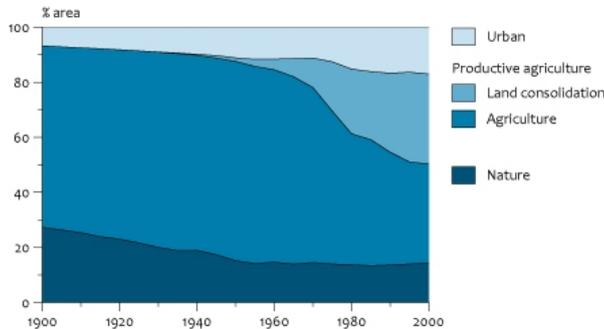
Figure 1: Intensity of standard turnover (SO)

This intensity is necessary to earn back the high price of land: €55.000-€70.000/ha



Figure 2 Price of non-rented agricultural land

Land use change in The Netherlands



Source: Statistics Netherlands.

www.pbl.nl

Figure 3 Land use in Netherlands

Agriculture manages 60% of the land in Netherlands. So farmers do not only have a responsibility for the land as an intensified production factor, they also deal with urban inhabitants that deserve a good living in the countryside.

Innovation has made it possible to combine high production in the different sectors with decreasing pressure on the environment. Cooperation between farmers, suppliers, logistics, processors, research, advisors, government, etc. was a key quality in this development. The high level of technology is getting even higher, because the actors in the production network cooperate closely.

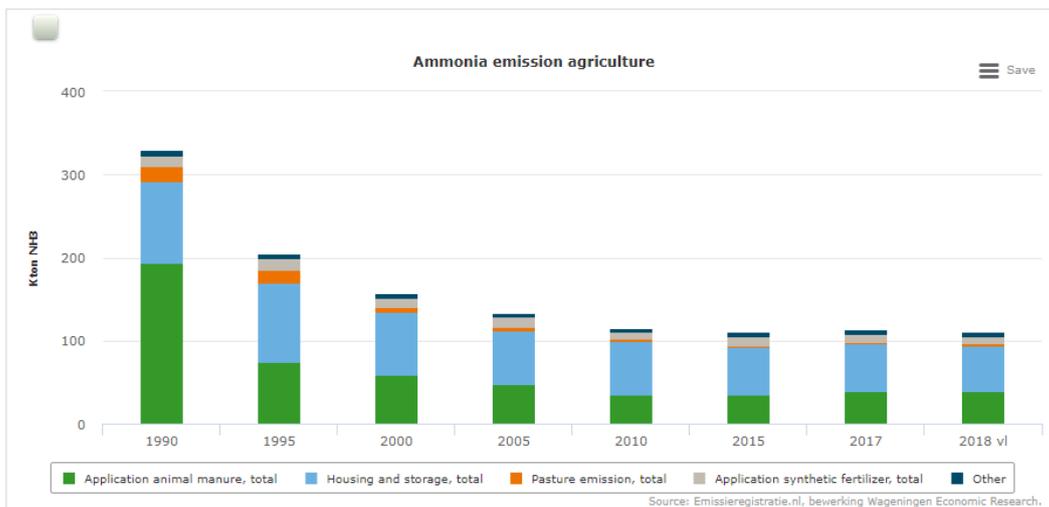


Figure 4 Decrease of NH3 exhaust

While society increases claims on sustainability, agriculture is encountering difficulties to match with these requirements. Larger scale production seemed a good solution for many farmers to be able to pay investments in more sustainable production methods. Related to the bigger scale per farm, the number of farms has decreased over the years.

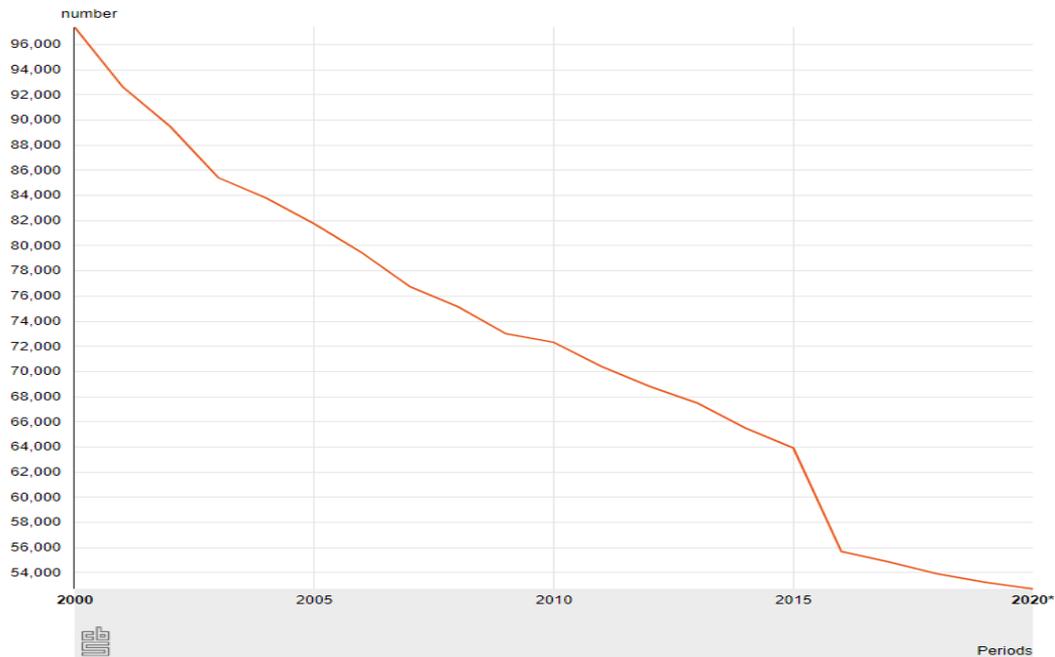


Figure 5: Number of farms in Netherlands

However, societal acceptance of increasing production is decreasing. Hence, farmers, the agri-food industry, researchers, advisors, education, policy makers and NGOs/citizens, have to work closer together in a multi-actor setting to find solutions for the complex and interrelated (wicked) problems agriculture is facing.

One third of the agricultural entrepreneurs is women: out of 138.000 persons active in family farms, 46.000 are female. The percentage of women differs per sector as the graph shows.

Women working at family farms

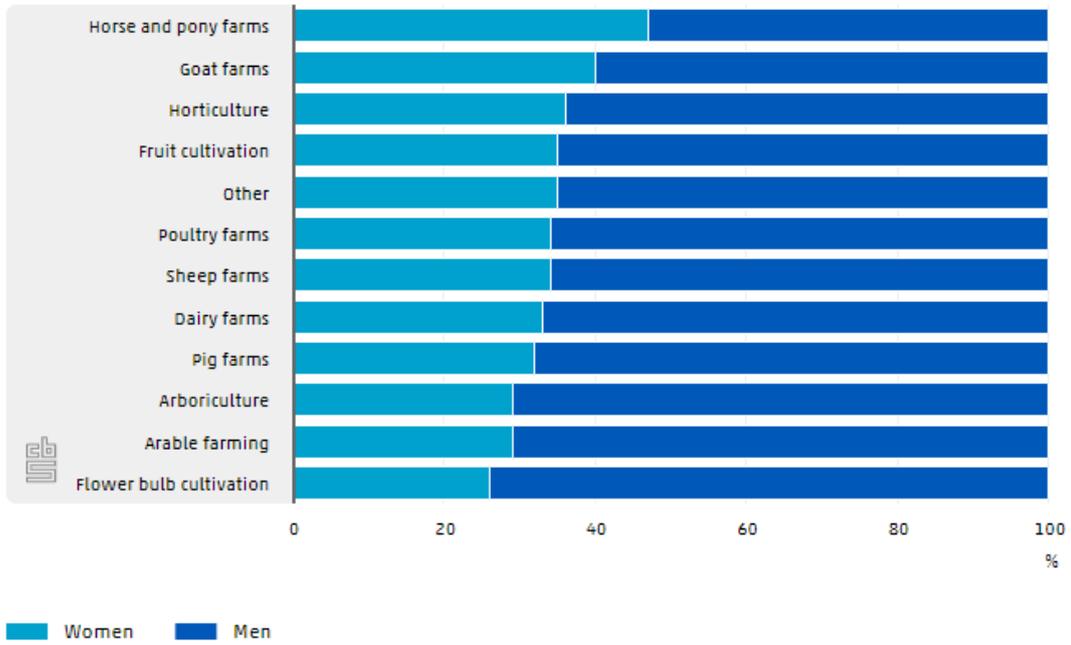


Figure 6: Balance of women and men in NL agriculture

- **Government & structural support** (orange)
We distinguish Non Agri Ministeries, Ministry of Agriculture (minLNV), National Paying Agency (RVO). On provincial level there are subsidy departments, Regional development organisations/ triple helix organisations, supporting farmers in different projects.
RVO conducts the annual audits, obligatory for 100% of the farmers.
- **Innovation Projects** (in yellow)
Farmers can participate in EU related projects (CAP, RDP, EFRO, ESF), national projects (mainly PPP “Topsector”-projects funded by MinLNV), sectoral projects (funded by branches and sector organisations, who are funded by levies) and regional projects (by provinces with related water boards and nature organisations).
- **Advice** (subjects of advice in red blocks and arrows)
Advice is given to farmers on strategic decisions; on agronomic/husbandry issues; on finance; and on daily management. The red arrows show that the types of advice come together on the farm.
We distinguish independent and product related advice:
- **Independent advice** (green blue)
Most frequent independent advice is given by Veterinarians, we estimate vets give monthly advice and medication.
Independent DLV/Delphi reaches farmers per consult or with a subscription for 3-6 visits a year.
Advisors of the farmers organisations reach the members individually at strategic decisions and groupwise in members’ meetings (60% is member).
Independent specialists have frequent contact with a focussed target group.
Special group are accountants; because NL farmers have to submit their financial progress/ VAT, their accountants have at least few contacts a year.
- **Product related advice** (blue)
Most Coops and commercial dealers build a relation with farmers by a combination of product and advice. The idea is that products they sell are used better in a combination with advice.
Apart from the advisors working for dealers, soil/plant/quality labs have their contact persons visiting farmers in addition to the mainly electronic exchange of information.
The industry of chemicals and machinery has direct contact with a small group of front running farmers.

- **Knowledge circles** (greenblue and blue)
In accountancy the organisation VAB started as meeting place for agri advisors in the accountants organisations. VAB now has organised, with the Ministry of Agriculture, the BAS, register of independent advisors.
In Netherlands all things are created double, from the technical advisory interest, the organisation Agrivaknet was started. In this organisation you find product related advisors.
- **Financial relations** (blue arrows)
Advice and support should be funded. The blue arrows give the main

What is *not* shown in this overview and in the diagram below, are the national and international umbrella organisations, like Copa for the Farmers organisations, National Cooperative Council and Cogeca for Coops, Nevedi/ECPA for pest control industry; EUFRAS for advisory services, etc.
entity in the diagram is not described in the previous paragraph: the independent advisors registry, managed by the VAB knowledge circle. Advisors registered there can be paid by vouchers that MinLNV provides to farmers.

2.2 Short description of organisations

In a diagram one cannot mention all organizations. A more detailed list of AKIS organisations is described below, to illustrate the great variety: for each challenge Dutch tend to make a new organization. This gives the impression of a scattered, chaotic ecosystem, but the good part of the story is: these organisations manage to collaborate well, they know and respect the focus and establish effective partnerships.

Those partnerships can be organized in projects (EU, national, regional), such as Operational Groups under RDP; or in structural relations such as the relation between farmers organizations and MinLNV (lobby and legislation).
Of course there is competition in the market, but in the AKIS world there is always a moment where competitors have a better position when they collaborate.

Table 1: Overview of some typical organisations in the Dutch AKIS ⁱ

Type	Name	Description / Primary role
International governing bodies	<ul style="list-style-type: none"> - European Union, OECD - World Bank, International trade organisations 	Policy and regulation, research and innovation funds
National Ministries	<ul style="list-style-type: none"> - Ministry of Agriculture, Nature and Food Quality¹ - Ministry of Economic Affairs; - Ministry of Foreign Affairs; - Ministry of Education, Culture and Science - Ministry of Infrastructure and Water management 	Policy and regulation, research and innovation funds
Regional and local governments	<ul style="list-style-type: none"> - Provinces - Municipalities - Water authorities 	Policy and regulation, research and innovation funds
Top-sectors: public-private innovation programs	<ul style="list-style-type: none"> - Horticulture & Starting Materials - Agro & Food 	Tripartite policy (government, business life and knowledge institutes), research and innovation funds, human capital agendas (education)
Public services	<ul style="list-style-type: none"> - Staatsbosbeheer (State Forestry Service, National Park service) 	
Other National Policy Research Institutes	<ul style="list-style-type: none"> - PBL - Netherlands Environmental Assessment Agency - Netherlands Bureau for Economic Policy Analysis, Statistics Netherlands, - The Netherlands Institute for Social Research / SCP - RIVM –National Institute for Public Health and the Environment 	Government agencies which conduct research in the social, environmental, and economic aspects of all areas of government policy. They officially resort under a Ministry, although they usually possess a large degree of independence
Independent and statutory Advisory Councils	<ul style="list-style-type: none"> - Advisory council for the Environment and Infrastructure (RLI) - Scientific council for government policy (WRR) 	Independent advisory commissions for strategic policy for the long and medium term
Research Councils	<ul style="list-style-type: none"> - The Netherlands Organisation for Scientific Research (NWO) - The Royal Netherlands Academy of Arts and Sciences (KNAW) 	<p>Funds and steers research by means of subsidy programmes</p> <p>Acts as a management body for specific research institutes and advises the Dutch Government on matters related to science</p>
Universities	<ul style="list-style-type: none"> - 14 Universities, of which - 3 Technical Universities (Delft, Eindhoven, Twente) - and 1 Life Science University (Wageningen) 	<p>Education and research</p> <p>Wageningen shifted from agricultural university to university of life sciences</p> <p>After WUR the University of Utrecht conducts most agricultural research</p>
Research for applied agriculture science	<ul style="list-style-type: none"> - 9 Institutes of Wageningen Research - TNO - NIZO, Louis Bolk Institute 	<p>Part of Wageningen UR, partly paid for applied research by the Ministry of Agriculture (TO2), partly commercially financed</p> <p>Partly publicly (TO2), partly commercial</p> <p>Commercial</p>
Universities of Applied Sciences	<ul style="list-style-type: none"> - 3 green UAS (HAS Den Bosch, Aeres Van Hall Larenstein) - 1 UAS with a green department (InHolland) 	Higher professional education (in Dutch HBO – BSc level)

¹ Including the Netherlands Enterprise Agency and the Netherlands Food and Consumer Product Safety Authority.

Type	Name	Description / Primary role
Agricultural Vocational Education	<ul style="list-style-type: none"> - 12 AVE centres with various establishments at both pre vocational, vocational and post initial training level - 1 general regional vocational centre (ROC), <u>including</u> vocational green curricula 	MBO: mid-level professional education geared towards the acquisition of vocational qualifications and training. VMBO: pre-vocational secondary education.
Farmer Unions	<ul style="list-style-type: none"> - Regional geographic distribution of unions: LLTB / LTO-Noord, ZLTO with LTO-Nederland as overarching organisation - Diverse branche and sector organizations 	Apart from lobbying and the classic interest protection, farmer unions play an important role organising farmer networks
Food Chain Input industry Actors	<ul style="list-style-type: none"> - Seeds, fertilizers, semen, feeds, stables and machinery, veterinary products, contractors 	Often coops. Provide specific advice to farmers on their own products; many have started their own research / or innovation centre
Food Processing and Outlet markets / retail	<ul style="list-style-type: none"> - E.g. Royal Friesland Campina, Cosun (Sugar), Vion, Unilever, Ahold, Auctions, etc. 	Often coops. Financing research on product innovation and strategies, consumers, marketing, etc.
Independent NGOs	<ul style="list-style-type: none"> - Natuurmonumenten, Dierenbescherming, Wakker Dier, Natuur en Milieu, Oxfam Novib, Solidaridad, etc. 	Represent of interests from stakeholders, lobbying, financing research
Chamber of commerce	<ul style="list-style-type: none"> - 19 offices 	Trade register, service provision and advice for entrepreneurs
Farmers Cooperatives	<ul style="list-style-type: none"> - From large Friesland/Campina to small regional environmental farming cooperatives 	Develop a shared vision, finance research and transfer knowledge to their members
Independent accountants and consultants	<ul style="list-style-type: none"> - 5 big agricultural accountancy offices (Abab, Flynth, Accon, Countus, Alfa); - Independent consultants have organised themselves in the Associated Business Consultants in Agriculture (VAB); - land brokers and notaries 	Provide information on commercial basis to farmers on specific topics: fiscal and legal issues, accountancy, environmental aspects, generational transfer.
Banks	<ul style="list-style-type: none"> - Rabobank is the most agro-minded bank 	Financers / loans, financial advice.
Intermediary organisations	<ul style="list-style-type: none"> - Both Regional and national based organisations that often act as facilitators in innovation projects 	Innovation brokers focussing on building networks

3. History of the advisory system

Dutch Agricultural policy has always evited protection and enhanced innovation. After WW2 a famous system of 'OVO-drieluik' (research-extension-education triptych) helped for increase of production and upscaling.

Since the mid-90s, the focus in policy changed:

- public money was no more available for agricultural structures, only to enhance the environment;
- public payed activities, except basic research and education, were tendered.

So, since the 90s, the AKIS in NL is privatized to a large extend.

In the early years of our century, the government started to invest in business structures and repair of market imperfections, mainly via tendering.

In 2020 the government opened a voucher system for independent advice, without tendering.

With the next CAP period in perspective, the government is currently analysing how to implement independent advisory services within the scope of the Dutch privatised advisory system, including instruments such as vouchers for independent advice.

4. The agricultural and forestry advisory service(s)

4.1 Overview of advisory service suppliers

Independent advice

- Veterinarians are trusted partners of the farmers. Their business models have changed: previously vets had a combined model to pay their advice: fee for advice and percentage on medicine. This is separated now, so we qualify the vets as independent.
- DLV (animal production) and Delphi (plant production) come out of the former state advisory services. In the 90s this service was privatized and both organisations made the successful shift from guaranteed funding to tendering for projects and payment by clients. On one hand this made the services agile and client oriented. On the other hand the advice on strategic issues and

societal challenges got a lower priority. Therefore, as mentioned, the government is testing new funding mechanisms (vouchers).

- Farmers organisations: LTO-Noord, LLTB and ZLTO have advisors and project leaders/ project experts that give strategic advice to the (potential) members.
- Independent specialists, often working alone or in small SME businesses find their market with outstanding knowledge on their subject.
- Accountants provide administrative reports. With the complete overview of costs and benefits, they can produce detailed advice for farmers.

Product related advice

- Dealers of supplies: in Netherlands half of the supplies for farmers are provided by cooperatives, and half by commercial dealers build a relation with farmers by a combination of product and advice. Of course the advisors are dependent of the margin when they buy or sell goods, but they cannot sustain their client relations without support that helps the client. Because they visit the farmer more frequent than any other advisor, often the farmers see these advisors as trusted person.
- Relation managers of soil/plant/quality labs: they visit the farms with very specific information which is often essential, to be able to sell the products.

4.2 Public policy, funding schemes, financing mechanisms, advisory service providers

All AKIS activities, except education and research are tendered in Netherlands. Most tenders are aligned with European funding. The extension and innovation chapters in RDP are key to organize national and provincial funding. Also EFRO (interreg, operational programmes) are available for agriculture in Netherlands.

Co-financing for the European funding is always a challenge for farmers and advisory organizations. There is a possibility to use levies, this system is starting to function after the product boards were obliged -by law- to stop in 2013.

4.3 Clients and topics and methods

Farmers pay for their independent advice. Advisory services make smart arrangements, when they apply for projects.

A substantial part of the advisory effort is paid via the product price. This is working on the main part of feed and supplies.

4.4 Human resources and methods of service provision

Main part of advisory work is done on individual contact, but also group and mass communication are used.

In COVID more online communication is introduced. People already get used to it.

4.5 Programming and planning of advisory work

When an advisory service has been able to acquire projects, the programming mechanisms are linked to those projects.

Dutch advisors are more connected with their clients' needs, than to programming by their organisations.

Key in the effectiveness of the advisory work is the professional pride of advisors to help farmers forward.

4.6 Linkages with other AKIS actors/knowledge flows

For advisors, the interaction with research and education is essential.

Biggest actor in Agri agricultural academic education, science and research is Wageningen University and Research. WUR is a very strong brand.

Wageningen University is one of the best in the world and the Research activities are successful in acquisition and operation of basic and applied research. Apart from that, WUR is making a strong network with agri industries.

WUR does not only deliver research, it also enhances innovation processes, produces policy recommendations, creates appealing scenarios, etc. This is often done in collaboration with partners, so multi actor approach is in the nature of Wageningen Masters and graduates.

4 agri universities for applied science: via their students these organizations are closely linked to farmers and agribusiness. Since 5 years this relation is deepened

with the appointment of lecturers that have time and budget to tackle challenges from practice.

Vocational agri education: most farmers have this level of education, so these schools create an involved group of young farmers.

Independent advisory services

Linkages between research & education on one hand and advisory services and innovation groups on the other hand, always need a lot of attention. For that reason, last year the Topsector Agro&Food launched a subsidy track on interaction between these stakeholders.

4.7 Advisory organizations forming the FAS and evaluation of their FAS implementation

Netherlands has a AKIS which is focussed on tenders and direct client relations. Advisors are proud to be relevant for farmers and their network, who are developing on a high level. Because the AKIS stakeholders connect to these successful people, the AKIS in NL is effective.

5. Summary and conclusions

In NL the farmers and their network in agriculture shape an ecosystem that contributes to an effective development of the sectors and the related AKIS.

6. Acknowledgement of partners, information sources and gaps

I thank Floor Geerling-Eef for her support, to provide information from reports produced for ScarAKIS and Dutch policy development.

The description of this chapter is not based on the survey, developed for i2connect, because there was no support of the AKIS organisations to fill it at this stage. The content is based on the knowledge and network of the author (experience of 40 years in the AKIS network).

7. References

Graphs are from Dutch Bureau of Statistics.

ⁱ Geerling-Eiff, F.A., K. Poppe and V. Linderhof (2014). Study on investments in agricultural research: Review for the Netherlands. *Country Report for the Netherlands*. EU FP7 IMPRESA project:

https://drive.google.com/file/d/1Rgl-abnWfo7_T33ZbihUiG2s1lUK61aq/view

AKIS and advisory services in *Poland*

Report for the AKIS inventory (Task 1.2) of the i2connect project

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Executive summary

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1. Main structural characteristics of the agricultural and forestry sector

Poland is placed on the third position in Europe regarding the agricultural land area contribution in the whole country area. That area equals 18 608 thousand ha, so 56%. Such considerable area facilitates both using a land in a less intensive way and practicing production methods friendly for the natural environment. The Polish agriculture is characterized by a huge fragmentation. An average surface of agricultural land areas (UR) per 1 farm is increasing. In 2002 it was 5.8 ha, in 2011 – 9.1 ha and in 2018 – 11.3 ha of farm fields. In 2018 a general number of farms in Poland amounted 1.4 mln. Despite of the fact that a tempo of land area concentration is increasing, slightly more than a half of farms in Poland (52.6%) exploit not more than 5 ha of agricultural land areas. In those farms there are 12.8% of the agricultural land areas. Three-quarters of farms (75.1%) exploit less than 10 ha of the agricultural land areas (UR) and their cumulative participation in the agricultural land areas amounts 28% (Figure 1). It places Poland in a row of the EU countries with the most fragmented structure of farms.¹

STRUCTURE OF PRIVATE FARMS EXCEEDING 1 ha OF AGRICULTURAL LAND AND AGRICULTURAL LAND AREAS BY AREA GROUPS
As of June

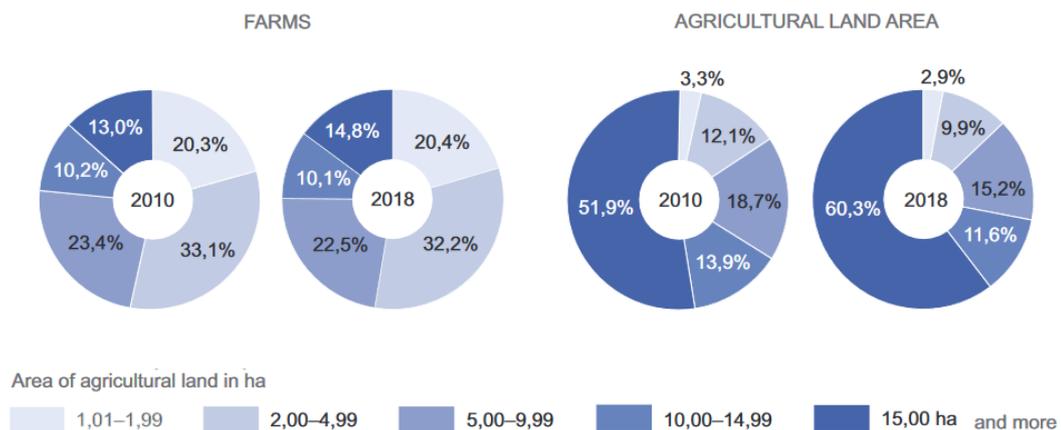


Figure 1 Structure of private farms exceeding 1 ha of agricultural land by area groups and void ships²

¹ GUS- Statistical Yearbook of Agriculture 2019, Warsaw 2020

² GUS, Statistical Yearbook of Agriculture 2019, Warsaw 2020

Describing the meaning of forests in a context of their influence on economic development, it is worth to notice that they take almost one fifth of the surface of Poland. Regarding the structure of a land usage in Poland only the agricultural land areas take more of the land surface.

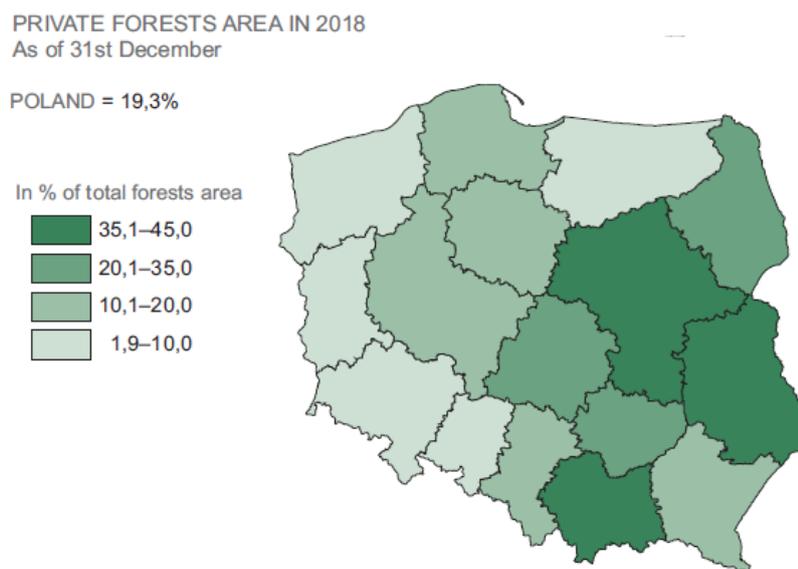


Figure 2 Private forest area in Poland³

A great potential of forestry is not reflected in macroeconomic indicators, what is a specific feature of this economy sector. The forestry makes about 0.3% of global production and the added gross value and concentrates a similar percentage of all people employed. However, the meaning of the forestry is clearly bigger in the other than economic categories – a social and environmental meaning, which are hard measurable.

The public forests are dominative in the structure of forest ownership in Poland – 80.7%, including the forests under the management of The State Forest – National Forest Holding – 76.9%. This structure in the whole post-war period has changed slightly. Between 1990 – 2017 the share in the private forest ownership increased of 2.3 percentage points up to present 19.3%. Simultaneously, the share of the public forest ownership has decreased from 83% to 80.7% (Figure 3.).

³ GUS, Statistical Yearbook of Forestry 2019, Warsaw 2020.

STRUCTURE OF FOREST OWNERSHIP IN 2018
As of 31st December

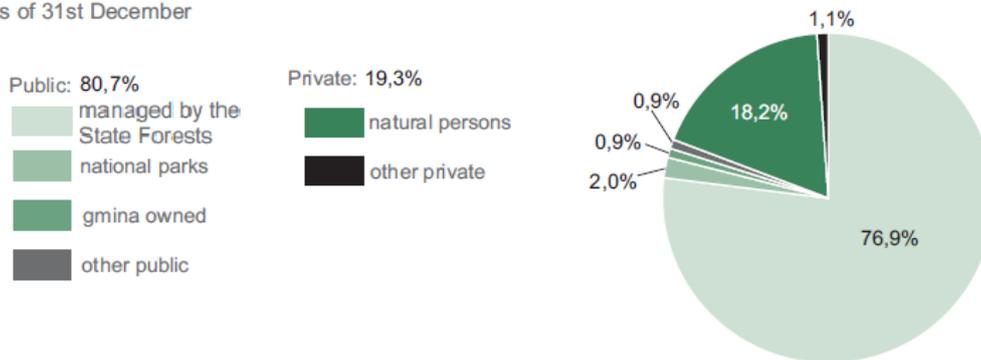


Figure 3 Structure of forest ownership in Poland ⁴

The agriculture together with the forestry and fishing are counted among the first sector of economy. Its meaningful role results from functions, which are: an economic function concerning the GDP, a social function relying on creation of job positions and a space function, which task is to shape a natural landscape into an agricultural one. The share of the agriculture, forestry, hunting and fishing in the GDP creation in 2010-2018 was being kept on a very similar level. It reached the highest values (2.9%) in 2011 and 2013. In turn, in 2018 it formed on the lowest level in the whole analysed period and it amounted 2.1%. It indicates a declining, profitable meaning of the agriculture in the national economy. The decreasing share of the agriculture in the GDP creation is a consequence of some structural changes and a faster tempo of growth of non-agricultural branches in the national economy.⁵

Work in the first sector of the national economy, including the agriculture and forestry is primary for the activity in the labour market of a huge group of people living in the agricultural areas – 93% among a general number of people working in the agriculture live in the country. According to WHO data, during the last several dozen of years, both the number and the share of professionally active people in the Polish agriculture were decreasing – from 53% in 1950, through 29% in 1982 to 19% in 2005. For comparison, the number of people working in the agriculture in 2018, according to Statistics Poland, amounts 14.9%. (Figure. 4).⁶

⁴ GUS- GUS, Statistical Yearbook of Forestry 2019, Warsaw 2020

⁵ GUS- Rural areas in Poland in 2018, Warsaw 2020

⁶ GUS- Yearbook of Labour Statistics 2019, Warsaw 2019

STRUCTURE OF EMPLOYED PERSONS IN THE NATIONAL ECONOMY BY OWNERSHIP SECTORS AND SECTIONS GROUPS

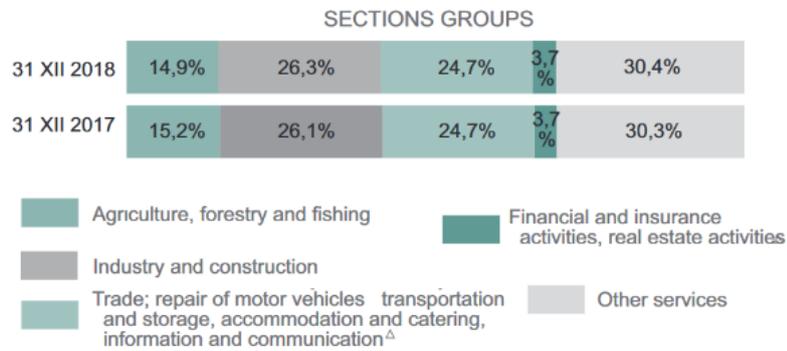


Figure 4 Structure of employed persons in the national economy ⁶

2. Characteristics of AKIS

2.1. AKIS description

Despite some strong territorial and functional connections, the relations between agriculture and forestry resulting from their specificity, i.e. the environmental space usage (including air, soil and water) and a strong interaction with nature, there is no one common and strongly institutionally connected AKIS in Poland.

The Polish AKIS is characterised by a clear separation of the agricultural AKIS and forestry FKIS in terms of public policy management and institutional framework between different Ministries. The Ministry of Agriculture and Rural Development manages AKIS and Minister of Climate and Environment is responsible for FKIS. Moreover, there are two parallel administrative systems covering both sub-sectors at the regional and local levels.

The politics in Poland regarding forests and forest management, including education on nature and forest protection, is carried out by the State Forests – the National State Forest Holding (PGL). It is a state unit with a separate structure. It conducts an economic activity and it is not subjected to Ministry of Agriculture and Rural Development.

It has been considered recently to transfer the management of the forestry to Ministry of Agriculture and Rural Development but the decision has not been taken to date.

Our review of AKIS is based on the processes covering the period between around 2015 until nowadays to emphasize an importance and a positive impact of the initiatives taken in this period by actors involved in the Polish AKIS. The desk study concerned all the relevant publications and CDR own researches, including two special reports (2017, 2019) focused on a future role of agricultural advisors and an increasing role of the innovative policy for all actors in the agriculture.

Agricultural Advisory role in AKIS

Agriculture advisory service is the most important unit in AKIS, which task is to support the flow of information and building connections between partners of this process. Additionally, the system of public advisory services facilitates a creation of new patterns of institutional knowledge amongst public and private actors involved in AKIS.

In many terms the institutional agricultural advisory system is an actor in AKIS, who aims to improve a cooperation of all involved entities related to a development of market services, including innovative solutions. In practice the agricultural advisory initiates a creation and facilitates making the connections stronger both between research, educational and private sector actors, farmers and their organizations.

In Poland, there is a public agricultural advisory system functioning, as one of the main tools for delivering the governmental policies in the area of agriculture and rural development. The system consists of 16 Regional Agricultural Advisory Services and Agricultural Advisory Centre in Brwinów with its Branch Offices in Kraków, Poznań, Radom, and Warsaw.

Agricultural Advisory Centre in Brwinów assists the Regional Agricultural Advisory Services in a methodological and didactic way. Trainings and agricultural advisory service for farmers and agricultural area inhabitants are their main scope of activity.

Agricultural Chambers

Agricultural services for formers are provided by Agricultural Chambers. The enactment regarding the Agricultural Chambers says about running advisory business in the field of agricultural activity, rural household and income diversification for farmers households. However, Agricultural Chambers, as a result of some limited staff issues, run the advisory only in a reduced field. They are engaged in national and international projects, organize trainings, shows and demonstrations. They make a cooperation with agricultural organizations and chambers in other countries. They also prepare a lot of study visits for farmers, showing good practical solutions in the land and abroad.⁷

Producers associations and cooperatives

Agricultural organizations provide specific advice to their members in the field of their activities. They train, organize conferences, conduct shows and demonstrations on their members' farms, publish publications and newspapers.

⁷ A.Ciechomska, praca dyplomowa „Samorząd rolniczy w przemianach strukturalnych polskiej wsi”, 2018r.

Private agriculture advisors

What is more, farmers are allowed to take advantage of private advisory services acting on the basis of the enactment from July 2, 2004 about economic activity freedom (i.e. Journal of Laws, 2013, item 672).

There are many private agricultural advisory companies in Poland. The list of advisers maintained by the CDR includes currently around 1,000 private advisers who provide services related to assistance with the use of the EU funds. In addition, there are many other advisers providing technological and economic consulting services by companies selling agricultural production means.

Research and scientific actors of AKIS

Within the Polish system, there are following kinds of research entities differentiated:

1. Research institutes operating within the framework of the Ministry of Agriculture and Rural Development:
 - Research Centre for Cultivar Testing in Słupia Wielka,
 - Prof. Waclaw Dąbrowski Institute of Agriculture and Food Biotechnology in Warsaw,
 - Institute of Agricultural and Food Economics National Research Institute in Warsaw,
 - The Plant Breeding and Acclimatization Institute (IHAR) - National Research Institute,
 - The Institute of Plant Protection – National Research Institute (IPP – NRI),
 - Research Institute of Horticulture in Skierniewice,
 - Institute of Technology and Life Sciences (ITP) in Falenty,
 - The Institute of Soil Science and Plant Cultivation in Puławy,
 - The Institute of Natural Fibres and Medicinal in Poznań,
 - National Research Institute of Animal Production In Krakow,
 - National Veterinary Research Institute in Pulawy,
2. Research institutes operating within the framework of Ministry of Climate and Environment in the FKIS system:
 - Forest Research Institute.

Each institute operates within an appropriate area of specialization based on programmes and projects funded by national and international programmes (i.e. H2020). A part of the institutes' activities is focused on a cooperation within AKIS

partners, such as public agricultural advisory services or farmers organisations, on applied science projects.

Network of agricultural universities in Poland:

The Agricultural Universities in Poland operate within the institutional frames of Ministry of Science and Education:

- Warsaw University of Life Science –SGGW
- University of Agriculture in Krakow,
- Poznan University of Life Sciences,
- Wrocław University of Environmental and Life Sciences,
- UTP University of Science and Technology in Bydgoszcz,
- The University of Life Sciences in Lublin,

The agricultural universities have a quite good functioning and developing divisions taking care of researches commercialization, obtaining entrepreneurships to cooperation and licence for technology elaboration, inventions registration in Patent Office or IT technology usage in order to accelerate the communication with the industry in the field of innovation dissemination and cooperation effectiveness growth between science and practice. The Centres for Technology Transfer of the universities take care of these. The information flow is facilitated also by the network which is created by Agreement of Academic Technology Transfer Centres (PACTT). They also own a data base platform regarding the technologies offered, innovative solutions proposals or research results ready to commercialize. The technology transfer from the universities, in major perspective, takes place not directly to farmers but indirectly through business entities servicing farmers, for instance, forage companies, those producing fertilizers, pesticides or machines and agricultural equipment.

Education in the field of agriculture and forestry

In Poland, there are 53 agricultural schools functioning in the field of institutional supervision of Ministry of Agriculture and Rural Development. Moreover, there are also schools in the organisational structures of territorial authorities, where the agricultural education is one of the fields of study. The aim of vocational training participation in the AKIS system is a comprehensive and specialistic education of a new future staff for all the participants of the system.

The number of forest schools in Poland amounts 33, including those supervised by the Minister of the Environment – 11 and those supervised by local authorities.⁸ Forest technical colleges are supported by the State Forests in the knowledge flow, they facilitate practices in forest areas, prepare trainings and field activities for students.

Additionally, in the frames of the knowledge transfer system in Poland, it is worthwhile to indicate:

1. National Centre for Agricultural Education (KCER) in Brwinów, which is a public in-service training facility for teachers of vocational subjects who teach in agricultural schools.
2. The Network of Forest Education Centres functioning under the State Forest. The entities act actively for education of society in a given scope.

Farmers

According to the statistical data in 2019, there are over 1.4 mln farms functioning in Poland. Over a half of them (53.5%) constituted farms with an area of 5 ha of agricultural land areas. The percentage of the biggest farms, with an area of 50 ha and more amounted only 2.4 %. Regarding such a fragmented structure of farms and numerous group of receivers in Poland all the knowledge and information transfer activities are difficult.

As regards farmers, the main task of agricultural advisory services is to identify potential leaders of innovation processes and define the most effective communication channels to promote their involvement in various forms of farmers needs driven by innovative bottom-up activities.

National Support Centre for Agriculture (KOWR)

The National Support Centre for Agriculture (KOWR) is a Polish public finance sector institution, supervised by the Minister of Agriculture and Rural Development and operating since September 1, 2017. It was established by merging two state agricultural agencies - the Agricultural Property Agency and the Agricultural Market Agency.

The KOWR's fields of activities are as follows:

- improvement of the competitiveness of Polish agri-food products at home and abroad,
- management of agricultural properties of the State Treasury,

⁸ Jacek Krawczyk Departament Leśnictwa Piotr Marciniak Technikum Leśne TucholaSękocin Stary, 13-15.03.2018 r.
STAN I PERSPEKTYWY ROZWOJU ŚREDNIEGO SZKOLNICTWA LEŚNEGO

- development of the agricultural system,
- supervision of plant and livestock breeding companies of particular interest to the national economy,
- stabilisation and monitoring of agricultural markets,
- activities related to renewable energy sources,
- food aid and programmes to promote consumption and healthy eating,
- promotion of innovation in agriculture and in the agri-food industry,
- support for rural development,
- transfer of knowledge in rural areas.⁹

The organisational structure of the KOWR covers the whole country and facilitates an efficient beneficiary and customer service. The KOWR is comprised of several distinct organisational units - the Central Office in Warsaw and 17 Regional Offices (ROs), one branch office and a network of affiliate offices.

The State Forests

The State Forests - the National Forest Holding is an organization protecting, utilizing, and shaping Poland's forests for over ninety years. It manages publicly owned forests on behalf of the Polish State Treasury. Their area exceeds 7.2 million ha. A staff of experienced, professional foresters guarantee that the next generations of Poles will be able to make use of all the benefits which forests provide to a not lower degree than they do today. The role of foresters is to conduct a sustainable forest management, which allows us to meet social needs without damaging the forests.

The State Forests management model is based on a three-tier structure:

- Director-General of the State Forests appointed by the Minister of the Environment. He manages the organization by issuing ordinances and decisions. His office is the Directorate-General of the State Forests – a central unit and the advisory body to the director-general is the Council of the State Forests.
- Regional directorates of the State Forests (17). Their task is to supervise the subordinate units and to coordinate their activities.
- Forest districts (430). They conduct forest management on the basis of the forest management plan. The forest district manager is responsible for the

⁹ https://www.kowr.gov.pl/uploads/pliki/wydawnictwa/kowr_en_2018.pdf

condition of forest in the district area. The forest districts are divided into forest units.¹⁰

State/provincial authorities

The three-tier administrative division of Poland (territorial) was introduced on January 1, 1999. According to it, the territory of Poland has been divided into voivodships, districts (including communities having the town status on rights of district) and communes. Under the information dated on January 1, 2020, the administrative division of Poland embraces:

- 16 voivodships,
- 314 districts and 66 towns on rights of district,
- 2477 communes (including 302 municipal communes, 642 urban-rural communes and 1533 rural communes)

¹⁰ <http://www.lasy.gov.pl/en>

2.2. AKIS diagram

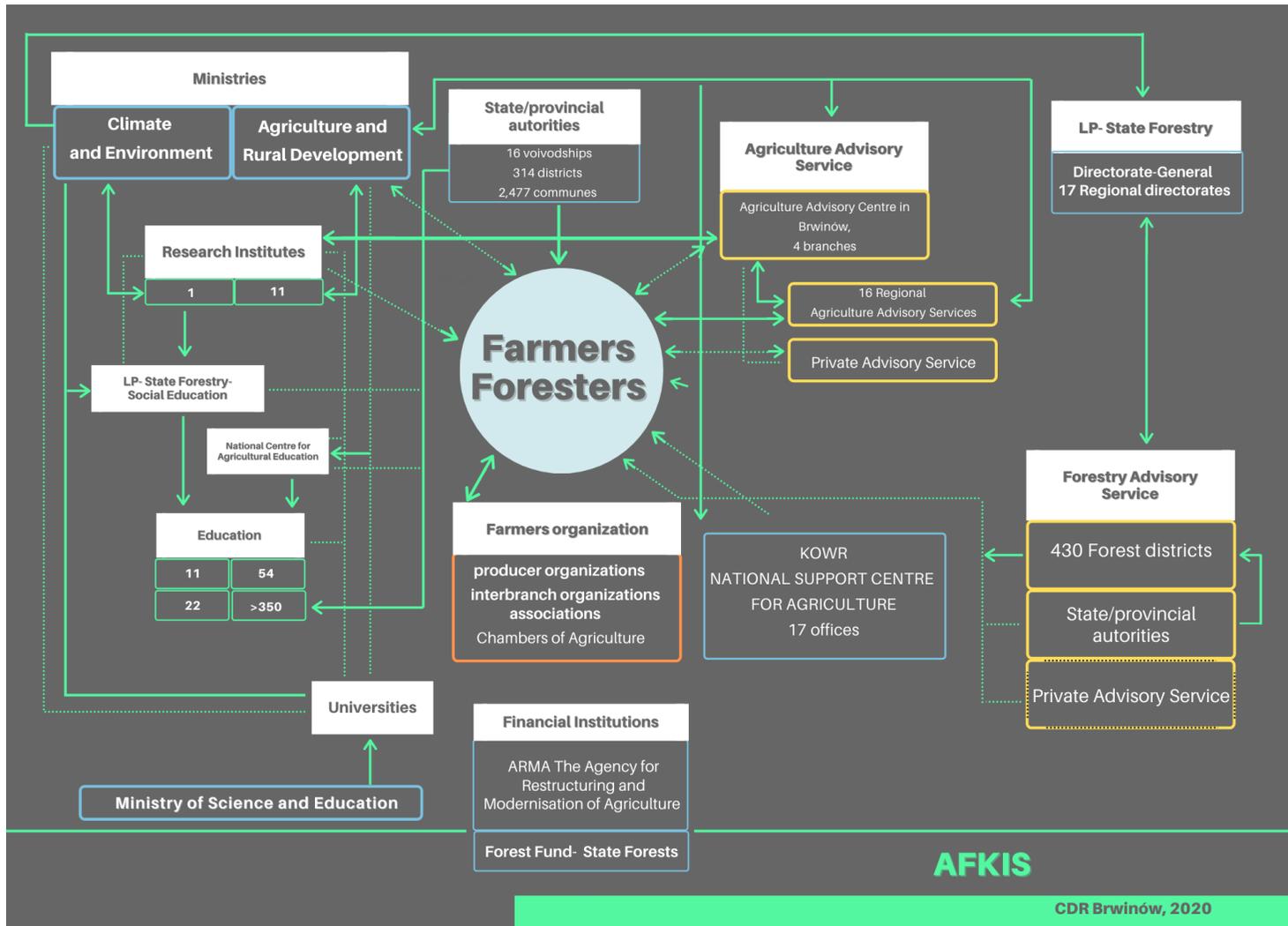


Figure 5 The Polish AKIS

3. History of the advisory system

The agricultural advisory service in Poland has several decades of traditions dating back to the beginning of the 20th century. When assessing the development of the agricultural advisory service over many decades in Poland, 6 most important stages of development have been identified in the literature on the subject. The main stages of the implementation of the advisory tasks and the evolution of agricultural advisory service are:

Stage I: the advisory as a support in education and training of farmers in Poland during the partitions of Poland in the second half of the nineteenth century run by agricultural circles, agricultural societies and agricultural schools.

Stage II: the period starting in 1907, when the Departments of Agricultural Circles in the Centres of Agricultural Societies were established. Then, in the 1920s and 1930s, along with the progressive reconstruction and slow development of low-efficiency agriculture, the development of social agronomy took place, which resulted in the creation of the foundations of professional consulting.

Stage III: the 1950s and 1960s – it is a development of the consultancy as a form of support for the administration controlling agriculture, development of advisory staff implementing agricultural policy, supporting the implementation of centrally controlled economy plans. The counseling was conducted by the Peasant Self-Help Union, state-owned machinery centres, agricultural circles and communal services.

Stage IV: the 1970s and 1980s – it is a development of the consultancy as a form of support for the diffusion of agricultural innovations. A pursued goal was to make new solutions available to farmers and to modernize farms. This period was characterized by the rapid development of science, a rapid increase in number of innovations, and the modernization of agriculture, meeting new challenges of the centrally controlled economy. These activities were carried out by voivodeship centres of agricultural progress (WOPR) established in 1975.

Stage V: it covers the 1990s to the first half of the second decade of the 21st century. It is the period of changing the centrally controlled economy system to the market one, implementing the assumption of the EU integration and adopting the CAP solutions. The consulting in this period supported the market economy, provided help in solving problems for farmers operating in the new system of the market economy. On January 1, 1999, the agricultural advisory centres located in

the voivodships were taken over by Marshal's Offices. The centres that were taken over by the minister responsible for rural development in order to establish the National Advisory Centre for Agricultural and Rural Development, in December 1998, were excluded. The National Centre was located in Brwinów. The adopted organizational solution created a two-tier advisory model that survived until the Polish regulations were adjusted to the rules in force in the European Union.

In connection with Poland's accession to the EU and the adoption of the Act on Agricultural Advisory Units, on October 22, 2004, some organizational solutions were adopted for the extensive two-tier advisory structure with a central unit - Agricultural Advisory Centre in Brwinów (along with its three branches) and 16 voivodeship centres. In this first period of operation, the consultancy in the field of information on available forms of aid financed from the EU funds played the greatest role, which contributed to their dissemination and implementation. This short period of less than ten years brought two fundamental model changes. The first amendment, from 2007, resulted in the adoption of the act on rural development, which allowed for a possibility of delegating tasks in this respect to entities other than advisory units, including agricultural chambers and private accredited advisory bodies. The second change, from 2009, resulted in changes in the organization and division of tasks of public administration in the voivodeships, when voivodeship advisory centres came under the supervision of voivodeship territorial self-government bodies and became self-government legal entities.

Stage VI: the period after 2014, in line with the next CAP programming period, means the EU requirement to create a uniform advisory system for an efficient support for farmers – the counseling as a system of professional support for farmers in order to meet expectations and needs of agricultural producers.

In the interwar period - shortly after regaining the independence in 1918 the first decisions aimed at creating a new forest administration were made. In 1920 there were four regional boards of state forests established (in Warsaw, Radom, Siedlce and Lviv), all supervised by Ministry of Agriculture and National Property.

The dual structure of the forestry advisory services mirrored the ownership pattern. One type operated under the aegis of publicly owned forests, the second was hired by an owner of lands and forests.

Years of the Polish People's Republic (PRL) - After the war, the state took over the ownership of forests, sawmills, wood processing plants and also other forest products. The area of the state forests increased then to more than 6 million ha.

As of January 1, 1948, in 16 Directorates of the State Forests there were 917 forest districts, including three national parks.

The next years brought further modifications of the state forests management system. In 1950, in place of 16 directorates there were two levels of management: the precinct (17) and district (137) boards established. In 1975, seven precinct boards were removed. In subsequent years, they returned gradually to the former number of the precinct boards, however, with great changes in the shape of the boundaries. The forestry advisory services were provided within the state company by employed foresters.

Third Republic - Another breakthrough for the State Forests happened in 1990s and as the result of the change of the political system in Poland. In 1994, the State Forests were given a new statute. This Act introduced a concept of the Forest Service. As a result, the forestry advisory services are provided by two parallel systems: the internal one - within the State Forest Holding and the network of private companies providing services to their clients.

4. The agricultural and forestry advisory service(s)

4.1 Overview of all service suppliers

AKIS services are supplied by a whole range of public and private suppliers.

As regards the agricultural services, three main suppliers shall be indicated:

a) The system of the public agricultural advisory services.

Agricultural Advisory Centre in Brwinow (CDR) together with its 4 branches and 16 Voivodship Agricultural Advisory Centers independent of CDR. All advisory units are subordinate to Minister of Agriculture and Rural Development. In total, the units employ over 4,000 people.

The Agricultural Advisory Centre keeps the lists of certified experts (public and private) in three categories: agricultural advisor - 3237 advisers, agri-environmental advisor - 2223 and nature expert - 715.

Moreover, on the basis of an agreement with The Agency for Restructuring and Modernisation of Agriculture (ARMA), CDR in Brwinów is creating a list of advisors authorized to handle the e-application (a document necessary to obtain direct payments).

b) Agricultural advisory services provided by the national network of Agricultural Chambers.

In Poland, under the Act on Agricultural Chambers of December 14, 1995, (Journal Of Laws of 2014, item 1079, in 2015) in 1995, agricultural chambers were created. It is a self-government that represents interests of farmers. The structure is made up of 16 voivodship agricultural chambers, and its representatives are represented by the national Council of Agricultural Chambers. Voivodship Agricultural Chambers also deal with agricultural advisory services, but on a much smaller scale than Voivodship Agrivultiral Advisory Centres (WODRs) due to their limited staff.

Advisory services for farmers provided by the Agricultural Chambers. The Act on Agricultural Chambers¹¹ says about advisory in the field of agricultural activity, rural households and income diversification for farmers households. However,

¹¹ Ustawa o Izbach Rolniczych z 14 grudnia 1995 roku Dz. U. z 2014 r. poz. 1079, z 2015 r.

due to limited human resources, Agricultural Chambers(IR) provide advice only to a limited extent¹².

c) Private agricultural advisors operating in the scope of publicly funded measures under RDP and others national programmes. Under the RDP 2014-2020 Act, farmers use advice provided by private advisory entities operating on the basis of the Act of July, 2, 2004 on the freedom of economic activity (i.e. Journal of Laws of 2013, item 672).

d) Private advisors employed as sales representatives of commercial firms supplying farmers in agricultural related inputs. They offer advisory services as part of the selling process of their products. According to the CDR researches a high quality of professional services are appreciated by at least a part of farmers. However, there is a common understanding amongst farming communities that commercial targets (i.e. reaching sales objectives) have an influence on objectivity of services provided by this group of advisors.

FKIS

The structure of ownership of forestry resources has a decisive impact on the system of advisory services. As the majority of forests is managed by The State Forest Holding, advisory services are delivered internally, within the company. The State Forest advisors provide also services for other owners of forests (i.e. local governments).

Similarly to agriculture, there are also private companies providing advisory services on commercial basis.

4.2 Public policy, funding schemes, financing mechanisms, advisory service providers

After Poland joined the European Union (EU), farmers, apart from the traditional source of financing - own funds and loans, received another instrument in the form of support under the Common Agricultural Policy (CAP) - i.e. measures implemented under Rural Development Program (2004-2020) and direct payments system. As a result, the situation with regard to modernization carried out on farms improved, as the funds from the EU are not exposed to the risk of

¹² Ustawa o Izbach Rolniczych z 14 grudnia 1995 roku Dz. U. z 2014 r. poz. 1079, z 2015 r.

debt repayment. Budget subsidies provided in the form of direct public aid have become one of the important elements shaping the current and future financial condition of farms.

The development of farm activities is shaped by the availability of internal and external sources of financing due to the continuous process of changes in the effectiveness of agricultural production, as well as the conditions of an activity conducted.

The system of public agricultural advisory network is funded directly from the state budget at level of 60-70% of total costs of activities (the remaining balance are earned by, inter alia, service provisions for farmers). The costs of advisory services provided by Agricultural Chambers and sectoral farming organisations are covered through their members (farmers) fees. The private agricultural advisors operates on a commercial basis.

There were also specific measures aimed at supporting agricultural advisory services provision in the EU co-funded RDPs since 2004. In RDP 2014-2020 there is a measure 2.1 "Support for the use of advisory services", type of operation "Provision of comprehensive advice to the farmer" and "Provision of comprehensive advice to the forest owner", support was obtained for the provision of advisory services to farmers or forest owners in the form of an annual, 2-year or 3-year advisory program.¹³

The aim of this action was to increase the profitability of farms and the competitiveness of all types of agriculture in the whole area of the country and to promote innovative technologies and sustainable agriculture based on comprehensive, specialized and professional advice. The key changes in the development of the Polish agriculture were supposed to lead to the diversification of agricultural production, improvement of the economic performance of all farms, their restructuring and modernization, and in particular, increase their participation in the market and market orientation. The implementation of the planned changes requires strengthening of the knowledge transfer and innovation mechanisms through agricultural consultancy, the offer of which will be tailored to the individual needs of farmers and forest owners.

One measure of particular relevance in terms of innovation promotion of the RDP 2014-2020 is the Cooperation measure as a policy instrument facilitating development of innovative projects based on multi-actors approach involving all relevant actors representing AKIS actors. The process of the measure delivery was

¹³ <https://www.arimr.gov.pl/pomoc-unijna/prow-2014-2020/dzialanie-2-uslugi-doradcze-uslugi-z-zakresu-zarzadzania-gospodarstwem-i-uslugi-z-zakresu-zastepstw/poddzialanie-21-wsparcie-korzystania-z-uslug-doradczych/poddzialanie-21-wsparcie-korzystania-z-uslug-doradczych-uslugi-doradcze-uslugi-z-zakresu-zarzadzania-gospodarstwem-rolnymi-uslugi-z-zakresu-zastepstw.html>

supported by establishment the Network for Innovation in Agriculture (SIR) within Agricultural Advisory Centre in Brwinów, an internal unit responsible for:

1. 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.
2. Facilitating the exchange of expertise and good practice in the field of innovation in agriculture and rural areas.
3. Assistance in the establishment of EIP Operational Groups and in the development of projects by Operational Groups and Innovation Partnerships.

Network for Innovation in Agriculture (SIR) manages the network of regional innovative brokers supporting the delivery of the Cooperation measure in Poland.

The structure of agricultural advisory services has changed as a result of the accession processes leading to focusing of advisory providers activities on supporting farmers and rural areas communities in applying for support available under, inter alia, all RDPs between 2004-2020 (earlier in the pre-accession phase SAPARD) and direct payments. It was a dominating scope of activities of public and private advisors in this period.

It is worthwhile to indicate new, growing trends since 2015 of refocusing of agricultural advisory services towards facilitating innovative development in the sector. This process was supported by the following activities:

- a) the whole spectrum of activities led by the Ministry of Agriculture and Rural Development facilitating networks built between relevant stakeholders of the AKIS process (i.e. regular meetings, workshops, seminars based on MA approach for actors representing research organisations, farmers and their organisations, agricultural advisory services, businesses and other relevant actors),
- b) facilitation by the Ministry of Agriculture and Rural Development a growing participation by actors of AKIS (i.e. research organisation, public advisory services) in international (i.e. H2020) and national programmes facilitating cooperation based on MAA promoting innovativeness in agriculture.

4.3 Human resources and methods of service provision

There is a system of public agricultural advisory services in Poland, as one of main tools for delivering governmental policies in the area of agriculture and rural development. This system consists of 16 Provincial Agricultural Advisory Centers and the Agricultural Advisory Center in Brwinów with its office branches in

Kraków, Poznań, Radom and Warsaw. Agricultural Advisory Center supports methodically and didactically Agricultural Advisory Centers, the main purpose of which is training and providing advisory services to farmers and inhabitants of rural areas.

The main human resources are concentrated in the public advisory. Agricultural advisory units employ over 4,000 people who provide services in the field of agriculture and rural development. The public advisory service employs mainly people with agricultural education. The graduates who do not have a specific education are referred to postgraduate studies in order to supplement their agricultural knowledge.

In order to improve the quality of agricultural services and support the implementation of the CAP, certification of agricultural advisors is carried out. Persons who meet the criteria of education, work experience in counseling and who have completed training and passed exams may be placed on the lists of advisors. In this way they are authorized to advise on the CAP and RDP. Two-thirds of the people on these lists are public advisors and the rest of them are private advisors.

Agricultural advisors constitute also the overwhelming majority of agri-environmental advisors. These are mainly advisors employed in the public system, but also employees of Agricultural Chambers and private advisors. In order to ensure the quality of advisory services and to increase the competences of advisers, certified qualifications have been created.

Currently, the most dominating form of service provision is the work with individual farmers. To large extent it reflects the nature of services focused on assisting in process of applying for external resources and provision of technological advisory services. Regarding methodologies applied in practice, direct face to face advisory dominates with a growing share for an indirect form through telephone or internet. The limitation concerning social distancing as a result of the Covid 19 virus enforced a more indirect form service provision, however, it seems difficult to estimate a long term impact of this trend lasting longer than social distancing limitation. It seems that, according to advisors opinion, farmers prefer face to face relationship over indirect forms of communication with their agricultural advisors.

The second form is advice for group of farmers through trainings, workshops, study tours etc. As a result of the Covid 19 social distance limitations there is a

growing trend of providing group advisory through online events (i.e. webinars, trainings). According to the opinion of some advisors, an online form of advisory services (i.e. webinars) is not as effective as direct meetings.

Demonstrations are an important link in the knowledge transfer. Demonstration farms have always played an important role in the flow of practical knowledge and innovation in Poland. Currently, work is being done on integrating activities and strengthening the links between science and agricultural practice by creating a network of demonstration farms. This will allow for a faster flow of information, better cooperation between farmers, the possibility of presenting innovative solutions at the national level using modern IT techniques, access to films from conducted demonstrations, live presentations and including the results of scientific research on farms.

In practice in the system of public advisory services the following pattern might be notified:

- a) autumn and winter – arrangement of various advisory forms for groups of farmers. It mirrors their availability for this type of activities in season, where in some types of agricultural production, farmers have more time to attend meetings,
- b) spring and summer – a dominance of work with individual farmers.

4.4 Clients and topics/contents

The main factor influencing the diversification of agricultural advisory services is size and level of specialization of a farmer as a clients, owners/managers of larger farms and those involved in more specialized type of agricultural production tend to use rather commercial advisors, less public, operating within the system of public agricultural advisory service. They use them in at least four forms:

- a) employment of an appropriate staff as a regular staff of farm (in case of larger professional farms),
- b) hiring on a contract basis some specialised services (i.e. veterinarian),
- c) using services of commercial advisors selling agricultural input for ad hoc needs,
- d) using external advisors, including public agricultural advisors, to provide administrative support in the scope of services related to the EU payments.

The small and medium size farmers are the most common users of the public agricultural advisory services. According to the CDR researches a template of structure of advisory services is as follows:

- a) around 50% of assistance consists of administrative support in the scope of services related to the EU payments, including measures aimed at investments at a farm level,
- b) around 40% of technological advisory – responding for specific questions from farmers concerning topics related to various types of agricultural production,
- c) others related to “issues of the day” (i.e. applying for some special financial support related to national programmes alleviating a negative impact of drought in farming production) and other related to specific tasks allocated by the policy decision makers to the public agricultural advisory services).

It shall be emphasized that it is a very general pattern which may vary in different regions of Poland and specific time, when the public advisory may be given some specific tasks requiring additional efforts and working time.

The activities of 16 innovative brokers located in each of the Polish voivodships are focused on:

- a) promotion of common actions by AKIS actors on activities under the Cooperation measure,
- b) provision of support for actors interested in an application development for innovative projects based on MAA within the framework of the Cooperation measure. The network of brokers is managed by the Network for Innovation in Agriculture (SIR), the internal unit of Agricultural Advisory Centre.

The forest advisory is provided by internal services of The State Forests. In the State Forests, the basic organizational unit is the forest inspectorate, managed by the forest inspector, which independently manages the forest on the basis of the forest management plan and is responsible for the condition of the forest. There are 430 forest districts in Poland.

According to the provisions of the Act on Forests, the State Forests are obliged to provide advice and assistance to private forest owners in forest management.

As part of these activities, foresters:

- advise private owners on how to conduct forest management,
- provide seedlings of trees and forest shrubs,

- perform eradication and protection measures in private forests at the expense of forest districts, if harmful organisms, threatening the forest sustainability, are present there,
- organize the performance of economic tasks in the forest (including the sale of wood), under an agreement with an owner of a forest,
- prepare large-scale forest inventories and maintain a forest data bank.

In Poland, after joining the European Union, foresters became involved in providing help to private owners of forests and lands intended for afforestation.

In particular, this applies to preparation of afforestation plans when applying for financial aid under the Rural Development Program (RDP) and confirming an implementation of this afforestation. In addition, foresters initiate financial support for private forest owners in the event of hurricanes, floods or other disasters. These activities are also carried out under the RDP.

Foresters also support private forest owners with their knowledge and experience to improve management of entire forests. This is achieved, among others, by materials - professional guides and videos.

4.5 Linkages with other AKIS actors/knowledge flows

General picture of AKIS is presented in diagram in section 2.1.

The most important interactions between the AKIS actors are listed in the table below.

	Farmers	Farmers organisations	Ministry of Agriculture and Rural Development	ARMA	KOWR	CDR	16 regional agricultural advisory centres	Chamber of Agriculture	Private advisory	Sectoral agricultural institutes	Agricultural universities	
Farmers	Strong	Strong	Strong	Strong	Medium	Medium	Strong	Medium	Medium	Medium	Weak	
	bidirectional	bidirectional	bidirectional	unidirectional to farmers	unidirectional to farmers	bidirectional	bidirectional	bidirectional	unidirectional to farmers	unidirectional to farmers	unidirectional to farmers	
	Peer-to peer learning	Peer-to peer learning	Policy, programmes, funding	Funding	Agricultural land management and potential source of funding	Policy and Programmes	Direct services to farmers	Direct services to farmers	Direct services to farmers	Cooperation on projects basis and dissemination activities	Cooperation on projects basis	
Farmers organisations	Strong	Strong	Strong	Strong	Medium	Medium	Strong	Strong	Weak	Medium	Weak	
	bidirectional	bidirectional	bidirectional	unidirectional to farmers	unidirectional to farmers	bidirectional	bidirectional	bidirectional	unidirectional to farmers	unidirectional to farmers	unidirectional	
	Peer-to peer learning	Peer-to peer learning	Policy, programmes, funding	Funding	Agricultural land management	Policy and Programmes	Direct services	Direct services	Direct services to farmers	Cooperation on projects basis and dissemination activities	Cooperation on projects basis	
Ministry of Agriculture and Rural Development	Strong	Strong	X	Strong	Strong	Strong	Strong	Strong	Weak	Strong	Weak	
	bidirectional	bidirectional		bidirectional	bidirectional	bidirectional	bidirectional	bidirectional		bidirectional		bidirectional
	Policy, programmes, funding	Policy, programmes, funding		Agency – the EU Paying Agency	Centre – policy implementation	CDR – policy implementation	Regional centres – policy implementation	Policy, programmes, funding		Ministry – policy maker, source of some research programmes		
ARMA	Strong	Strong	Medium	X	Strong	Strong	Strong	Medium	Strong	Weak	Weak	
	unidirectional to farmers	unidirectional	unidirectional		bidirectional	bidirectional	unidirectional	bidirectional	unidirectional			
	Funding	Funding	Agricultural land management Agency – the EU Paying Agency		Coordination of activities at a strategic level.	Coordination of activities at a strategic level	The Agency – the EU Paying Agency set the rule of application processes	Cooperation in the area of social consultation process	The Agency – the EU Paying Agency set the rule of application processes			
KOWR	Medium	Medium	Strong	Strong	X	Weak	Weak	Weak	Weak	Weak	Weak	
	unidirectional to farmers	unidirectional to farmers	bidirectional	bidirectional								
	Agricultural land management and potential source of funding	Agricultural land management and potential source of funding	Ministry – policy maker Centre – policy implementation	Coordination of activities at a strategic level								
CDR	Medium	Medium	Strong	Strong	Strong	X	Strong	Weak	Weak	Strong	Medium	
	bidirectional	bidirectional	bidirectional	bidirectional	bidirectional		bidirectional			bidirectional	bidirectional	
	Policy, programmes, CDR as an umbrella organisation operates through the regional advisory centres	Policy, programmes, CDR as an umbrella organisation operates through the regional advisory centres	Policy, CDR-implementation, Ministry- policy maker	Coordination of activities at a strategic level	Coordination of activities at a strategic level		CDR – an umbrella organisation supporting the regional advisory centres, including support			Regular cooperation on facilitation of research information flow and on basis of projects and other dissemination activities	Limited cooperation on facilitation of research information flow and on basis of projects and other dissemination activities	

Figure 6 Linkages with other AKIS actors

	Farmers	Farmers organisations	Ministry of Agriculture and Rural Development	ARMA	KOWR	CDR	16 regional agricultural advisory centres	Chamber of Agriculture	Private advisory	Sectoral agricultural institutes	Agricultural universities	
16 regional agricultural advisory centres	Strong	Strong	Strong	Strong	Weak	Strong	CDR – an umbrella organisation supporting the regional advisory centres, including support	Medium	Weak	Strong	Strong	
	bidirectional	bidirectional	bidirectional	unidirectional		bidirectional		bidirectional		bidirectional	bidirectional	bidirectional
	Direct services to farmers	Direct services to farmers	Policy, Regional offices- implementation, Ministry- policy maker	The Agency – the EU Paying Agency set the rule of application processes		Coordination of activities		Regular cooperation on facilitation of research information flow and on basis of projects and other dissemination activities		Regular cooperation on facilitation of research information flow and on basis of projects and other dissemination activities		
Chamber of Agriculture	Strong	Strong	Strong	Medium	Medium	Medium	Weak	Weak	Weak	Medium	Medium	
	bidirectional	bidirectional	bidirectional	unidirectional	unidirectional	bidirectional				bidirectional	bidirectional	bidirectional
	Direct services to farmers	Direct services	Policy, programmes, funding	Participation in a consultation process.	Participation in a consultation process.	Coordination of activities				Regular cooperation on facilitation of research information flow and on basis of projects and other dissemination activities	Regular cooperation on facilitation of research information flow and on basis of projects and other dissemination activities	
Private advisory	Strong unidirectional to farmers	Weak	Medium unidirectional	Medium unidirectional	Weak	Weak unidirectional	Weak	Weak	Weak	Weak	Weak	
	Direct service with provision		Delivering on commercial projects basis under the public funded programmes (i.e. RDP)	Delivering on commercial projects basis under the public funded programmes (i.e. RDP)		CDR certifies private advisors operating under the RDP 2014-2020 legislation framework				changing towards medium as a result of growing involvement of private advisors in the Cooperation measure application development	Changing towards medium as a result of growing involvement of private advisors in the Cooperation measure application development	
										bidirectional	bidirectional	
Sectoral agricultural institutes	Medium unidirectional	Medium unidirectional	Strong bidirectional	Medium unidirectional	Weak	Strong bidirectional	Weak	Weak	Weak	Weak	Weak	
	towards farmers as a result of growing involvement of farmers in the Cooperation measure projects delivery and other programmes.	towards farmers as a result of growing involvement of farmers in the Cooperation measure projects delivery and other programmes.	Ministry – policy maker, source of some research programmes	Within the framework of projects administrated by the EU Paying Agency		Regular cooperation on facilitation of research information flow and on basis of projects and other dissemination activities						Regular cooperation in facilitation of research information flow and on basis of projects and other dissemination activities
Agricultural universities	Weak	Weak	Weak	Medium unidirectional	Weak	Medium bidirectional	Weak	Weak	Weak	Weak	Weak	
				Within the framework of projects administrated by the EU Paying Agency		Limited cooperation on facilitation of research information flow and on basis of projects and other dissemination activities						Regular cooperation on facilitation of research information flow and on basis of projects and other dissemination activities

4.6 Programming and planning of advisory work

AKIS

Programming and planning processes are managed at two levels:

- a) management of work in the public agricultural advisory services system,
- b) regulatory activities concerning other types of agricultural advisory services

Both activities are managed by the Ministry of Agriculture and Rural Development.

As regards managing of the public advisory system, it operates in the following way:

<p>The Ministry of Agriculture and Rural Development is responsible for development of legal and managerial framework of the public agricultural advisory services system in Poland.</p> <p>It is also involved in designing a guidance (including the goals and overall form of their implementation) concerning the annual work programme for each organisation within the network.</p> <p>The managerial system is supported by an appropriate monitoring system.</p>	
<p>Agricultural Advisory Centre (CDR) operates as an umbrella organisation of the system. The main functions relate to advising the Ministry in the scope of professional development of advisory personnel (i.e. type of specialization), providing professional development trainings and carrying out analytical activities. It shall be emphasized that Agricultural Advisory Centre (CDR) also manages national network of innovative brokers facilitating development of innovative projects in agriculture based on MAA (funded by the Cooperation measure) through the Network for Innovation in Agriculture (SIR)</p>	<p>16 regional agricultural advisory centres delivering their activities through network of local offices located across their area activities. Advisors provide direct services for farmers.</p>

Concerning the regulatory activities, the Ministry covers only advisors acting within the measures delivered under RDP 2014-2020. It is required that only advisors working in private companies or hired by Chambers of Agriculture who came through the cycle of trainings arranged by CDR and passing all the required examination could be certified to provide services within framework of this programme.

FKIS

The State Forest prepares annual action plans that include work in advising forest owners and advising on nature and environmental protection. The plans are prepared by Forest Districts and Ecological Education Centers.

The State Forest cooperates with many non-governmental organizations dealing with nature protection. It also cooperates extensively with primary and secondary schools. It prepares educational packages and field activities for children and teenagers.

4.7 Advisory organisations forming the FAS and evaluation of the FAS implementation

The Polish FAS consists of two types of organisations:

1. Working as a part of the public agricultural advisory system:

a) Agricultural Advisory Centre (CDR) employs nearly 200 people. Most of them are experts on specific topics related to agricultural advisory processes. The Centre in Brwinow operates through the network of four office branches located in Poznań, Radom, Kraków and Warsaw. There are also some internal units specializing on selected areas (i.e. Network for Innovation in Agriculture (SIR) to support innovation development in agriculture).

b) Network of 16 regional agricultural advisory centres providing services directly to farmers and rural communities, including over 3.000 advisors working directly with farmers. They implement nationally designed plans of activities adjusted to regional structures of farm activities and needs.

2. Operating as an external advisors:

a) advisors functioning within the structures of Agricultural Chambers,

b) advisors delivering their services as private consultancy companies.



According to the Polish law requirements every advisor providing services under RDP 2014-2020 shall be certified by CDR on the basis of participation in the cycle of training and pass the exams.

5 Summary and conclusions

5.1 Summary and conclusions on section 1 – 3

The Polish AKIS and FKIS are characterised by the clear separation of the agriculture and forestry in terms of public policy management and institutional framework between different Ministries, the Ministry of Agriculture Rural Development and Ministry of Climate relatively. Moreover, there exist two parallel administrative systems covering both sub-sectors at the regional and local level.

The main factor having an impact on promotion and dissemination of innovation in agriculture is the structure of farm holdings. According to the data of the Central Statistical Office, in 2019, there are over 1.4 million farms in Poland, half of which (53.5%) are used by farms of up to 5 ha of arable land. The percentage of the biggest farms, with an area of 50 ha and more, was only 2.4%. With such a fragmented farm policy and such a large group of recipients in Poland, all knowledge and information transfer activities are straitened.

The flow of information within the Polish Agricultural Knowledge and Innovation System as presented in the diagram in section 2.2. covers the following actors:

1. Farmers and their organisations.
2. The agricultural advisory services provided by public and private sector actors:
 - a) the system of public Agricultural Advisory Services consisting of 16 regional agricultural advisory centres as direct suppliers for farmers and rural communities and Agricultural Advisory Centre as the main training and analytical unit providing services mostly to regional advisory centres,
 - b) system of agricultural advisory services provided by the national network of Agricultural Chambers,
 - c) private agricultural advisors operating in the scope of publicly funded measures under RDP and other national programmes.
 - d) private advisors employed as sales representatives of commercial firms supplying farmers in agricultural related inputs.
3. Sectoral research institutes operating within the framework of the Ministry of Agriculture and Rural Development. Each institute operates within an appropriate area of specialization based on programmes and projects funded

by the national and international programmes (i.e. H2020). A part of the activities of the institutes is focused on the cooperation within AKIS partners, such as public agricultural advisory services or farmers organisations, on applied sciences projects.

4. Agricultural universities in Poland operate within the institutional framework of two ministries, the Ministry of Science and Higher Education as the leading ministry with a supporting role of the Ministry of Agriculture and Rural Development. Agricultural universities have quite well-functioning and developing units dealing with the commercialization of research and attracting enterprises to cooperation. This is done by the Technology Transfer Centers of universities. The flow of information is also facilitated by the network formed by the Centers through Agreement of Academic Technology Transfer Centres (PACTT). They also have a platform with a database of technologies offered, proposals of innovative solutions or research results ready for commercialization. Technology transfer from universities to a large extent does not take place directly to farmers, but indirectly through economic entities providing services to farmers, such as for example fodder companies, producers of fertilizers, plant protection products, agricultural machinery and equipment.
5. Other actors having potential role to play in AKIS, i.e. agricultural vocational schools.

Regarding FKIS the structure of ownership of forestry resources has a decisive impact on the system of advisory services. The ownership structure of forests in Poland is dominated by public forests - 80.7%, including forests managed by the State Forests National Forest Holding - 76.9%. local authorities Thus, advisory services are delivered internally, within the company. The State Forest advisors provide also services for other owners of floristries.

Similarly to the agriculture, there are also private companies providing advisory services on commercial basis.

5.2 Summary and conclusions on section 1 – 3

The Polish AKFIS services are supplied by the whole range of public and private suppliers.

As regards the agricultural services, three main suppliers shall be indicated:

a) The Agricultural Advisory Center in Brwinów with its branches, together with sixteen Voivodship Agricultural Advisory Centers, constitutes a public advisory. The public system is based on the system defined in the relevant legal provisions. In addition, it operates within the framework of detailed legal solutions specified in the RDP (Rural Development Program 2014-2020). In the system of the Agricultural Advisory Center in Brwinów there are 3237 agricultural advisors, 2223 agri-environmental advisors within the RDP 2014-2020, and 715 environmental experts within the RDP 2014-2020. The overwhelming majority of agri-environmental advisors are also agricultural advisors. They are mainly advisors employed by the regional advisory centers, but also employees of Agricultural Chambers and private advisors.

b) System of agricultural advisory services provided by the national network of Agricultural Chambers

Advisory services for farmers provided by the Agricultural Chambers. The Act on Agricultural Chambers¹⁴ says about the advisory services in the field of agricultural activity, rural households and additional income for farmers. However, due to limited human resources, Agricultural Chambers provide advice only to a limited extent¹⁵.

c) Private agricultural advisors operating in the scope of the publicly funded measures under RDP and other national programmes. Under the RDP 2014-2020 Act, farmers use advice provided by private advisory entities operating on the basis of the Act of July 2, 2004 on the economic activity freedom (i.e. Journal of Laws of 2013, item 672).

d) Private agricultural advisors employed as sales representatives of commercial firms supplying farmers in agricultural related inputs. They offer advisory services as a part of selling process of their products. According to the Agricultural Advisory Center in Brwinów (CDR) researches a high quality of professional services is appreciated by at least a part of farmers. However, there is common understanding amongst farming communities that commercial targets (i.e. reaching sales objectives) have an influence on objectivity of services provided by this group of advisors. These type of service despite of being a part of the agricultural advisory process in not covered by this analyses as not being a part of

¹⁴ Ustawa o Izbach Rolniczych z 14 grudnia 1995 roku Dz. U. z 2014 r. poz. 1079, z 2015 r.

¹⁵ Ryszard Kamiński, Potencjał i rola systemu doradztwa rolniczego w propagowaniu systemów krótkich łańcuchów żywności dla potrzeb Kampanii „Wiedz i Mądrze Jedz”. Ekspertyza zrealizowana w ramach operacji pt. Ogólnopolska kampania na rzecz Krótkich Łańcuchów dostaw Żywności. Realizacja: Fundacja Rozwoju Podhala w ramach umowy nr KSOW/2/2018/038. Wersja 13.10.2018. s. 25.

the publicly managed AKFIS process. Although, it shall be emphasized that their activities in the market which led innovative solution are relevant from a wider analytical point of view.

Regarding the forestry, as it was already emphasized, the forestry advisory services are provided within the state company - the State Forests, by employed foresters. They operate at the levels of precinct and district boards.

As a result, the forestry advisory services are provided by two parallel systems: the internal one within the company - the State Forests, and the network of private companies providing services to their clients.

6 Acknowledgement of partners, information sources, gaps, etc.

A special expression of gratitude shall be directed to all the colleagues and partners who facilitated work on this report. A substantial majority of them are the CDR partners participating in our research and analytical activities on regular basis as a part of our organisation statutory activities. These partners represent agricultural advisory services (mostly public, although some of them operate as private advisors), research organisations (both sectoral institutes operating under the aegis of the Ministry of Agriculture and Rural Development and agricultural universities and farmers communities.

A particular appreciation is addressed to Mr Wojciech Styburski, the head of AgrolIntegracja company who kindly agreed to participate not only as a respondent for our report but also has agreed to participate in the I2Connect case studies activities.

However, it is worthwhile to indicate the areas requiring some quite substantial further researches:

- a) first of all, it is the whole area of forestry which has a long tradition of functioning in a parallel to agricultural system world; it would require a lot of new researches and analyses to create a common ground of cooperation between these two advisory systems,
- b) the topic of dynamic changes within private providers of agricultural services requires further in-depth analyses,
- c) similarly, the mechanism concerning a more effective involvement of the network of vocational agricultural and forestry schools into AKFIS processes also requires more specific follow-up researches.

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AKIS and advisory services in *Portugal*

Report for the AKIS inventory (Task 1.2) of the i2connect project

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Executive summary

The main aim of the report is to provide a comprehensive description of the Agricultural Knowledge and Information System (AKIS) in Portugal, with a particular focus on advisory services. The description includes history, policy, funding, advisory methods and a section on how the Farm Advisory System (FAS) was implemented.

This report represents an output of the H2020 i2connect project. It is one of 30 country reports that were produced in 2020 by project partners and subcontractors for compiling an inventory of Agricultural Knowledge and Information Systems. AKIS describe the exchange of knowledge and supporting services between many diverse actors from the first, second or third sector in rural areas. AKIS provide farmers with relevant knowledge and networks around innovations in agriculture. The report is an update of the previous Portuguese AKIS report, developed as part of the PROAKIS project in 2014

In the last 6 years, Portuguese agriculture and rural areas have faced a reorganisation both at social and economic levels, including a sharp reduction in the number of farms and a significant decrease and ageing of the population. The changes that occurred during this period favoured the emergence of new stakeholders, claiming innovation to meet their needs, and the development of new networks (between farmers/foresters, farmers/foresters and knowledge and information providers, farmers/foresters and farming and forestry based associations), modifying the pre-existent relationships among the actors, both at local and national level.

Presently, the Portuguese AKIS is characterised by the large number and diversity of actors, as well as the organisational fragmentation and relatively low coordination by the State. This is especially evident both with advisory services, an activity that tends to be performed by many farm-based organisations, and with knowledge and information providers that are mostly supported by small private companies. The other AKIS actors are within research and education and national and regional directorates, both of which are coordinated by the State.

The interactions between the Farms and Forestry and Farming Based Associations and Knowledges and Innovation Providers is strong while the Research and Education sub-system is weakly connected to the Farming and Forestry Based Associations. In addition, the linkages between the National and Regional Directorates, Research and Education and Farms and Forestry is also weak. In

general, the Portuguese Research and Education has limited dialogue to the other AKIS actors.

1. Main structural characteristics of agricultural and forestry sector in Portugal

The population in Portugal is about 10.3 million people. In 2016 there were more 4% agroforestry holdings, more 2% agricultural holdings and 8.3% forestry holdings. Since 2013 there has been an increase in the area (14 ha on average) and on the economic dimension of agricultural holdings in Portugal. The total standard output has increased 16.5%, since 2013, to 19.9 thousand euros.



Figure 1 – Evolution from 2013 to 2016

More than 70% of agricultural holdings are specialized (2/3 of their total standard output), highlighting specialisation in herbivores and permanent crops. 1/3 of the Utilised Agricultural Area (UAA) has produced 44.6% of the total livestock. Although in Portugal forestry is the main business complement of agricultural holdings, since 2013 there has been an increase of 18% of unused forest land.

The average age of the Portuguese farmer is the oldest in EU28, 65 years. According to 2016's Farm structure survey, 34% of individual farmers are women and the academic background of 71.4% was only elementary school. In 2016 the family farming population was about 628 thousand individuals, which represents 6.1% of the resident population in Portugal, with a 20.8% decrease in the family farming population since 2009. In 2016, the family workforce weighed 87% while in 1989 it accounted for 94% of the agricultural workforce.

Although a significant number of producers have ceased agricultural activity since 2009 (-15.2%), the UAA has not changed significantly, remaining at 3.6 million hectares (39.5% of the total country area). The land structure of agricultural holdings continued to evolve positively, with an increase in average size (UAA per

holding) from 12 ha in 2009 to 14 ha in 2016. In 2018 forest was the principal use of the Portuguese soil, together the different forestry spaces make up about 70% of the country's area.

In 2016 more than half of the UAA (58.0%) was operated by production units with 100 or more hectares, which represented only 2.4% of farms. It should be noted that a small number of large farms (261 farms with 1,000 or more hectares of UAA) operated 12.3% of the national UAA. In contrast, small farms (less than 1 ha), despite accounting for 19% of the total, cultivated only 0.7% of the UAA. The regional composition of the UAA reflects in a very synthetic way the specificities of national agriculture, with arable land, permanent crops and permanent pastures being fairly distributed in the North and also in the Centre, while in the Algarve and in the Autonomous Region of Madeira permanent crops predominate. In the Azores, permanent pastures are practically the expression of monoculture, while in the Alentejo they also constitute the majority of UAA.

The harvested production in 2018 of the main arable crops in tons would be maize (714); rice (161); wheat (68); barley (60) and rye (17). In 2018 the amount of cereals produced for grain decreased 25% since 2000. The area of cereals also decreases by 48% in this period, whilst there was an increase of 1.73 t/ha in productivity.

Regarding the production of vegetables and fruits in tons is tomatoes (104); apples (264); oranges (341); carrots (92); onions (54) and peaches (43). Since 2000 there was a 24% decrease in the production of fruits and a 53% decrease in the production of vegetables.

The livestock unit numbers in 2016 are represented by cattle (1,567 thousand); pigs (1,875 thousand); sheep (2,200 thousand) and goats (390 thousand). Cattle was the only one that recorded an increase in headcount compared to 2009 (+9.5%). The average number of cattle per holding rose from 28.6 head in 2009 to 36.1 head in 2016.

In the same period there was an 8% reduction in apparent fertilizer consumption. There was a 60% increase in the area of organic farming mode, an increase from 151 461 ha in 2009 to 252 812 ha in 2017. Reaching in 2017, 7% of the UAA and 4 267 farmers.

Regarding forest data, the main crop in Portugal in 2015 was the Eucalyptus with an area of 856 Kha, more 59 Kha than in 2010. The second major crop is the Pinus pinaster, with an area of 718 Kha, less 85 Kha than in 2010. Both these crops

are the main forestry production in the continent, in Madeira and in Azores. The remaining crops have different expressions in the 3 regions, in the continent the top three other crops are Cork oak tree, Scarlet oak tree and Oak tree, whilst in Azores the other crops are Cryptomeria, Japanese pine tree and Beechwood of the islands, and, finally, in Madeira the top three are Oak trees, Acacia and other hardwoods.

According to a study made by the National Forest Strategy in 2006, forest and associated space contribute, each year, 982 thousand euros to the Portuguese economy. Being the production activity responsible for 876 thousand euros, with an average yearly production of 11,5 million of m³ of wood, 100 kton of cork (corresponding to half of the world production) and finally 8 kton of resin, 70 kton of pinecone and 25 kton of chestnut. Forest biomass is one of the main sources of energy used today in Portugal and is, among the renewable energy sources, the most easily usable at any time of the year. In a recent assessment, the potential availability of biomass for energy production was estimated at 2.2 Mt/year.

During the last century, there have been significant changes of the use of soil and of the continental land occupation. In the first half of the 20th century there was a clear growth in the agricultural and forest areas, due to a decreased in uncultivated fields. In the 1960 there was a rise in the area of Eucalyptus and there was a spike in the Pinus pinaster' area in 1980. Moreover in between 2015 and 2018 there were 150 Kha of Eucalyptus burned down as well as 135 Kha of Pinus pinaster. In total 329 Kha burned down during this period.

In Europe 40% of forest is publicly owned, however in Portugal only 3% of all forest land are owned by the state, and, whilst 92% are privately owned, only 4% are managed by industrial companies.

As of 2018 there were recorded 135 Forest Producers Organisations in the Portuguese Institute for Nature Conservation and Forest Management (ICNF), as well as an, yearly average of joint land management of 1,1 Mha due to Forest Intervention Zones (ZIF).

2. Characteristics of AKIS

2.1. AKIS description

In Portugal, the creation of knowledge is closely linked to all AKIS participants, and there is transfer of this knowledge between all of them. There is currently a logic of knowledge flow between the different links, between science, political actors, industry and farmers.

The most empirical, practical and applied knowledge is generated among farmers/foresters and their peers and this knowledge should also be transferred to the education and research system. The logic of co-knowledge, co-creation of content and co-development of solutions for the sector is currently used in all innovation clusters, both at national and European level. Sometimes the great difficulty is the opposite, i.e. passing on scientific knowledge to farmers/foresters in a way that is perceptible and applicable. Communication and dissemination of the results of all research is therefore essential for this flow of knowledge to be effective and efficient.

Knowledge in the agricultural sector and associated innovation has increased in recent years, mainly due to a greater link between the different actors in the value chain, and the existence of many innovation projects at national and international levels. There are already a series of national actors involved in European consortia under the Horizon 2020 programme, meaning that in the coming years there will be this sharing at national and European level and a greater application of innovation in the agricultural sector in Portugal.

Innovation projects should serve as a launch pad for economically viable solutions, applicable to the market and recognized by consumers and society in general. The great difficulty of the agroforest sector is the ability to communicate in a sexy, attractive, and irreverent way, demonstrating to society that this is an innovative sector, fundamental to the economy, job creation and above all responsible for feeding the world.

2.1.1. AKIS actors and knowledge flows

The Portuguese AKIS is composed by a series of actors with specific objectives, with a different set of actors and different connections between them. These actors can be divided into four main groups and Farms & Forestry, the central group. The four main groups are: Farming & Forestry Based Associations,

Knowledge & Innovation Providers, National & Regional Directorates, Research & Education. This way, the AKIS can be described as four main groups, contributing for the central group Farms & Forestry.

These actors are both public and private, and the former may or may not have profit making objectives. The public actors are mostly linked to such areas as policymaking, regulation, planning and monitoring public funds as well as research, education, knowledge transfer and demonstration. The non-profit actors are farmers' organisations, cooperatives and interprofessional associations that, besides lobbying and policy related and administrative roles, are involved in providing technical advisory, training, information transfer and extension, communication and benchmarking. The private actors can be linked to knowledge and innovation providers providing farm equipment and service providers, or advisory consultancy firms, agroindustry and forestry industries and more.

The first main group, Farming & Forestry Based Associations, is represented by the confederation of farmers, farmers and forestry associations, interprofessional associations, cooperatives and producer organisations. Their mission includes technical advisory, training, communication, dissemination, benchmarking, funding investment projects, multiactor knowledge network, policy recommendations, sectorial advocacy

The second is Knowledge & Innovation Providers comprises advisory consultants, sectorial private companies, service providers (ICT, seeds, farming inputs, machinery...), innovation hubs (competence centres, digital innovation hubs, collaborative laboratories), software and hardware providers, agroindustry, forest industries, technological clusters, retail & distribution. Their tasks include knowledge transfer, technical advisory, training, innovation brokers, communication, dissemination, private funding, benchmarking and Multiactor Knowledge Networks

The third main group, Research & Education includes agricultural universities, polytechnic institutes, professional agricultural schools, R&TD institutions, the National Agrarian & Veterinarian Research Institute (INIAV) and the Portuguese Sea and Atmosphere Institute (IPMA). They're in charge of research, education, knowledge transfer, demonstration, technical publications, multiactor knowledge transfer.

And finally, the fourth group, National & Regional Directorates, includes the Ministry of Agriculture, the Ministry of Science, Technology & Health Education

and the Ministry of Environment & Climate Action. It also includes regional directorates for agriculture, and the National Rural Network. They're in charge of policies, regulations, territorial planning, public funding, audits & control and environmental & biodiversity guidelines.

All these four main groups have different objectives and provide different services/ resources to Farmers and Foresters, the central group of the AKIS.

Fifteen experts were interviewed, representing the different sectors identified, including the agriculture and forestry sector. They were asked to comment on the diagram and the level of interaction between them, including with farmers and forestry.

The links between the main groups and Farms & Forestry were divided in three options: weak, medium and strong links. The connections are described in the table below:

Table 1 - Portuguese AKIS connections

	Farming & Forestry Based Associations	Knowledge & Innovation Providers	National & Regional Directorates	Research & Education	Farms & Forestry
Farming & Forestry Based Associations		Strong	Medium	Weak	Medium
Knowledge & Innovation Providers	Strong		Medium	Medium	Strong
National & Regional Directorates	Medium	Medium		Medium	Medium
Research & Education	Weak	Medium	Medium		Medium
Farms & Forestry	Strong	Medium	Weak	Weak	

2.1.2. Policy framework at the national level

Policies are of different natures and may be directing international agreements on certain practices (resource consumption, environment, etc.); or they may be of a pro-active nature in terms of industry and sector interests. In both cases, it is essential that policies dictate the rules of operation of the agricultural and forestry sector and consequently its strategic objectives and general and specific goals, which align and change according to the community framework.

Usually the policy framework supports innovation in agroforestry by setting national investment priorities, managing resources and creating the conditions for the sector to develop. On the one hand, by encouraging investment and funding under Portugal 2020, Horizonte 2020, Lisbon 2020, PDR2020 or other R&D partnerships, involving the sector as a whole and introducing innovation and research (technological, environmental, business, investment, etc.) such as Operational Groups, Competence Centres and more. On the other hand, public policies are very much based on a huge administrative and bureaucratic burden, so the measures defined do not always succeed in adequately supporting the definition of strategic objectives for agriculture, forestry and rural development. In addition, support must be linked to results and evaluated differently so that the focus of these partnerships is not the response to the "administrative burden" but rather a response to problems and a search for solutions.

Other handicaps are non-compliance with deadlines and management difficulties on the part of state bodies, and the inability of many agricultural and forestry companies to deal with more formal requirements and to monitor the implementation of these projects.

2.1.3. Coordination Structures

Existing national agreements on knowledge exchange are explained in different programmes and with different governance and coordination structures, some examples being the Rural Development Plan (PDR) 2014/2020, which has an area aimed at Innovation and Knowledge with different training and knowledge exchange operations (e.g. Operational Groups) between actors in the sector and the National Innovation Agency (ANI), whose mobilising programmes aim at creating new products, processes or services with a high technological and innovation content that contribute to the value chain.

There are structures for the coordination of financial instruments dispersed among the different ministries, with IFAP - Instituto de Financiamento de Agricultura e Pescas, I.P., being the most important. However, its operation does not assess the possibilities of synergies, complementarities, and impacts, focusing on operational and processing issues, not on common strategies and objectives. While funding at regional level is structured through RIS3 (Research and Innovation Strategies for Intelligent Specialisation), managed by different Commissions for Coordination and Regional Development (CCDR).

It is important to recognise that there has been an effort to develop specific, sectoral or thematic research and innovation agendas by Foundation for Science and Technologies (FCT), but synergies between national, regional and sectoral strategies remain to be created and integrated into the various support programmes in a coordinated manner.

In terms of national agreements on the exchange of knowledge, Competence Centres and Technology Centres act as platforms for this purpose. They aim to increase the level of knowledge and the exchange of experiences, bringing together production and SCTN (National Scientific and Technological System). That's why the National Rural Network, EIP-Agri's focal point in the country, brought them together to set up an Innovation Working Group, which helps to define political support measures for this area.

2.2. Portuguese AKIS diagram



Figure 2 - Overview of AKIS actors in Portugal

3. History of the advisory system

In general, in Portugal, the practice of public agricultural extension has been sporadic and mostly disorganized. Until the mid-70's the major programs gave emphasis to information and demonstration campaigns and the transmission of technological messages not adapted to the local social and economic circumstances (OECD, 1980: 161). The services reached few farmers and the field workers were simultaneously engaged in a variety of regulatory functions. Madureira (1980, 1-2), as well as Teixeira (1980, 4), pointed out that the technical assistance initiatives lacked consistency and continuity, and were based on government policy problems, not on problems identified or demanded by farmers. Besides, the central services were overemphasized and the contact with the farming communities was rather limited.

The Revolution of April 1974, and the new democratic orientation of the State opened up the possibility of trying out new paths and models. Throughout 1975, 1976 and 1977 various laws were approved leading to major changes: regionalization through the creation of Regional Agricultural Services; and launching of extension, through the new Rural Extension Services. A General Directorate of Rural Extension, a central level department, was also created. Its main objectives were to support the rural extension services, at the regional and local levels, in the organisation, planning, training, and evaluation tasks.

The first organised extension programmes, planned along the lines of the Training & Visit System, were initiated in 1978/79. However, these programmes were only implemented in some sub-regions of the country (Cristóvão, 1986). In 1982 the National Institute for Agricultural Research was transformed into the National Institute for Agricultural Research & Extension, in order to better link both subsystems, but the experience was short lived. In 1983 the Programmes to Support Regional Agricultural Development, included initiatives in the fields of extension and professional training (Cristóvão, 1985). Universities such as University of Trás-os-montes e Alto Douro (UTAD) played a role in up-grading the qualifications of public extension staff in the late 1980s and early 1990s and a study associated to this programmes identified competencies for their training (Koehnen and Cristóvão, 1993).

In January 1986 Portugal became a member of the EEC and in 1990 a major programme - PROAGRI - was launched, with the objective of strengthening the capabilities of farmers' organisations in the areas of management and technical

support to members and non-members. PROAGRI reflected the prevailing privatisation views. It is important to stress that cooperatives and farmers' associations were frequently weak, in both organisational and financial terms. On the other hand, the transfer of functions to such organisations was not accompanied by changes in extension practices, and the top-down and linear perspectives of the State services remained dominant.

The existence of public agricultural extension after PROAGRI is questionable. In the mid 90's the government created 300 new "Agricultural Zones" and the so called "family technicians": each municipality corresponded to an "Agricultural Zone", and each "Zone" had a team of agents, of whom a number of farm families was assigned, in order to allow a more personalized contact. The emphasis was placed on information, particularly on Common Agricultural Policy measures and policies, and practices tended to be quite bureaucratic. After this period and in spite of this measure, technical support to agricultural development became a function of many institutions and services, especially cooperatives and farmers' associations, in a more or less fragmented and dispersed fashion, the exception being the existence of networks or some form of articulation and coordination between them (Cristóvão, 1999).

(Extracted and adapted from AKIS report 2014 - PRO AKIS project. Authors: Alberto Baptista, Artur Cristóvão, Timothy Koehnen, Livia Madureira, Miguel Pires - UTAD/CETRAD)

4. The agricultural and forestry advisory service(s)

Portuguese AKIS consist of by a group of actors that can be divided into four main groups, all directly linked to Farms & Forestry. The four main groups are: Farming & Forestry Based Associations, Knowledge & Innovation Providers, National & Regional Directorates, Research & Education. All these four main groups have different objectives and provide different services/ resources to Farmers and Foresters.

These organisations operate in the following NUTS II, a nomenclature created by Eurostat in the early 1970s with the aim of harmonising the statistics of the various countries in terms of the collection, compilation, and dissemination of regional statistics:

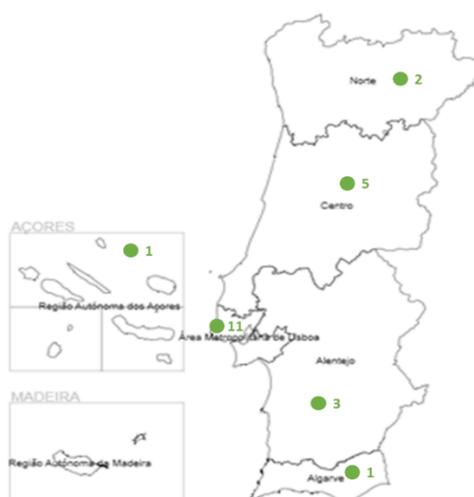


Figure 3 - Survey responses in the different NUTSII

Representativeness was ensured, both in the agricultural and forestry sectors, with the collection of questionnaires not only from the main Portuguese advisory entities, but also from other private and public entities, so that the answers could demonstrate the reality of advisory services in Portugal.

4.1. The overview of all service suppliers

4.1.1. Public agricultural services

The policy of the Ministry of Agriculture over the past two or three decades has been characterized by the transfer of various functions to farmers' associations and other private organisations, including technical advice, preparation of agricultural investment projects, access to different subsidies, training and information exchange.

Presently, the Ministry of Agriculture, Ocean, Environment and Spatial Planning includes the Secretaries of State for Agriculture, Forestry and Rural Development, Ocean, Environment and Spatial Planning, and Food and Agribusiness Research, in a very complex structure with central and regional services.

The five Regional Directorates for Agriculture and Fisheries are the operational services closer to farmers and agricultural development agents. According to the law, these services should “Encourage actions and intervention projects in the rural areas and programmes or plans of integrated rural development, and support farmers and their associations, as well as rural populations” (Decreto-Lei no. 7/2012, de 17 de Janeiro). However, today their major functions have to do with policy monitoring and evaluation, production of statistical data, reception, review, approval, monitoring and validation of investment projects supported by public funds, implementation of regulatory actions, coordination of licensing processes, and implementation at the regional level of the policy orientations in such areas as forestry and natural resources management.

Each Regional Directorate has a variable number of sub-regional delegations, composed of nuclei (a set of municipalities) and local technical teams (at municipal level). For instance, in the Northern Region there are 6 delegations, 26 nuclei and 47 local technical teams. In the past, the regional services were present in all municipalities, but today, given a sharp reduction of human resources – from about 2000 people in 2007 to less than 750 in 2013 -, most local teams operate on an itinerant fashion, visiting each municipality only once or twice a week.

In Alentejo, Southern Portugal, the four sub-regional delegations are called Regional Services and have eight poles and offices in some municipalities. The agents are involved in routine work and give some occasional technical support. In the three regional experimentation centres "field days" are held four or five times per year, to present some technical innovations to potential users, with the

contribution of higher education institutions, research centres and farmers' organisations. These centres develop several experimental and demonstration projects in the areas of agriculture, olive groves, vineyards and extensive livestock production, in collaboration with several research bodies and other institutions.

In the field visits the local agents use office facilities provided by the municipal governments, cooperatives, associations, training centres, schools and other public services and organisations. In these visits, the agents receive people who present, for instance, technical or commercialization related problems or pose questions regarding the available policy instruments or agricultural investments. The advice is provided free of cost.

In some cases, the services cooperate with the municipalities, which today are very active in the promotion of rural development initiatives, like farmers' markets, box schemes, community gardens and land banks. Additionally, the Regional Directorates provide several services in such areas as soils and plant analysis, animal health, public hygiene, pest management, some of which are subject to payment. All Directorates have webpages in which extensive information concerning their areas of intervention is available.

Each Directorate is a case, but globally the regional services tend to be quite removed from the field and only occasionally perform advisory related functions. Their training activities were transferred to farmers' organisations and the training centres tend to be underused, information is mostly available through internet, local agents visit the municipalities on a rotational basis, generally to answer questions raised by farmers, and farm experimentation and demonstration activities are scarce. In general, the regional agricultural technicians have fewer staff than six year ago, while performing, above all, desk-type policy related functions linked to investment projects supported by public funds, and a variety of other regulatory actions.

4.1.2. Farmers' organisations

In the agriculture sector, in Portugal, there are three major umbrella farm-based organisations: The Confederation of Portuguese Farmers (CAP), the National Confederation of Agriculture (CNA), and the National Confederation of Agriculture Cooperatives and Farm Credit Cooperatives (CONFAGRI). The latter, unlike the two initials, includes exclusively cooperatives. These organisations have lobbying as a major function, but their affiliated organisations (associations and cooperatives)

perform a variety tasks in the territories where they are located, some of which are connected to AKIS.

Confederation of Portuguese Farmers (CAP)

According to the information in the CAP website, this is a socio professional Organisation, created in November 1975, that groups over 300 organisations nationwide, including federations, wine cooperatives, regional associations, sectorial associations and other cooperatives. It maintains permanent contacts with their affiliates through national and regional meetings, by identifying needs and problems of national agriculture and forwarding the same to technical analysis and specialized studies. The CAP aims to defend the interests of Portuguese agriculture in the country and abroad, safeguarding the economic component of the activity in the promotion of a dignified quality of life for all farmers who wish to continue their activity. It works to warn and engage the Government in achieving critical infrastructures, defending an agricultural policy that respects the integration of Portugal in the European Union and a healthy and proper participation in the Single Market.

As a representative of the socio-professional agricultural associations, the Organisation has the status of Partner in the national Social and Economic Council – Permanent Commission for Social Dialogue. It is also represented in many other consultative bodies of different public authorities. The CAP has a permanent delegation in Brussels and participates in all Agricultural Committees, Advisory Groups and other European organisations (COPA, GEOPA, USSE, CEPF, FIPA, EESC, etc.)

Among the various specialized technical services provided by CAP to farmers, two deserve to be mentioned: training, with three Agricultural Training Centres already established; and direct aid to agricultural holdings, provided through a network of 15 Rural Information Centres, covering all the country. The Organisation publishes a monthly magazine devoted to agricultural policy, agricultural economics, and current technical issues (“Farmer Magazine”).

In general, the following services are provided: training (the Organisation is accredited in all areas: diagnosis, planning, design, organisation and promotion, development/implementation, monitoring, evaluation and other interventions); application for farm subsidies; Farm Advisory Services; livestock management (personalized telephone information service); “Visto by CAP” (a new consulting service in the food safety area, fully geared for producers and processors of food

in rural areas, helping them to meet the legal requirements in this area, particularly in the application of the principles of hazard analysis and critical control point - HACCP); demonstrations and applied research projects; and young farmers contests.

It is important to mention that the advisory tasks are exclusively performed by the affiliated organisations, at the regional and local levels, using different approaches and methods, being training and informational the crucial ones. Most information initiatives have to do with the EU policy and agricultural investment projects.

A leader of a Farm Management Centre affiliated with this confederation was interviewed. It is a non-profit organisation operating with mixed funding, mostly private (60%), with the remaining from the State and the EU. It has four advisors, three with college degrees. All advisors have more than 12 years of experience and are certified in cross compliance and advisory topics. The advisory services are charged to farmers, per hour of service or according to packages. Most work is done individually, especially through farm visits and occasionally by telephone. The organisation serves about 1,000 farms, mostly small ones with an average of 5 ha, and deals more often with plant and animal production questions, followed by stable design, bookkeeping, taxes, cross compliance, and rural development/rural tourism. Agricultural accounting, taxes and farm management are considered important topics to meet the challenges of CAP 2013-2020. The university is classified as the main knowledge source and cooperation partner. The Centre has a strategic annual plan developed internally, keeps records of advisory work, and has incentives to reward the performance of advisors.

4.1.3. National Confederation of Agriculture (CNA)

The National Confederation of Agriculture (CNA) was established in 1978, in Coimbra. Its programmatic basis is the "Carta da Lavoura Portuguesa", which defines it as "the organised expression of family farms." Among other principles, it assumes the "current concerns about the construction of an agriculture that meets the quality requirements of products, environmental protection, preservation of rural areas, concerns for health and work, and the enhancement of the income and quality of life for Portuguese farmers".

The CNA is primarily composed of farmers associations although it also involves other associations focused on the broader context of rural development (a total of about 80). With the mission of defending the social and professional interests

of farmers, it develops the provision of a wide range of technical services and participates in various consultative organisms, such as the

Economic and Social Council, the major one. Among the services developed by the CNA and associated organisations are: training (North, Central and Alentejo Regions); National Animal Identification and Registration (a network of service centres throughout the country applying rules for identification, registration and movement of bovine, sheep, goats, swine and equine); support to applications for subsidies and information (legislation, manuals, leaflets and posters, also available online).

As in the case of the Confederation of Portuguese Farmers, most advisory and training tasks are performed by the affiliated organisations, at the local and regional levels. The central body of CNA has a very light structure and most technicians are based in the local and regional associations. Training is the main activity of the organisation (about 50% of staff activities), followed by a variety of tasks related to CAP programmes and instruments (30-40%), and farmer advisory services is minimum (only 10%). Funding is mostly public, and the interviewed leader stressed that the organisation has no permanent human resources, a fact that limits its intervention.

4.1.4. CONFAGRI National Confederation of Agriculture Cooperatives and Farm Credit Cooperatives

Established in 1985, with the aim of contributing to the growth and development of a balanced and effective Cooperative Sector, the CONFAGRI is the structure representing agricultural cooperatives in Portugal. It has about 500 affiliated agricultural cooperatives and agricultural credit cooperatives, organised in Federations and other structures, representing an annual turnover well in excess of 7,500 million euros. In fact, the cooperatives are responsible for a significant part of the processing and marketing of agricultural products, and the Agricultural Credit sector is the leading financial group acting in the Portuguese rural world. The economic importance and role of cooperatives is evident in different sectors, such as wine, milk and olive oil. In the case of wine, for example, the cooperative sector, in 2010/2011, was responsible for 43% of the production.

In June 1996, a new model was implemented for collecting applications for income support, resulting from the CAP reform, which, in some areas, came under the sole responsibility of the major agricultural organisations. Since then, the

Confederation and its affiliates accounted for over 50% of the applications submitted by farmers for income support, in activities such as arable crops and animal production, among others.

The Confederation has established several protocols with Agriculture Ministry services, to perform various functions, from training and informational, to management of applications for income support and other tasks related with the Common Agriculture Policy programmes and measures.

At the individual level, agricultural cooperatives play multiple roles, and some of them have technical teams to provide support and advice to farmers. The dynamism of cooperatives is variable, but many continue to have an important role in the system of information and advice to farmers. Once again, the economic importance and role of cooperatives is evident in different sectors, such as wine, milk and olive oil. In the case of wine, for example, the cooperative sector, in 2010/2011, was responsible for 43% of the production.

4.1.5. Other farmer-based organisations

Besides these major national level farmer based organisations, that bind a number of other numerous associations and cooperatives as its members, there are a very large number of other autonomous organisations that develop various support services to farmers, including training, information transfer and advice, at different territorial scales. Some are national and more generalist, like the Association of Young Farmers of Portugal (AJAP), the National Federation of Young Farmers and Rural Development (CNJ); others are more specialized, like the Portuguese Association of Organic Agriculture (AGROBIO) or the Portuguese Forestry Association (FORESTIS); and still others have a regional character, like the Federation of Agriculture of Trás-os-Montes and Alto Douro (FATA) or the Technical Association of Winegrowers of Alentejo (ATEVA).

It is important to underline the case of AJAP, a national association created in 1983 to represent young farmers at the national and international levels, and to support agricultural and rural development in different ways (informational, training, technical and legal support, access to CAP instruments, etc.). This organisation has only individual members but works closely with about 50 organisations (Associations, Cooperatives, Farm Management Centres), which serve as their extension arm. AJAP has 30 offices spread throughout the country and a total of 45 technicians who generally have a higher education degree in agriculture or

animal production, some with a specialization in olive production, viticulture, or horticulture. The staff is paid with public funds from various sources (Common Agricultural Policy measures, FAS, Rural Development Programme, Training Programmes) and concentrates most attention (about 55% of time) in advisory work, followed by project applications (25%), farm investment projects (15%) and training (5-10%), supporting a total of about 16 thousand farmers, mostly on an individual bases. This organisation presented a high number of applications to FAS, according to the interviewed member or about 50% of the total, as he said mainly due to their proximity to farmers.

4.1.6. Organic farming

Support to organic farming is quite scarce. The Ministry of Agriculture is practically absent in this field, being an exception, the case of the Autonomous Region of Madeira, where a specialized Technical Division of the Regional Agrarian Services was created 10 year ago, involving 25 staff members performing information, farmer advisory services, experimentation and administrative tasks. At the national level there is the Portuguese Association of Organic Agriculture (AGROBIO) that publishes a journal and promotes producer-consumers linkages, organic farmers' markets, annual fairs and information to consumers. Besides this, there is a small set of consultancy firms and independent consultants, and the occasional involvement of municipalities and development associations. Training in this field has been promoted by the above-mentioned farm-based organisations, as well as by private ones. The interviewed consultant works with 20 to 25 farmers who pay a fixed amount to receive regular visits. This individual also manages a small firm that publishes the only technical magazine of organic farming in the country ("Segredo da Terra"), as well as the publication of manuals and brochures, and facilitates a community of experts in this field, who regularly meet to share experiences and knowledge.

4.1.7. Overview

In general, the following conclusions can be drawn: 1) the three Confederations, as umbrella organisations, are active at the national and European levels, developing various lobbying functions, and organise and promote the delivery of a variety of services to their affiliates and farmers, some of which relate to AKIS; the interventions in the territory and at field level are held by its local and regional members; 2) there is a very large number of diverse organisations providing some kind of support and advice to farmers, in a very fragmented and not necessarily

articulated fashion; 3) in many instances this work is primarily linked to the applications for grants and financial support available through the Common Agriculture Policy.

4.1.8. Private consultancy firms and services

A great number and variety of private consultancy firms also provide advice and support to farmers. Many are linked to the agro-industrial and food distribution sectors, as well as to farm input and equipment companies (seeds, fertilizers, pesticides, machines, etc.), and have grown tremendously in the last decades, occupying the space and functions that the state has left open.

Many large companies, including multinationals, have commercial teams selling their products to farmers and farm businesses, and simultaneously giving technical advice. Some examples are companies selling Phyto-pharmaceuticals, animal feed and food additives, agricultural equipment and machinery, animal health products, as well as laboratory networks in areas like hygiene and food quality. Also, the large food distribution chains provide a kind of commodity extension system to farmers with whom they have supply contracts.

Besides these, there is a very high number of micro and small private consultancy firms that deliver various services for agriculture, scattered throughout the territory and developing activities such as consulting in specific areas (vineyards and wine, forestry, irrigation, environment, Agro tourism, etc.), training, project planning and management, management and accounting, support for agricultural subsidies, marketing services, new technologies, etc. In the Douro region, for instance, there are private consulting firms with qualified technicians specialized in grape production, winemaking, and marketing studies.

Many small and medium Agro-food industries have partnerships with universities and research centres to conduct applied research and experimentation in order to answer specific practical problems within their activity. Some large businesses have their own research and product development departments and teams. It is, in most cases, applied research aimed at solving specific problems or developing a given product.

4.1.9. Local development associations

In the early 90's, with the new EU promoted LEADER Initiative, new Local Development Associations (LDAs) were created in all rural areas. In the first phase

(1991/92), in the case of Portugal, 19 LEADER regions were established, each one being managed by one such Association and animated by a technical team named Local Action Group (LAG). Presently, there are 53 regions and Associations (each one with a LAG), organised in a national Federation, called “Minha Terra” (My Land). These Associations are, in most cases, local alliances or partnerships, involving institutions from various sectors (agriculture, forestry, small and medium enterprises, tourism, education, etc.).

The activities of these organisations are quite diverse, with the major aim to “animate” rural territories and diversify the economy, promoting revitalization initiatives in many different domains. They represent one of the new faces of rural advisory service, more decentralized, with a wider focus, based on multidisciplinary teams and participatory methods. In this section an overview of these advisory service actors is presented, based on previous research and considering a sample of 17 out of the 53 LDAs (Cristóvão and Baptista, 2012).

The creation of many LDAs resulted from the union of a group of people and organisations linked to rural areas. They decided to mobilize efforts to boost and integrate local resources thereby creating wealth and promoting social, cultural and economic development. The LDAs have as members, in general, a wide range of public and private entities based within their territories of action, including local governments (municipalities and parish councils), schools, natural parks, tourism offices, cooperatives, tourism associations, producers’ associations (agriculture, forestry, crafts), social welfare institutions, cultural and recreational associations, business associations, private businesses, individual persons, among many others. In many of these associations local authorities have a key role, occupying, for example, leading positions in the Boards of Directors, Fiscal Council and General Assembly, but are not the majority of the membership.

The primary mission of these Associations is the promotion of rural local development, to improve the living conditions of the population, including the social, cultural and economic circumstances of the concerned territories. To achieve this broad mission they have a wide range of specific objectives, such as: diversification and promotion of the local economic activity, notably by promoting local production systems, tourism and recreation; use and valorisation of endogenous resources; protection of cultural, historical, architectural and environmental heritage; organisation of events with the purpose of spreading the traditions and products of their region; promotion of education and vocational training according to local needs and resources, targeting in particular the

questions of employability and job creation; promotion of employment by supporting Small Medium Enterprises (SMEs), entrepreneurship and business development; and provision of social services to the elderly and fight against poverty and social exclusion.

The participants and recipients of the actions are also very different, depending on the characteristics of projects, and include farmers, artisans, unemployed men and women, entrepreneurs (trade, tourism, Agro-industry, crafts), associations and other non-profit organisations, and disadvantaged groups, such as minorities and isolated elderly people. In general, the activities and even the human resources of the LDAs were heavily formatted according to the national and EU programmes to which they apply for and within the framework of which they evolved and are operating.

The number of employees of these LDAs is relatively low, with an average of 16, ranging from 4 to 49. The number of employees is generally related to the number and diversity of activities. Regarding gender, there is a clear predominance of women (76%), which correspond, in general, to three in four employees. The education level of the employees of these LDAs is quite high, representing those who have a college degree, 81%. Of the remainder, only about 11% had schooling at or below the 9th grade. The analysis of the age of employees of LDAs shows that they are relatively young. The age group most represented is the one between 31 and 40 years, with 41%, then the group immediately below, between 19 and 30, with 35% of employees. Only 24% have over 41 years, without any employee over the age of 65

(Extracted from AKIS report 2014 - PRO AKIS project. Authors: Alberto Baptista, Artur Cristovão, Timothy Koehnen, Livia Madureira, Miguel Pires - UTAD/CETRAD)

The i2connect Portuguese online survey was carried out in October 2020 and a total of 23 of 30 (76%) institutions responded, including:



Figure 4 - Number of answered surveys by advisory category

Representativeness was ensured, both in the agricultural and forestry sectors, with the collection of questionnaires not only from the main Portuguese advisory entities, but also from other private and public entities, so that the answers could demonstrate the reality of advisory services in Portugal.

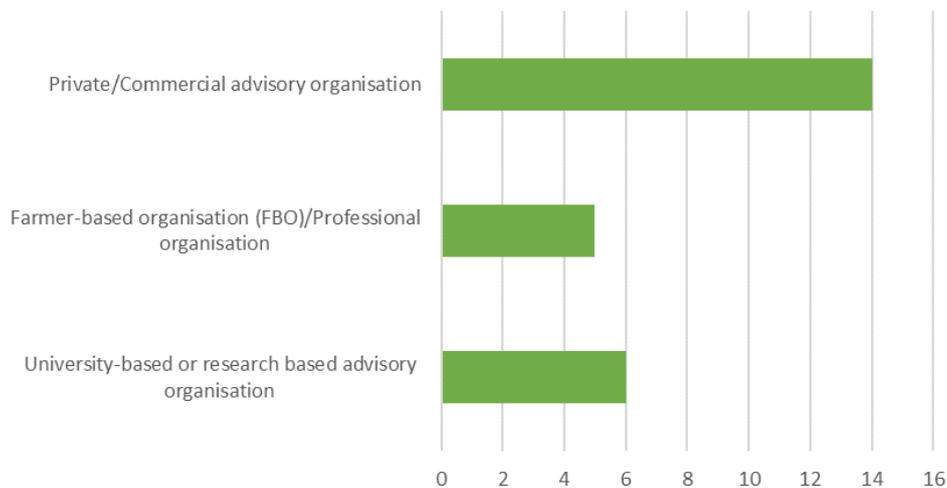


Figure 5 - Categories of advisory organisations

Private consultancy firms are well established across Portugal, most of them providing advising in the also provide advice and support to farmers in the interior of Portugal and of regions of low density. These private organisations are micro and small private advisory companies that deliver several services for agriculture and forest. Farmer-based organisations are also a very important category on the advisory services in agricultural and forestry sector. Universities and Research

Institutes have a very important role, developing and providing knowledge to the entire sector.

4.2. Public policy, funding schemes, financing mechanisms, advisory service providers

In accordance to the surveys outputs, one of the major problems at national level, desertification and abandonment of agricultural and forestry properties, has not been adequately addressed by appropriate public policies, and there has not been much progress in R&D on these issues (at least with practical and visible application).

Regarding territorial and resource management issues (water, energy, communications, data centres, etc.) policies should be holistic of these factors and not separate. In other words, they cannot be thought of in a sectional way (one policy for water, another for land management, another for combating climate change, another for energy, etc.), which in the end do not allow the different productive factors to be aligned.

Innovation and digitisation of the different sectors of the economy are very much an objective of the EU and the different member states, including Portugal. There are real and functional incentives for the agricultural and forestry sector, but they are still little used by their agents. We live in an age of information overload and it is not always easy for a farmer or forest producer to know what projects exist to help create Innovation on their farms. Those who provide advisory services have a decisive role here, because they are the ones who manage to bring the different agents together and empower partnerships in line with the defined policy framework.

On the other hand, Public policies must be the catalyst for this change and this path. Investment support must be increased if it meets the challenges of this system or if it is promoted by partner organisations. The support to the R&D System must be positively differentiated if it is promoted in a logic of Operational Groups (with partnerships between R&D, companies, and organisations). In addition, the support must be linked to results and evaluated differently so that the focus of these partnerships is not the response to the "administrative burden" but rather an answer to the problems and a search for the application of solutions.

Nevertheless, it should be recognised that there has been an effort to develop sectorial research and innovation agendas for different agriculture and forestry sectors, but these are only documents that will hardly illuminate the agendas/measures of funding programmes, with the exception of cases where the same actors are involved in building both documents.

The current model for financing innovation in the sector is totally residual; it is enough to mention that the support for innovation under the current Rural Development Programme is less than 2% of the total funds made available by the Programme, which shows how little importance is attached to this strategic models.

Advisory organisations are mostly funded in accordance to the graphic below. Private organisations based on cost-recovery, farm-based organisations based on membership fee, and Public organisations by national/regional funds:

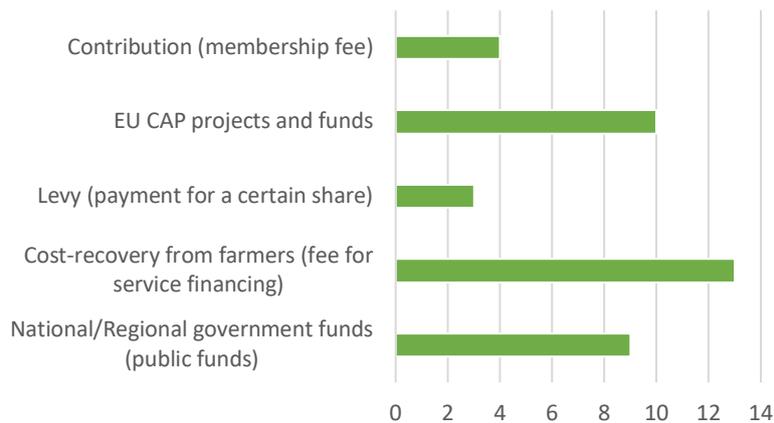


Figure 6 - Primary sources of funding for advisory organisation

From the survey, 43% of the advisory organisations did not significantly changed their budget. The ones that did, identified the main reasons:

- Farmers are more alert, considering that advisors are now more relevant, due to new pest and diseases, new crops new methods
- To support digitalisation and precision farming
- COVID19 is changing the way they do business. Advisors have an important role to facilitate adaptation
- New farmers generation, willing to have different technical expertise on their farms and business

4.3. Human resources and methods of service provision

Table 2 – Aggregated years of professional experience

Aggregated years of professional experience? 0 - 3 years	Aggregated years of professional experience? 3 - 10 years	Aggregated years of professional experience? More than 10 years
77	130	114
24%	40%	36%

Out of a total of 321 advisors represented by the organisations that answered the survey, those with experience of up to 10 years gain relevance, together with those with more than 10 years of experience.

Table 3 - Number of Women and Advisors per Total number of employees

Total number of employees in your organisation Total: Number of employees	Total number of employees in your organisation Female: number of employees	How many are advisors? Total: Number of advisors
740	321	585
	43%	79%

Almost half of the advisors are female, and 79% are advisors in the universe of organizations that responded to the survey.

Complementary to the advisory models, some of the main findings from the i2connect survey are:

Human resource

- The number of advisors is higher in full advisory organizations than in organizations with an advisory component
- Advisory organizations reported significant increases in their advisory staff due to:
 - New crops new methods
 - To support digitalisation
 - Precision farming
 - New farmers generation
 - Farmers are more alert
 - Due to diversification of services and expansion of existing ones

- Advisors are now more relevant

Education level of advisors

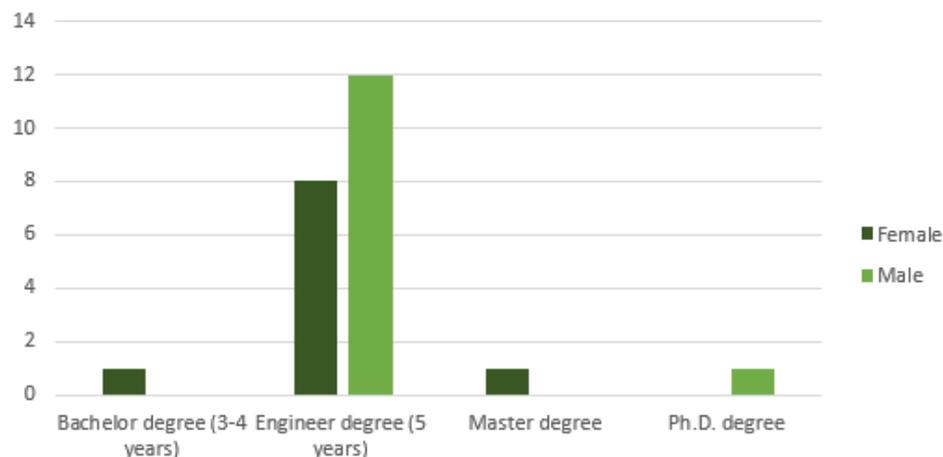


Figure 7 - Education level of advisors by gender

- Most of the advisors has an engineer degree, with not significant differences between advisors within advisory organizations and freelancers. Overall, there is a high level of education of advisors.

Professional experience in years

- The average of the total answers collected by the survey is around 10 years or more of professional experience (76%).

Advisory certification:

Advisors

- Mainly advisors do not have a certification. In fact, they even question what does this means? They are sometimes qualified with specific training for specific advisory (organic production, Global Gap, training by National Certification Body – DGERT).
- The answers also indicate that there a few advisors know about CECRA or EUFRAS.

4.4. Clients and topics and methods

Advisory methods

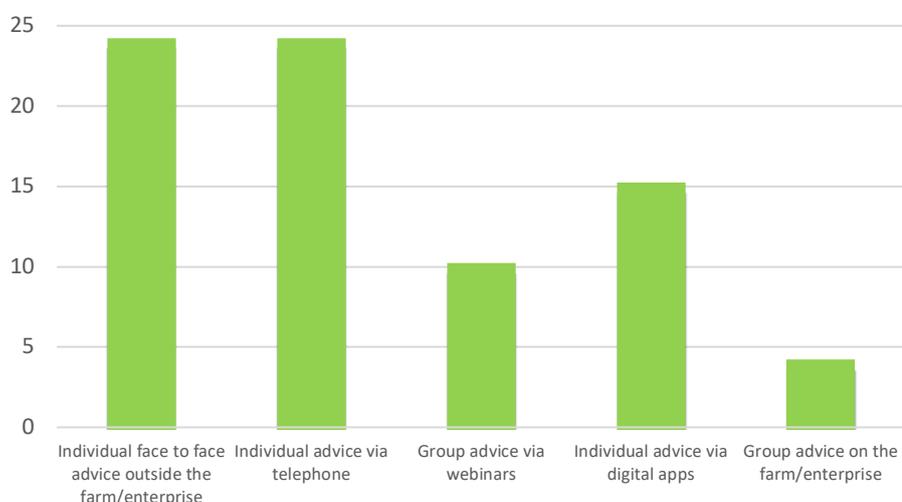


Figure 8 - Percentage of advisory methods used by the three advisory provider's categories included in the i2connect survey

It is interesting to note that the most used method is still face to face advice, but over the telephone it is also a consolidated method practiced by many advisers. On the other hand, it is important to note the evolution of the use of technological tools, namely those already used in the farming community (skype call, WhatsApp, email).

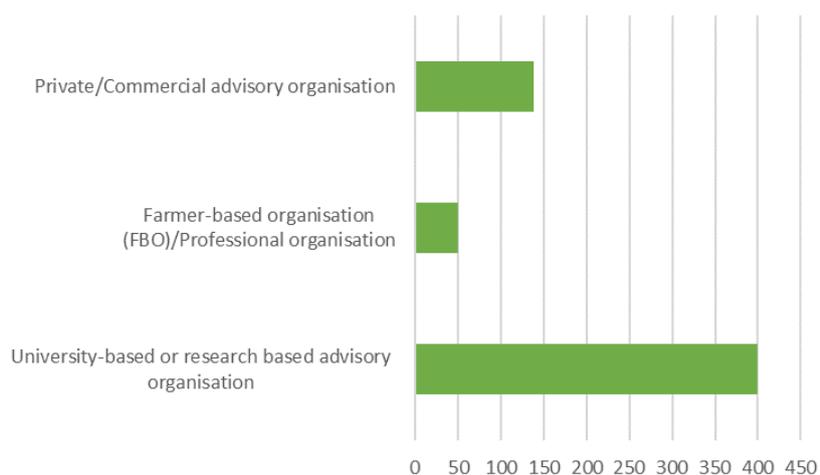


Figure 9 - Average number of clients in a year

The advisory organization have about 850 contacts with clients a year, organization with an advisory component about 580.

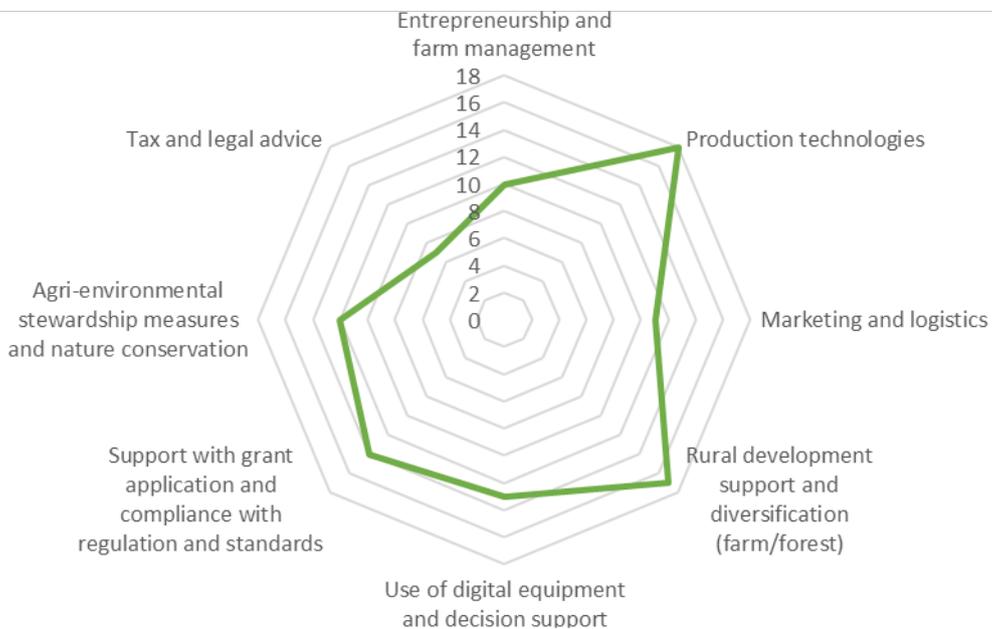


Figure 10 - Cross-cutting advisory topics most demanded by the clients

The most demanded topics by clients are production technologies, rural development support and diversification and support with grant application and compliance with regulation and standards and tax and legal advice.

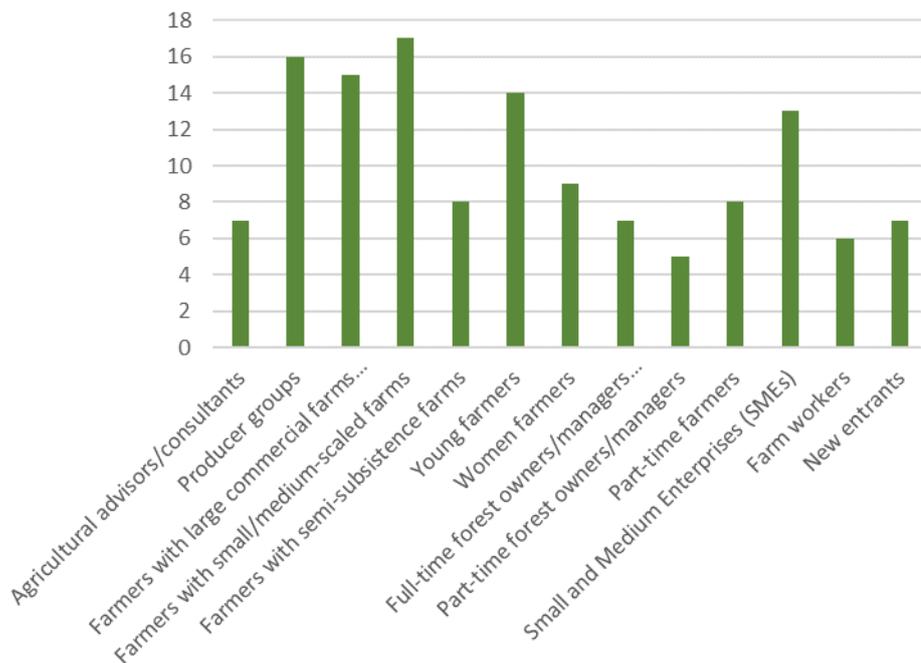


Figure 11 - Advisory organization's client groups

The most important client groups of advisory organizations are farmers with small/medium-scaled farms, producer groups, Farmers with large commercial farms (>100ha) and young farmers.

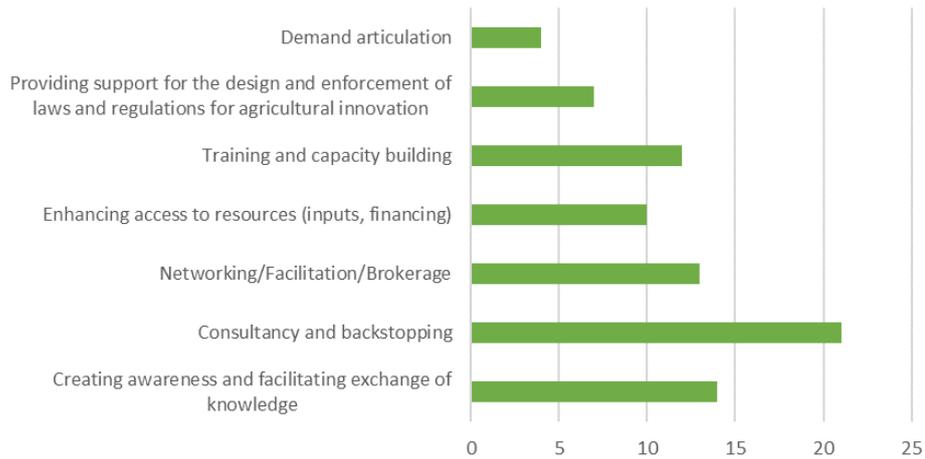


Figure 12 - Main advisory activities

The main advisory activities are Consultancy and backstopping, creating awareness and facilitating exchange of knowledge, Networking/Facilitation/Brokerage and Training and capacity building.

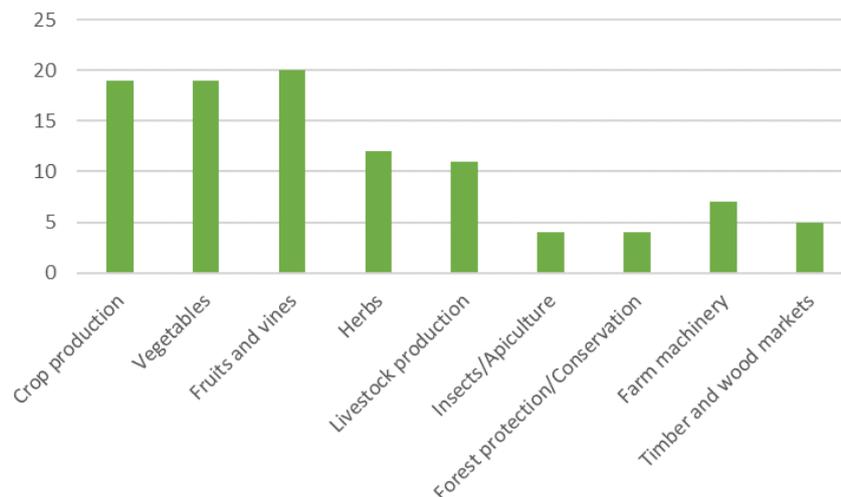


Figure 13 - Advisory topics organizations provides

Reflecting Portuguese agricultural and forestry reality, main topics are fruits and wines, vegetables, and crop production. Forest and Timber/wood markets are also very well identified.

4.5. Linkages with other AKIS actors/knowledge flows

Cooperation with private companies is quite strong, as with the Farmer based organisations. In fact, private companies are always very dynamic and willing to cooperate, along with Farmer based organisations.

The cooperation with Universities and research Institutions and with Public authorities is medium. Weak is the cooperation with NGOs, EIP Operational Groups and EU projects.

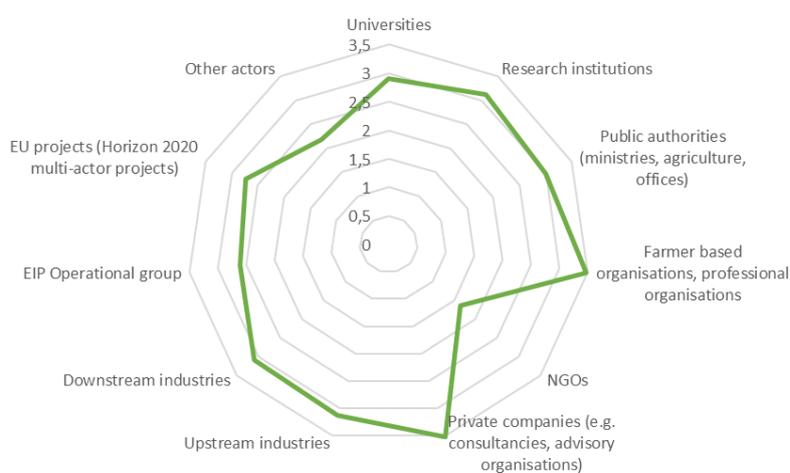


Figure 14 - Linkages within some of the AKIS relevant actors. Elaborated within Focus Group on Advisory Services within AKIS

For the Operational Groups, the reason may be that they are only now beginning the stage of dissemination and knowledge transfer. It will be something to improve, so that the link to the innovation processes are interrelated right from the beginning of these innovation projects. As far as the EU projects are concerned, there is in fact still a great distance between them and the main actors of the national AKIS.

4.6. Programming and planning of advisory work

Targeted consultation services are the most relevant services provided by advisor's organisations, followed by information dissemination and innovation support activities.

Table 4 - Programming and planning of advisory work (%)

Teaching and training activities (%)	Innovation support activities (facilitation, networking, brokerage) (%)	Targeted consultation services (business plans, credit/subsidy application, etc.) (%)	Information dissemination (face to face, via digital tools) (%)	Further development of one's knowledge and skills (participating in training programs) (%)	Others (%)
14%	18%	29%	23%	8%	8%

4.7. Advisory organisations forming the FAS and evaluation of their FAS implementation

Portugal has an Agricultural and Forestry Advisory Service (SAAF), managed by the Directorate-General for Agriculture and Rural Development (DGADR). This system promotes advisory services in the agricultural and forestry sector, encouraging farmers and forest holders to improve the performance of their exploitation in terms of economic and environmental performance, in a context of adaptation to the existing regulatory requirements and better use of resources. These recognized entities are national, regional or district associations, cooperatives, or federations. These entities are:

- **CAP - Confederação dos Agricultores de Portugal** (Confederation of Portuguese Farmers) and a group of related entities included on the application submitted
- **CNA - Confederação Nacional da Agricultura** (National Confederation of Agriculture) and a group of related entities included on the application submitted

- **CONFAGRI - Confederação Nacional das Cooperativas Agrícolas e do Crédito Agrícola de Portugal, CCRL** (National Confederation of Agricultural Cooperatives and Agricultural Credit of Portugal) and a group of related entities included on the application submitted
- **AJAP - Associação dos Jovens Agricultores de Portugal** (Association of Young Farmers of Portugal)
- **AATM - Associação de Agricultores de Trás-os-Montes** (Trás-os-Montes Farmers' Association)
- **AGROBIO - Associação Portuguesa de Agricultura Biológica** (Portuguese Organic Farming Association) and a group of related entities included on the application submitted
- **FATA - Federation of Agriculture of Trás-os-Montes and Alto Douro** and a group of related entities included on the application submitted
- **Fórum Florestal** (Forestry Forum) and a group of related entities included on the application submitted
- **FORESTIS - Associação Florestal de Portugal** (Forestry Association of Portugal) and a group of related entities included on the application submitted
- **FNAPF - Federação Nacional de Associações de Proprietários Florestais** (National Federation of Forest Owners' Associations) and a group of related entities included on the application submitted

The Agricultural Advisory Service (SAA) was created on 8 May and operated between 2008 and 2016, date on which the Agricultural and Forestry Advisory Service (SAAF) was created, following the thematic areas:

- **Conditionality**, which covers the statutory management requirements and standards for good agricultural and environmental conditions.
- **Health & Safety**, which covers the standards laid down in the relevant Community and national legislation applicable.
- **Climate and Environment Beneficial Agricultural Practices** – Greening.
- **Maintenance of agricultural area.**
- **Water quality protection measures**, which incorporate the requirements laid down in the programme of measures in the river basin management plans regulated by Portuguese Law.
- **Sustainable use of plant protection products.**
- **Measures at farm or forestry level.**

- **First setting-up of young farmers.**
- **Minimum requirements for Agri-environmental measures.**
- **Forest management plan, which covers advice on the implementation of the forest management plan.**
- **Forest protection, which covers advisory matters relating to plant health and forest fire protection.**

5. Summary and conclusions

5.1. Summary and conclusions on sections 1 – 3

Sections 1-3 shows the wide range of actors in the current AKIS in Portugal. The Portuguese AKIS is composed by a series of actors with specific objectives, with a different set of actors and different connections between them. These actors can be divided into four main groups and Farms & Forestry, the central group. The four main groups are: Farming & Forestry Based Associations, Knowledge & Innovation Providers, National & Regional Directorates, Research & Education. This way, the AKIS can be described as four main groups, contributing for the central group Farms & Forestry.

In Portugal, the creation of knowledge is closely linked to all AKIS participants, and there is transfer of this knowledge between all of them. There is currently a logic of knowledge flow between the different links, between science, political actors, industry and farmers.

The logic of co-knowledge, co-creation of content and co-development of solutions for the sector is currently used in all innovation clusters, both at national and European level. Sometimes the great difficulty is the opposite, i.e. passing on scientific knowledge to farmers/foresters in a way that is perceptible and applicable. Communication and dissemination of the results of all research is therefore essential for this flow of knowledge to be effective and efficient.

Policies are of different natures and may be directing international agreements on certain practices (resource consumption, environment, etc.); or they may be of a pro-active nature in terms of industry and sector interests. In both cases, it is essential that policies dictate the rules of operation of the agricultural and forestry sector and consequently its strategic objectives and general and specific goals, which align and change according to the community framework.

5.2. Summary and conclusions on section 4

The online survey covered the advisory services in Portugal, for agriculture and forestry, with a geographic representation. The survey provides a valuable insight into the situation of agricultural advisory services in Portugal, but it is important to safeguard that it is based on a sample, which was intended to be representative, but which is not certain to be so.

Private consultancy firms are well established across Portugal, most of them providing advising in the also provide advice and support to farmers in the interior of Portugal and of regions of low density. These private organisations are micro and small private advisory companies that deliver several services for agriculture and forest. Farmer-based organisations are also a very important category on the advisory services in agricultural and forestry sector. Universities and Research Institutes have a very important role, developing and providing knowledge to the entire sector.

The most important advisory activities are consultancy and backstopping, creating awareness and facilitating exchange of knowledge, Networking/Facilitation/Brokerage and Training and capacity building.

Reflecting Portuguese agricultural and forestry reality, main topics are fruits and wines, vegetables, and crop production. Forest and Timber/wood markets are also very well identified.

The most important client groups of advisory organizations are farmers with small/medium-scaled farms, producer groups, Farmers with large commercial farms (>100ha) and young farmers.

The most demanded topics by clients are production technologies, rural development support and diversification and support with grant application and compliance with regulation and standards and tax and legal advice.

The most frequently advisory methods used still is individual face to face advice, but there's a strong perception that online methods and apps are increasingly becoming an efficient solution.

6. Acknowledgements of partners, information sources and gaps

The research was based on literature review, document analysis, and fieldwork. Fieldwork started in June 2020, with online interviews with public services and private organisations, followed by a questionnaire applied to advisors, researchers, policy makers and other members of the AKIS. The interviews touch topics such as: characteristics of agriculture in the surveyed country; characteristics of the AKIS; history of advisory services; characteristics of the current organisation and managing structure of the main agricultural extension and advisory organisations; characteristics of the FAS; and conclusions and recommendations.

Interviews were done with representatives of governmental institutions like the Rural Nacional Network and the Nacional Agriculture and Veterinarian Research Institute. Additionally, different advisory companies, producers' organisations and Agro-industry companies were interviewed.

Subsequently an online questionnaire was applied to both advisors working in advisory companies and freelance advisors.

In addition to the fieldwork, a literature and document search was also done, consulting studies, reports, webpage materials, etc. The previous Portuguese AKIS report produced by UTAD/CETRAD in 2014, was examined with the objective of identifying references on the history of extension services in Portugal, and information about the characteristics of AKIS organisations and the implementation and performance of the FAS in Portugal.

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AKIS and advisory services in *Serbia*

Report for the AKIS inventory (Task 1.2) of the i2connect project

Date: December, 2020

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Executive summary

The public extension service in Serbia has a long history, and its 34 agricultural stations cover the entire country and contain a wide variety of expertise of use to farmers. However, operating with limited budgets and in a bureaucratic structure, the majority of farmers in Serbia are not able to receive the services of the extension services.

Agricultural production in Serbia is mostly organized on small family farms (FFs), which are characterized by poor production results and non-profitability, which again influences Serbian agriculture to act as undeveloped and non-competitive. Agricultural advisory and professional services (PSSS/FAS/FAS) are an important link in the agricultural development chain. In Serbia, advisory services are organized and funded by government, with the task of knowledge transfer to agricultural producers, in order to increase profitability on FFs and improve the competitiveness of agriculture.

Knowledge transfer in the field of agriculture is carried out through the system of formal education (from secondary education to doctoral studies), through various types of training organized by educational and research institutions and organizations, Farm Advisory Service (FAS), media, etc.

In addition to formal education, in Serbia, the transfer of knowledge through non-formal education of agricultural producers and others interested in the field of agricultural production is very important.

The Institute for the Application of Science in Agriculture (IPN) from Belgrade has a significant role in this type of education. IPN as a scientific research institution and authorized organization for training and development of agricultural advisors and agricultural producers and other interested individuals and legal entities organizes education with the aim of transferring new knowledge and technologies that are the result of research by scientific institutes and universities in agriculture and agroeconomics.

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Abbreviations

MAFWM	Ministry of Agriculture, Forestry and Water Management
MoEST	Ministry of Education, Science and Technological Development
IF	The Innovation Fund of the Republic of Serbia
IPN / ISAA	Institute for Science Application in Agriculture
PA	Directorate for Agrarian Payments (Payment Agency)
FAS	Farm Advisory Service
PSSS/ PSS	Agricultural Advisory and Expert Services/ Stations
CECRA	Certificate for European Consultants in Rural Areas

1. Main structural characteristics of the agricultural and forestry sector

Serbia's regional trade opportunities are expanding rapidly, driven by economic recovery in the post accession countries, a proliferation of bilateral free trade agreements and plans for WTO accession and an EU Stabilization and Association Agreement. In order to capitalize on these trade opportunities, in late 2000 the Government of Serbia launched an ambitious reform program to improve the business environment and create a vibrant private sector. The program is producing the desired results and the country was recently voted the world's number one overall reformer on a variety of measures relating to business regulations and their enforcement.

Serbia has significant comparative advantages in agriculture. The country has large amounts of agricultural land, high quality soils, a strategic trading location, and an educated workforce. Almost half of Serbia's population of 7.5 million lives in rural areas. Agriculture sector performance has been mixed in recent years mainly due to highly varying weather conditions, with growth in two of the last five years. Although agriculture share of GDP is declining due to the rapid rise of the services sector, it nevertheless remains an important part of the economy, accounting for 11 percent of GDP in 2005. With agro-processing, its contribution rises to over 15 percent of GDP. About 66 percent of Serbia's total area is agricultural land¹ (5.1 million ha), including about 3.4 million ha of arable fields, 0.3 million ha of permanent crops (orchards and vineyards), 0.6 million ha of meadows and 0.8 million ha of pastures. A further 25 percent of Serbia's total area is under forests (1.9 million ha). About 0.6 million ha (15 percent of the total cultivated area) is comprised of large corporate and cooperative farms, most of which have been partly privatized as shareholding "mixed enterprises." The remainder consists of small private farms which may be commercial or subsistence level. There are about 700,000 private farms, including about 600,000 mostly subsistence farms under five ha in size with fragmented holdings and limited market-oriented production. These households depend heavily on non-farm income. The emerging group of about 100,000 commercial family farms, predominantly located in central

¹ Agricultural land includes cultivable areas, pastures and fish ponds. Cultivable area consists of arable land and gardens, perennial crops (orchards and vineyards), and meadows.

Serbia, tends to be involved in mixed farming of high-value crops (berries, orchards and vineyards) and animal production and account for about forty six percent of the total arable land.

There is significant regional variation in production systems and products. For example, agriculture in the low-lying and fertile Vojvodina region is dominated by field and industrial crops, notably wheat, maize, sugar-beet and sunflower, as well as the production of pigs, cattle and poultry, mainly in large, partially privatized and/or employee-owned Agro-kombinats. Producers in this region are more strongly market-oriented than in the rest of the country. By contrast, Central Serbia is characterized by hilly topography, small farms and diverse farm production systems, with fairly intense production of high-value fruits and vegetables. Livestock production in the Central region is dominated by dairy cattle. Southern Serbia, the poorest and least developed of the three regions, has mountainous geography and is characterized by small, fragmented arable areas and extensive pasture and forest. It is most suitable for extensive or semi-intensive production of ruminant livestock, but in recent decades, government policies have promoted intensive production of cattle and pigs. This can provide high short-term yields but is not environmentally sustainable over the long term.

The GoS Agricultural Development Strategy prioritizes enhancing Serbia's access to, and competitiveness in, international markets, particularly the EU. Gross Agricultural Output (GAO) has risen about 10% since 2000, with about 40% growth in plant output and static livestock output. The crop sub-sector, however, is vulnerable to climatic variations, which in turn makes agricultural production depended on weather conditions, as implied by declines in GAO in drought years (2000 and 2003) and floods (2005)². At the same time, cultivated areas of most crops are not increasing substantially, which points to improving productivity. Fruit (especially plums, sour cherries, and peaches) and industrial crops (mostly sugar beet, sunflower, industrial paprika, and soybean) have significant increases in total production. Decreasing livestock numbers (as much as 30 percent decrease since 2000) combined with static levels of total livestock production also indicate improving animal productivity (especially eggs and cow milk), although to a lesser degree than for crops.

² Over the observed period (2000-2005), Serbia has experienced *overly* dry (2000, 2002, 2003) and humid years (2005). To reduce the sector's weather dependence the government has recently started to implement project focusing on irrigation and drainage rehabilitation.

Despite increasing productivity, however, yields still remain below EU levels, largely due to low levels of fertilizer and agro-chemical use (in 2004, fertilizer use was half the EU average), the often poor quality of domestically produced seeds and outdated on-farm technologies. This is especially true for such major field crops as wheat, maize, and sugar beet. Yields for these crops are 30-40 percent lower than the EU average, while yields for sunflower seeds, sour cherries, plums, and raspberries are comparable or higher. As with crops, animal productivity is low compared to EU levels, with meat and milk productivity, for example, about 20 and 60 percent respectively lower than in the EU. Low productivity levels suggest that better input use and investments in agriculture and animal husbandry are necessary to bring agricultural productivity in line with EU levels.

Agri-food exports accounted for about 20 percent of total exports. Serbia's main export commodities are cereals (maize, wheat), raw and processed fruit (frozen raspberries, prunes), refined sugar and some livestock and meat products. Agro-processing accounts for about 80 percent of total agricultural exports. The key trade partners for Serbia are the EU-25 and its neighboring countries (mostly Bosnia and Herzegovina and FYR Macedonia). Although agriculture has decreased as a share of total exports recently (down from 25 percent in 2002), in real terms it grew by an impressive 71 percent between 2002-2005 and has the potential to grow further by taking advantage of expanding regional trade opportunities. During the same period agricultural imports grew at a slower pace in real terms (40 percent) and played a smaller role in total imports (about 7 percent in 2005). The faster growth of agricultural exports compared to imports resulted in Serbia's first agricultural trade surplus in 2005³. Numerous free trade agreements are contributing to the positive agricultural trade balance, but the surplus is largely driven by import protection rates of up to 30 percent, and even higher effective rates for many key agricultural products including dairy and pork. Further trade liberalization and removal of tariffs will require significant improvement in sector competitiveness in order to sustain the positive trade balance.

Positive trends in Agri-food: Serbia's foreign trade in the first half of 2017 amounted to about 17 billion euros and is higher by 13.2% than in the same period last year, and expressed in dollars, the exchange was 18.5 billion, an increase of

³ The agricultural trade surplus of US\$150 million obtained for the first time in 2005 contributed to reversing the trend of ever-growing economy-wide trade deficit (in 2004 at its highest US\$7.5 billion).

9.6 %, (RZS). Exports of goods had a value of 7.5 billion euros and were higher by 13.6%, and in dollars the increase was 10%, to eight billion. It was imported for 9.6 billion euros, which is an increase of 12.9%, while in dollars the import was worth 10.4 billion and is higher by 9.3%. The coverage of imports by exports is 77.7% and is higher than the coverage in the same period of previous year, when it amounted to 77.2%. Serbia's main foreign trade partners in exports were Italy (\$ 1.2 billion), Germany (one billion), Bosnia and Herzegovina (615 million), Russia (470 million) and Romania (415 million). The main import partners were Germany (\$ 1.3 billion), Italy (one billion), Russia (827 million), China (809 million) and Hungary (480.8 million). Foreign trade was the largest with countries with which Serbia has signed free trade agreements. European Union member states account for 64.9% of total trade. The second most important partner are the countries of the CEFTA region, with which Serbia had a trade surplus of 943 million dollars, which is the result mainly of exports of agricultural products (cereals and cereal products and various beverages).

Exports dominated by commodity groups:

- fruits and vegetables, with exports of \$ 806.4 million, and a 5.4 percent share of total merchandise exports, and
- cereals and cereal-based products, worth \$ 699.9 million, with a 4.7 percent share in total merchandise exports and a realized surplus of \$ 616.2 million.

According to the realized value in imports, they are the most represented

- fruits and vegetables with an import value of \$ 297.9 million, with a share in total imports of 1.5 percent and a trade surplus of \$ 508.6 million, as well as
- coffee, tea, cocoa and spices worth \$ 191.1 million, with a share of total imports of one percent.

The indicators draw attention to the fact that the export orientation of agriculture is focused on certain groups of products, which have been successful on the international market for a long time and can serve as one of the indicators of the competitiveness of these products on the world market.

Trade in agri-food products is based on the exchange of primary agricultural products, which participate in the structure of exports on average with about 79%, and in imports with about 65%.

Although the results are positive, they indicate a lack of added value in agricultural production.

Serbia is not efficient enough in turning good innovative ideas into products and services for the market.

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2. Characteristics of AKIS

2.1. AKIS description

The agriculture sector is supported by a publicly funded extension service delivered primarily by 34 contracted, socially owned Agricultural Stations but also some private and NGO providers. Under the 1991 Law on Agriculture Departments, the Institute for Science Application in Agriculture (ISAA) is tasked with coordinating extension management, however, the Ministry of Agriculture, Forestry and Water Management (MAFWM) has fulfilled this role in recent years. In 2006, MAFWM extension contracts valued at about US\$3 million US\$ financed extension agent and farmer capacity building, a market price information service and statistical reporting. Extension contracts are milestone based and, increasingly, contestable, however there is no formal stakeholder participation in extension planning or management. Agriculture research is primarily funded by the Ministry of Education, Science and Technological development (MoEST) through 4-year contracts for basic research and technology improvement projects and 6-12 month contracts for technology innovation. Total public research funding, however, is very low, with salaries absorbing up to 90% of funding and most research stations relying on income from product sales and service contracts for their survival.

2.1.1. AKIS actors and knowledge flows

Agricultural Knowledge creation / research in Serbia is conducted by:

- Research Institutions (Institutes, SME's...)
- University (Faculties, Institutes linked to University...).
- Agricultural Knowledge creation / research in Serbia is funded by:
 - Ministry of Education, Science and Technological Development of Republic of Serbia
 - The Innovation Fund of the Republic of Serbia
 - Ministry of Agriculture, Forestry and Water Management of Republic of Serbia
 - Donor funds
 - International projects (EU funded primarily).

2.1.2. Policy framework at national level

Ministry of Education, Science and Technological Development of Republic of Serbia (www.mpn.gov.rs) is Funding projects within biotechnological research, based on Law on Scientific and Research Law.

The Innovation Fund of the Republic of Serbia (<http://www.inovacionifond.rs>), has established an independent governance structure, with a robust international peer review system and a distinguished Investment Committee that includes international and diaspora professionals experienced in managing technology firms, scientific research, commercialization, and the investor community.

Ministry of Agriculture, Forestry and Water Management of Republic of Serbia (www.minpolj.gov.rs), is funding Applied Agricultural Research projects through annual calls for projects, implemented by Directorate for Agrarian Payments (PA), as a part of the Ministry of Agriculture.

2.1.3. Coordination Structures

Ministry of Education, Science and Technological Development of Republic of Serbia (www.mpn.gov.rs)

- Funding projects within biotechnological research, categorised as
 1. Basic / Fundamental research
 2. Technological development research
 3. Integrated Interdisciplinary research

The Innovation Fund of the Republic of Serbia (<http://www.inovacionifond.rs>)

- The Innovation Fund has established an independent governance structure, with a robust international peer review system and a distinguished Investment Committee that includes international and diaspora professionals experienced in managing technology firms, scientific research, commercialization, and the investor community.
- The **EU's support** for the Innovation Fund has been instrumental in advancing Serbia's innovation financing and promoting better integration between the research and private sectors. The Fund is thus an important step towards closer links between Serbia's and EU's research communities and innovation ecosystems. It enables

the positioning of Serbia as a leader in the region and the establishment of links with the EU and global markets. So far, the EU has allocated around EUR 15.8 million from the IPA funds to the Innovation Fund.

Ministry of Agriculture, Forestry and Water Management of Republic of Serbia (www.minpolj.gov.rs)

- Funding Applied Agricultural Research projects through annual calls for projects
- Pre determined topics for each call
- Implemented by Directorate for Agrarian Payments (PA), as a part of the Ministry of Agriculture. PA is a necessary institutional framework set up to enable not only use of the IPA pre-accession funds, but also further integration of the Serbian agriculture into EU Common Agricultural policy (after the full membership into EU), namely European Agricultural Guarantee Fund (EAGF) and European Agricultural Fund for Rural Development (EAFRD).

2.2. AKIS diagram

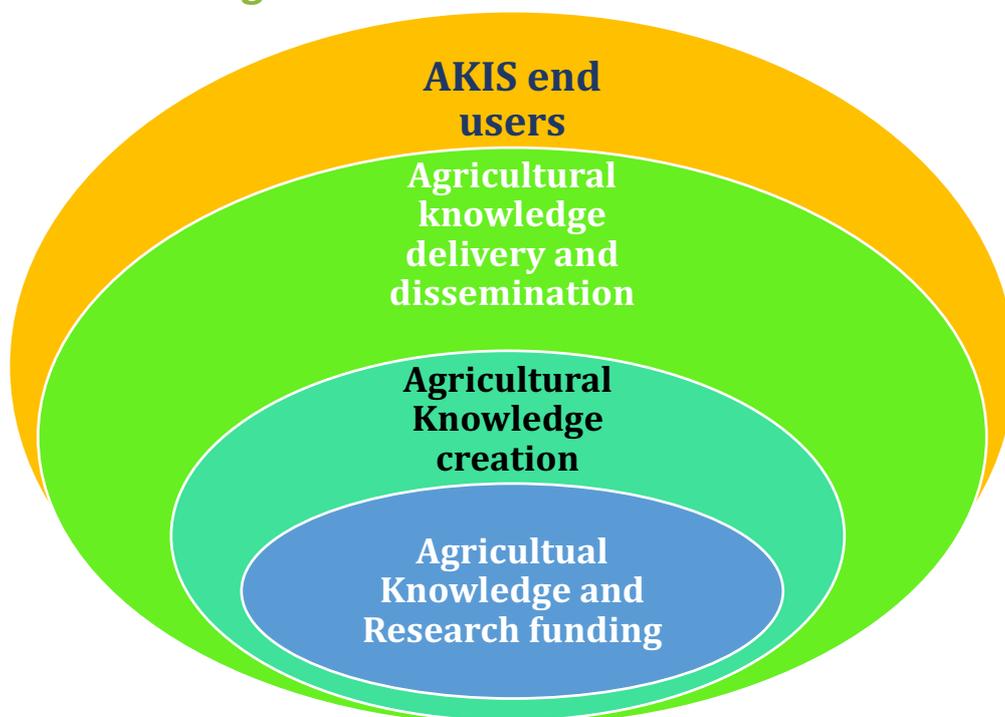


Figure 1 AKIS diagram in Serbia

Agricultural Knowledge and Research funding:

- Ministry of Education, Science and Technological Development of Republic of Serbia
- The Innovation Fund of the Republic of Serbia
- Ministry of Agriculture, Forestry and Water Management of Republic of Serbia
- Donor funds

Agricultural Knowledge creation

- Research Institutions (Institutes, SME's...)
- University (Faculties, Institutes linked to University...).

Agricultural Knowledge delivery and dissemination

- Research Institutions (Institutes, SME's...)
- University (Faculties, Institutes linked to University...).

Agricultural Knowledge End users

- Formal: students, pupils
- Informal / Lifelong: FAS: Farmers, advisors, Cooperatives, SMEs, public..

3. History of the advisory system

Serbia has had an agricultural extension service since 1922. The current system of regional Agricultural Stations was developed in the Socialist Federal Republic of Yugoslavia to advise a few hundred cooperative farms and kombinats that reported to the Ministry of Agriculture. Since the dissolution of Yugoslavia, privatisation, restitution and a new policy direction have replaced this client group with almost 630,000 private family farms and 3,000 legal enterprises, so an Agricultural Station originally established to serve around 20 large social-sector farms may now be faced with 20,000 small private farms all in need of advice. Meanwhile, great strides in information and communications technology have created entirely new possibilities for generating advice and delivering it to farmers in areas that range from ration formulation to rapid warning system for plant pests and diseases. Additionally, Serbia has embarked on its journey towards the European Union, which carries implications for agricultural, environmental and rural development policy.

The beginning of agricultural counseling in Serbia dates back to the formation of the State Economy in Topčider (1851), the Livestock Institute in Dobričevo (1852) and the Agricultural School in Topčider (1853), where 200 agronomists were educated.

The Society for the Field Economy was formed in 1869, and in 1881 it was renamed the Supska Agricultural Society with the aim of spreading new knowledge about agricultural production among the peasants. The company was highly valued and respected and had great financial support from the state and numerous benefits. It stopped working in 1946.

During the Kingdom of Yugoslavia, agricultural stations were established with the task of modernizing Serbian agriculture by introducing new knowledge and innovations in that sector of importance for the entire country.

Agricultural stations were established by the Law on Agricultural Experimental Control Stations in 1922 (February 12), published in the Official Gazette of the Kingdom of Serbs, Croats and Slovenes by amending the Ordinance of the same name of November 10, 1919. This Law clearly defines the task, arrangement, jobs, specific duties and salaries of employees in agricultural stations.

After the Second World War, agrarian reforms and socialization of agriculture in terms of dividing the land into landless people and fragmenting plots, in 1952, first the Regional Plant Protection Stations were formed, and then the District Agricultural Stations in 1956. On the territory of the SFRY, at that time, there were more than 100 agricultural stations with a strong personnel structure and great financial support from the then state institutions.

District agricultural stations were transformed into agricultural stations in 1965, and in the early 1970s they were integrated into factories, where they were more oriented to commercial than to individual agricultural producers, which affected the lower level of improvement of agricultural production on agricultural farms.

The Law on Agricultural Service was adopted in 1991 ("Official Gazette of RS" 61/91) and on the basis of the same, agricultural stations and institutes and agro-institutes under the common names "Professional Agricultural Service" were entrusted with professional tasks of improving agricultural production from by the RS Ministry of Agriculture, Water Management and Forestry. This Law defines the conditions, manner of work and financing of services and determines the supervision of services.

Professional and advisory work is performed on individual and other farms in order to improve agricultural production. Significance is given to direct advisory work with farms, instead of forced group methods until then. The notion of selected farms is introduced.

The control of the work of the services was then performed by the IPN in front of the Ministry of Agriculture, and at the beginning of 2000 in AP Vojvodina, that role was taken over by the Secretariat for Agriculture of AP Vojvodina.

At the beginning of 2008, the Conclusion of the Government of the RS in the then Socially Owned Enterprises (SOEs) - agricultural stations determined the share of state capital of 100 percent and thus the RS took over the founding and management rights in proportion to the state capital. The main reason for this transformation is the protection against possible bad privatization of agricultural stations and their preservation with staff and equipment due to their importance for the development of agriculture in Serbia.

At the end of 2008 and the beginning of 2009, the RS Government, based on the Companies Act and the Government Law, passed individual Decisions on Amendments to the Founding Act of Agricultural Stations, which changed the name of agricultural stations as social enterprises to Agricultural Professional Services, Limited Liability Companies. The same Act regulates the status of a company as a legal entity that operates with state-owned assets, as well as all other provisions that regulate the manner of business, activity, capital, bodies and acts of the company.

Based on the aforementioned Decision and the established status, the Agricultural Advisory and Expert Services (PSSS/FAS) in Central Serbia and the Agricultural Expert Services (PSS/FAS) in AP Vojvodina still function on the same basis.

In Serbia, there are agricultural services distributed according to the regional or district principle.

- There are 19 PSSS/FASs in Central Serbia, founded by the Republic of Serbia, and three private services.
- There are 12 regional PSS/FAS operating in AP Vojvodina.

Approximately 195 advisors are employed in the services in Central Serbia, and 84 advisors in the services in Vojvodina, in final score with cca 300 advisors in Serbia.

4. The agricultural and forestry advisory service(s)

4.1. Overview of all service suppliers

The front-line units for delivering advice to farmers are 34 “Agricultural Stations”, of which:

- 12 are in Vojvodina
- 22 are in Central Serbia

The network of Agricultural Stations was established in the Socialist Federal Republic of Yugoslavia, where they each had the structure of “socially-owned enterprises”. Privatization of these stations was begun in 2003, following the model used for other socially-owned enterprises, but was then halted in recognition of their special character and public-good function after just one station (Loznica) had been privatized with 2-3 newly established private regional services. After some discussion the remaining 33 were transformed into separate state-owned companies, following the alternative legal model then available for the transformation of the former social sector. This specific history explains why the extension service currently comprises 34 largely independent legal entities.

Within Central Serbia, strategic management is exercised by the Department for Extension of the Sector for Rural Development in the Ministry of Agriculture and Environmental Protection.

Day-to-day management and monitoring, together with training of advisors and a number of other specific functions, are assigned to the Institute for the Application of Science in Agriculture (usually known by its Serbian acronym “IPN”). Funding comes from the state budget.

Within Province of Vojvodina, a department within the Provincial Secretariat exercises both strategic and tactical management, and funding comes from the Province budget.

4.2. Public policy, funding schemes, financing mechanisms, advisory service providers

The primary legal basis for extension work throughout the Republic of Serbia is the “*Law on providing advisory and specialised services in the field of agriculture*”. It sets out the objectives, tasks, institutional structure and funding of extension in Central Serbia, but for Vojvodina devolves each of these functions to the government of the Autonomous Province of Vojvodina.

The law, adopted in 2010 to replace the previous law from 1999, covers four main issues:

- 1) It defines agricultural advisory services and their objectives, as well as “expert services” such as plant pest forecasting and soil testing, and says that advisory services can only be carried out by legal entities registered for this purpose, that they may not also sell or promote agricultural inputs or machinery, and that all that advisors must be licensed, registered and employed in an advisory service. These provisions apply to all advisors, whether in the state system or private sector, and the law specifically includes the possibility for Local Governments (Municipalities and Cities) to provide advisory services.
- 2) It establishes an “*Expert council for advisory work and applied research in agriculture*”. In principle this is responsible for all forms of advisory work, though in practice its main role is strategic management of the state advisory services in Central Serbia and in Vojvodina.
- 3) It defines mechanisms for training advisors from all parts of the system, public and private, and assigns responsible to an “authorised research organization”, i.e. to IPN.
- 4) It defines mechanisms for planning, management and funding of the state extension service and allocates responsibilities between the responsible department in the Ministry of Agriculture and the “authorised research organization” - IPN.



Figure 2 Map of Regional FAS offices in Serbia (300 advisors, 34 offices).

4.3. Human resources and methods of service provision

Approximately 200 advisors are employed in the services in Central Serbia, and less than 100 advisors in the services in Vojvodina, in final score with cca 300 advisors in Serbia.

- There are 19 PSSS/FASs in Central Serbia, founded by the Republic of Serbia, and three private services.
- There are 12 regional PSS/FAS operating in AP Vojvodina.

METHODS OF SERVICE

The basic legal regulation for performing advisory work on the entire territory of the Republic is the "Law on performing advisory and professional work in the field

of agriculture", which was passed in 2010. This Law defines primarily advisory, but also professional work in agriculture, their goal and states that advisory work in agriculture can be performed by companies founded by RS and registered under certain activity codes, but also other legal entities registered under the same codes, if they have one employed advisor. According to the same Law, companies that perform consulting activities cannot produce or advertise producers of inputs and mechanization in agriculture.

The law lists advisory activities in agriculture, as follows:

- 1) providing professional assistance in the application of scientific achievements and new technologies;
- 2) provision of expert advice and services, transfer of practical knowledge and skills of technological - technical improvement of production;
- 3) acquainting agricultural producers with good agricultural practice;
- 4) conducting demonstration experiments in various areas of agriculture;
- 5) training of agricultural producers for the management of agricultural holdings and keeping accounting records of the holding;
- 6) assistance to the affirmation of rural development;
- 7) application of advice on plant protection on the basis of data from the forecasting and reporting service;
- 8) encouraging interest associations and entrepreneurship in agriculture;
- 9) providing advice and giving proposals for the expansion of economic activities as additional activities on the farm;
- 10) giving recommendations in the field of animal husbandry;
- 11) giving advice and recommendations on rational land use;
- 12) providing advisory assistance in other areas in which agricultural producers express interest. "

Advisory jobs in agriculture are defined by the same Law, as jobs of interest to the RS and they can be performed by legal entities and entrepreneurs who perform advisory work. An agricultural advisor may not perform professional tasks at the same time as an advisory one, according to this Law.

The Law also stipulates that advisors must be licensed, registered and employed in the counseling service. It is planned to form an "Expert Council for Advisory Affairs and Applied Research in Agriculture", which the Minister will establish as a special working group - the Expert Council.

Council is responsible for all forms of advisory activities, gives proposals, opinions, and evaluates proposed acts and has a major role in the strategic management of advisory services in Serbia.

The Law defines the mechanisms of education of advisors, public and private, and prescribes the "authorization of a scientific research organization" (IPN) and the Education Center for the same as responsible institutions.

The main goals of advisory work in agriculture, based on the "Decree on determining the medium-term program for the development of advisory work in agriculture for the period from 2011 to 2015" are to raise the knowledge and information of agricultural producers to achieve the following:

1. increase the competitiveness of production, through adjustment to market requirements, increase revenue and product quality standards;
2. harmonization of production and processing with EU rules, in order to be competitive on the EU market;
3. use of loans, subsidies and funds from EU pre-accession funds;
4. development of entrepreneurship;
5. interest grouping;
6. conservation of natural resources;
7. environmental protection and
8. rural development.

The manner of conducting activities based on the Medium-Term Program is done by applying individual and group methods, mass media and monitoring, data collection and dissemination.

Individual methods of advisory work imply the provision of all types of advice and assistance of advisors through direct, direct contact with agricultural producers and on the basis of this method the achieved effects of advisory work can be monitored. In addition to the main goal of this method to raise the level of knowledge and information of agricultural producers in all spheres of agricultural production, to increase competitiveness and farm incomes, individual advisory work enables the formation of an adequate database of selected farms with all structural and economic factors.

The result expected by applying this method is primarily an increase in economic effects based on gross margin in selected farms.

Group methods of advisory work include contact of advisors with groups of agricultural producers, in order to increase the total number of users of advisory services. They are based on holding lectures, workshops and seminars, on organizing forums and field days, as well as on direct contact with representatives and members of associations and informal groups.

By applying this method, a mass of agricultural producers is expected to apply the acquired knowledge and gain trust in advisory services.

The broadest information of agricultural producers is achieved by using the media in advisory work such as television, radio and other electronic and print media.

Other bylaws, in accordance with the Law on Advisory and Professional Affairs in the Field of Agriculture are:

- Rulebook on the content and manner of keeping the Register of Agricultural Advisors ("Official Gazette of RS" No. 67/14),
- Rulebook on the form and content of the identification card of the agricultural advisor, as well as the manner of its use, issuance and annulment ("Official Gazette of RS" No. 72/14) and
- Rulebook on detailed conditions for issuing a license for performing advisory activities in agriculture ("Official Gazette of RS" No. 80/14).

These Regulations are in the function of mandatory licensing of advisors and apply equally to the advisory board of Central Serbia and AP Vojvodina. Serbia has adopted a number of strategic documents. These documents, in some of their chapters, contain parts related to agricultural advisory, which again gives importance to this topic when it comes to Serbian agriculture and its development.

The umbrella document is the Law on Agriculture and Rural Development, which prescribes that "agricultural policy and rural development policy of RS be implemented through the implementation of the Strategy of Agriculture and Rural Development, the National Program for Agriculture and the National Program for Rural Development."

Within the key principles of the Strategy of Agriculture and Rural Development of the RS, and in accordance with its vision, two principles are of special importance for the advisory service, namely:

1. growth of productivity of the agricultural sector in accordance with technical - technological progress and innovation of products and solutions
2. modernization of institutions - bodies and organizations of the Ministry of Agriculture, Forestry and Water Management for the purpose of efficient

management of public policy with the aim of availability of EU pre-accession funds and harmonization of agricultural policy with EU standards.

The main goal of advising is to raise the productivity of agricultural production, and in order for advisory work to be more efficient, modernization should be carried out - reform of advisory services.

In accordance with the principles, the strategic goals of the Strategy have been determined, and several pillars of reforms have been identified for their implementation, of which "establishing more efficient and operational systems for implementing existing and creating new knowledge and its transfer" is of particular importance for the agricultural advisory system. The first links in the chain of knowledge transfer directly to agricultural producers.

Within the part of the Priority Areas of Strategic Changes of the Strategy, "improvement of the knowledge transfer system and human resources development" is stated as one of the priorities that is important for increasing the competitiveness of agricultural production through harmonization of new knowledge and technologies with real needs of farmers.

The importance of agricultural services was emphasized in this segment of the Strategy, with a suggestion for stronger cooperation between faculties and institutes with the Ministry and PSSS/FAS, in order to make the transfer and adoption of knowledge by producers more efficient.

The strategy, in this part, emphasizes that advisory work should be more focused on groups of farmers due to the small number of advisors and that in that sense it should enable the commercialization of advisory activities, ie the participation of private advisors.

4.4. Clients and topics

The most important clients and activities related to FAS are as following:

- Visits to "chosen farms" accounts for 25.7 % of all points, more than twice as much as the next-highest activity (workshops, 12.3 %) and almost three times as high as visits to other farms, at 9.0 %. It is also very variable, with some advisors spending up to 44 % of their time visiting chosen farms;
- Visits to "other farms", the most powerful way in which advisors can respond to individual farmers' needs, now account for less than one tenth of total time input. Whilst there are good arguments for limiting the share of resources given to this relatively time-consuming private-good activity, it seems as though

this may have been taken too far, leaving advisors with insufficient resources to address serious needs when they arise;

- Lectures, workshops and Winter Schools – all forms of structured education for groups of farmers – account for 24.3 %. The idea of a “thematic farmer group”, where farmers with similar interests meet regularly to learn from each other with the advisor’s support, has not yet been developed in Serbia;
- Public policy discussions) where advisors present and discuss new regulations and support measures, account for 6.2 % of advisors’ time, which seems perhaps a little high;
- Field days and visits to demonstration farms together account for just 4.0 %; given the amount of resources that can go into a demonstration farm or field trial, and the “seeing is believing” impact these can have, it might be worth putting a little more time and effort into bringing more farmers to see these activities;
- Of the 18.8 % spent on mass information, attention might be focused on the 5.0 % spent on writing texts for Agricultural Stations’ monthly bulletins: there is a lot of repetition in these texts (i.e. similar information being printed by different Stations) and the circulation is generally small (according to the regulation, the normal circulation should be equal to the number of chosen farms plus 20 %, i.e. a few hundred);
- The time input for the “STIPS” market information system and the “FADN” farm accountancy data network together averages 2.9 % of the advisors’ time, but with a lot of variation between advisors and between Stations (some of which are not involved in STIPS at all);
- Reporting to the Ministry on arable and fruit production (a task that in most western countries would be carried out by the Statistical Office) accounts for 1.1 % of time.

4.5. Linkages with other AKIS actors/knowledge flows

IPN - ISAA – Institute for Science Application in Agriculture, Belgrade is engaged in research and experimental development in the field of biotechnical sciences, applied and development research in the multidisciplinary field of agriculture and rural development. The Institute has employed experts from all areas of agriculture

ISAA is an authorized organization for conducting training and development of agricultural extension agents and agricultural producers according to the decision of the Ministry of Agriculture.

This model of work of ISAA is a model of effective knowledge transfer system.

Transfer of scientific research achievements in all fields of agriculture towards agricultural advisers and farmers was carried out in cooperation with:

- Ministry of Agriculture and Environmental Protection of the Republic of Serbia,
- Ministry of Education, Science and Technological Development
- International Donors,
- a number of educational and research institutions in our country, continuously conducting training agricultural extension agents and farmers.

Since 2019, IPN/ISAA is Authorized CECRA training provider.

4.6. Programming and planning of advisory work

In Central Serbia, the Department of Agricultural Advisory and Rural Development at the Ministry of Agriculture, Forestry and Water Management is in charge of the service management strategy, programming and planning.

Control and monitoring of the work of services, organization of training of advisors and other activities related to advisory work are performed by IPN.

In Vojvodina, strategic management, programming and planning is performed by the Department for Agricultural Advisory at the Provincial Secretariat for Agriculture, while the "mirror" organization to IPN is the newly established "Education Center" in Sremski Karlovci.

Planning documents, Medium-Term and Annual programs for the development of advisory activities in agriculture are also defined by this Law. They have the form of a Decree, as a bylaw. The medium-term program, in accordance with the strategy of agriculture, determines the goals of the development of advisory

activities, as well as the manner and deadlines for their realization. It predicts the expected results and defines the method of financing.

The medium-term program is adopted by the Government of RS for Central Serbia, and the competent body of AP Vojvodina for Vojvodina for a period of five years.

Based on the Medium-Term Program, every year the Government of the RS and the Competent Authority of AP Vojvodina adopt Annual Programs which regulate specific activities in the areas where advisory work is performed. The programs contain the scope, deadlines, manner of implementation and manner of control over the implementation of activities as well as the source, manner and schedule of use of funds.

PSSS/FAS, founded by RS, submits a request for getting the right to use funds to perform advisory work, and legal entities and entrepreneurs in areas where the Government has not established PSSS/FAS participate in the competition.

The Decree on Determining the Annual Program for the Development of Advisory Affairs regulates the Annual Program for the Development of Advisory Affairs in Agriculture for each year.

The Annual program must be in accordance with the Law on Performing Advisory and Professional Affairs in Agriculture, the Medium-Term Program, the Law on Incentives in Agriculture and Rural Development, the Law on RS Budget and the Law on Government, ie their members related to agricultural advisory.

The Annual program determines the areas in which advisory work is performed in agriculture, the number and area of advisors in each area and the PSSS/FAS, which will perform advisory work in those areas.

In accordance with the "Rulebook on the manner of performing advisory work in agriculture", as a bylaw, the annual program defines specific activities, their scope and scoring them by advisor or by service, depending on the type of activity. In that way, the minimum number of points that each of the advisors should achieve in order to achieve the plan for the current year was determined for each year.

The Annual program for each type of planned activity defines its number, frequency and duration per advisor or service, as well as the territorial distribution of individual and group activities according to the area of work of the advisory

service. The same Program also envisages certain topics for individual, mostly group activities, which are current for the year for which it has been determined. The Annual program is a document on the basis of which the source, schedule and manner of using financial resources for the implementation of advisory work in the year for which it was adopted have been determined. Funds for the implementation of the Annual Program for Central Serbia are provided in the RS budget, and for the implementation of the Annual Program for Vojvodina, in the budget of AP Vojvodina. The total amount of funds provided in the RS budget is distributed to individual amounts according to the purpose and user of funds.

The beneficiaries of the funds are PSSS/FAS and the Authorized Organization. PSSS/FAS purposefully uses funds for advisory work, for the work of advisors and other costs that accompany advisory work and part of the funds allocated for the development of PSSS/FAS, ie for strengthening the capacity of PSSS/FAS by supporting the improvement of investment conditions in PSSS/FAS.

The Annual program for the improvement of advisory work in agriculture in AP Vojvodina is adopted by the competent body of AP Vojvodina - the Provincial Secretariat for Agriculture, Water Management and Forestry (Secretariat) and within the same the Rulebook on the work of advisors for the same year. In Central Serbia, the Rulebook is a bylaw that is not adopted annually.

The program consists of Basic and Special programs. The basic program determines: programs and projects based on advisory activities, which are intended for agricultural producers for PSS; equipping PSS and setting up experiments in accordance with the adopted methodology; education of advisors and agricultural producers; equipping and developing the Training Center; enga training of new advisors in PSS and laboratory analysis in PSS and Oenological Station.

Special programs refer to the implementation of advisory work and projects intended except for public and private advisory services and to the implementation of projects intended for faculties and agricultural schools from the territory of APV. The realization of projects on the basis of special programs is preceded by a competition announced by the Secretariat.

The scope, manner and realization of advisory work and advisory activities in APV are specially regulated in the Rulebook which is in accordance with the Annual Program.

The main differences in the essence of the Annual Programs of Central Serbia and AP Vojvodina, when it comes to advisory work are as follows:

- the work program of advisors in Vojvodina is oriented to the project tasks of each advisor, which include all types of activities, unlike Central Serbia where the activities are listed according to a certain number,
- advisory work in Vojvodina is based on a closed circle of project activities for a particular farm and is more focused on determining the economic parameters of the farm's business based on agro-economic production indicators, which is not a priority in Central Serbia,
- control and reporting, as well as the work of advisors, are carried out on the basis of GPS data and GPS system codebook established by the Secretariat, on the basis of which the work of advisors is evaluated in accordance with the Rulebook.
- the influence of the Authorized Organization in Vojvodina is not as important for these activities as in Central Serbia,

Knowledge transfer in the field of agriculture is implemented through a system of formal education at all levels (from secondary education to doctoral studies), through various types of training organized by educational and research institutions and organizations and institutions, PSSS/FAS, private companies and project units, media etc. (RS Agriculture and Rural Development Strategy for the period 2014 - 2024, 2014).

The main role of agricultural advisory services in Serbia consisted mainly in collecting information, innovations and knowledge from research and educational institutions in agriculture and transferring them to agricultural producers, and in order to increase production and productivity and introduce innovations in agricultural practice. The activity and advice of advisors were mostly based on biological and technical - technological knowledge in agriculture.

The development of a market economy with an emphasis on the economic and organizational aspects of the production of consulting sets the task to move from the production to the market and development mission.

Increasing the competitiveness of agricultural production and training farmers for more successful agricultural production and farm management are a priority of advisory work and activities of the PSSS/FAS.

The same tasks are defined as priorities by the Law on Performing Advisory and Professional Affairs in the Field of Agriculture, 2010.

In order to develop advisory services in the direction of adequate knowledge transfer and improve the competitiveness of the agricultural sector in Serbia, since 2010 IPN organizes training of agricultural advisors with increased intensity of participation in agro-economic topics (modules).

- IPN prepares annual plan of training of extension agents and agricultural producers (GP / ATP).
- Annual training plans are developed on the basis of regular assessments of the needs of advisors, farmers, agribusiness and agricultural sector.
- The modules are implemented in a period of 1 to 5 days, combining theoretical and practical work.
- Theoretical classes are held in Belgrade in the ISAA.
- For modules related to modernization of knowledge (modern technology) are also planned activities in the field, in order to better recognition of problems, and refer to the modern technologies in the field of farming, animal husbandry, horticulture and plant protection.
- For the practical part IPN/ISAA provide locations with adequate facilities, closely related to theoretical classes.

4.7. Advisory organizations forming the FAS and evaluation of their FAS implementation

The Annual Program defines the manner of reporting on performed advisory activities, which is preceded by the PSSS/FAS Advisory Work Plan submitted to the Ministry and the Authorized Organization (IPN). The manner of reporting to the advisors on the performed activities is envisaged, as well as the quarterly report of the PSSS/FAS in electronic and written form, as well as the reporting deadline.

Within the annual program, the Authorized Organization is in charge of reporting to the Ministry on a quarterly and annual level on the implementation of advisory activities as well as to monitor and evaluate the effects of the work of advisors based on established methods.

The authorized organization purposely uses funds for monitoring and evaluating the effect of the work of advisors for the salaries of a certain number of executors and the costs that accompany them for the development of PSSS/FAS, for training advisors and making materials, organizing an annual seminar of consultants and for developing the PSSS/FAS portal in Serbia.

The participation of the Authorized Organization in the use of total funds for the performance of advisory activities in Central Serbia is approximately ten percent in each year.

Control, reporting and evaluation of work and evaluation of activities are also regulated by the Rulebook.

The program envisages the number of professional services and the number of hired advisors by services, as well as the source, manner and schedule of used funds for the basic and special program.

5. Summary and conclusions

5.1. Summary and conclusions on sections 1 – 3

The Agricultural Knowledge and Information System (AKIS) model describes how knowledge generation functions, and how it is disseminated and applied.

The actors at the knowledge policy level are the Ministry of Agriculture and the Ministries of Science and Education.

The knowledge generation level encompasses research institutes and institutes of higher education.

Serbia has a comprehensive agricultural education system, which is organized through a number of agricultural schools and university faculties. The whole system is under the authority of the Ministry of Education, which is responsible for the design and the implementation of the curricula. Secondary schools provide basic agricultural knowledge but course are little practice oriented. Agricultural faculties (*e.g.* Belgrade, Novi Sad, Cacak) provide comprehensive and multidisciplinary agricultural studies.

In the Western Balkans, current agricultural extension structures have been developed mainly within the last two decades with the help of international donors (FAO 2011). Serbia is an exception as agricultural extension service started its initial development during the 50s of the last century. In fact, in the period 1953-1960 was sat up a network of agricultural stations. During this period was formed the Centre for the Improvement of Agricultural Production and the Department of Livestock Breeding. Nowadays, the legal successor of the Centre and the Institute is the Institute for Science Application in Agriculture.

As for the institutional setup of public extension, Serbia has a national structure with direct field branches at the regional level. These cover a number of municipalities. The network of professional extension services in Serbia is coordinated by the Institute for Application of Science in Agriculture, which is under the auspices of the Ministry of Science. About 300 field advisors and administration staff are employed by the Serbian public extension. Agricultural extension and advisory system in Serbia is composed by public extension and private advisory services.

The development of advisory services in the Western Balkans started after the years of crisis and war with the strong support of international donor projects. Donor projects are still active at national level in Serbia (*i.e.* World Bank project). The common strategy of all donor projects was to establish and support advisory structures (public and private) in order to select and train advisors and to provide them with the necessary tools and materials for their everyday work. In almost all cases the establishment of potentially workable extension structures can be called successful. Extension agents have been provided with a sound base of technical (and partially methodological) knowledge and skills, before being left on their own.

Support for public services in agriculture (*e.g.* extension service, veterinary and phytosanitary services, etc.) in Serbia is provided but the share of agricultural budgetary funds dedicated to these services is small. Within the general services sector, the greatest proportion of support funds is directed to extension services or to financing agricultural expert service (34-56 %).

Extension organisations emerged from the former extension systems for state owned and individual farms. The majority of the field staff within the system are agricultural experts from the former system. In fact, the majority of advisors are over 40 years. This strengthens two biases: the strong focus that is still directed towards production techniques and the relative preference given to large farms with respect to small and medium holdings.

Until 2010 no systematic training was on offer for Serbian field advisors. The ISAA performed practical training courses to extension agents but they were not regular and to a large extent production technology oriented. The Serbian Transitional Agriculture Reform project (STAR) takes up training activities in 2010 preparing for the provision of an advisor training program. The Institute for Science Application in Agriculture started educational activities of extension agents – with the support of World Bank project and the Ministry of Agriculture, Forestry and Water Management of Serbia – and become a national training and support institute for agricultural advisory services.

As of 2011 (FAO 2011), Serbian extension agents needed training sessions mainly on the following issues: extension methodology; farm economy, farm management and whole farm development; marketing, market development and value chains; national rules and regulations; EU regulations relating to production,

marketing and product quality; supporting farmer groups and associations; specific computer programs; and foreign languages. The Institute for Science Application in Agriculture (ISAA) started in 2010 training activities dealing with most of these issues in the whole country.

Monitoring of advisory work is fairly advanced in Serbia, having a considerable database on advisors' activities, farmers' needs and the results of on-farm research. However, monitoring is more about examining the activities of advisors than documenting the impacts of advisory work. Moreover, the data that is collected is not used to its full potential for supporting the advisory system management.

5.2. Summary and conclusions on sections 4

Transfer of scientific research achievements in all fields of agriculture towards agricultural advisers and farmers was carried out in cooperation with:

- Ministry of Agriculture and Environmental Protection of the Republic of Serbia,
- Ministry of Education, Science and Technological Development
- International Donors,
- Educational and research institutions in our country, continuously conducting training agricultural extension agents and farmers.

ISAA is an authorized organization for conducting training and development of agricultural extension agents and agricultural producers according to the decision of the Ministry of Agriculture. Since 2019, IPN/ISAA is Authorized CECRA training provider.

This model of work of ISAA is a model of effective knowledge transfer system.

AKIS in Serbia in future will give special attention to the transfer of research results to the end users, in accordance with the concept of the European Innovation Partnership (EIP), trying to keep involvement of all relevant stakeholders in agriculture in the joint action whose aim is to transfer knowledge to farmers and processors.

6. Acknowledgement of partners, information sources and gaps

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AKIS and advisory services in *Slovak Republic*

Report for the AKIS inventory (Task 1.2) of the i2connect project

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Executive summary

Advisory is an independent professional consulting service supporting the activities of managers and organizations to fulfill the goals and mission of companies by solving specific problems. Management of advisory is rapidly changing the world wherever new players, disciplines and capacities are systematically integrated into the profession. It is changing the world where the limits of opportunity are still widening in a globally interconnected business covering a wide range of areas that a few years ago practically did not even exist in human thought. Today, the world is much more than in the past a place of never-ending rapid change. This brings a big challenge for business consultants to make the most of the changes for their customers. The presented report deals with the system of functioning of advisory services in the Slovak Republic, the institutional organization of agricultural advisory services with existing advisory services. Requirements for consultants who provide advisory services are changing dynamically, especially in areas such as technical knowledge and skills, communication skills. With globalization and volatile change, we are becoming part of the virtual environment and virtual teams, and we are more and more dependent on virtual contacts. Among other aspects, the work of consultants is dominated by project approaches, with fundamental issues of project management.



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Abbreviations

AFC	Agriculture and Food Chamber
AFSE	Association of Forest Sector Employers
AFW	Association of Forestry Workers
AFKIS	Agricultural and Forestry Knowledge and Information System
ARVI	Agency for Rural Development
APA	Agricultural Payment Agency
CAP	Common Agricultural Policy
CNFOA	Council of Non-state Forest Owner Associations
DESIPAP	Development of Extension Services to Improve Primary Agricultural Production
EU	European Union
EUR	euro
FAS	Farm Advisory System
FPS	Forestry Protection System
GDP	Gross Domestic Product
Ha	hectare
IFEE	Institute for Forestry Extension and Education
IFCE	International Forestry and Consultancy in Zvolen
IETFMMW	Institute for the Education and Training of Forestry and Water Management Workers
PEFC SK	Forest Certification Body
MOARD	Ministry of Agriculture and Rural Development
NFC	National Forestry Centre
SAPARD	Special Accession Programme for Agriculture and Rural Development
SMRs	Statutory Management Requirements
SO	Statistical Office
SPU	Slovak University in Nitra
STU	Slovak Technical University
TANAP	Tatras National Park
TUZVO	Technical University in Zvolen

1. Main structural characteristics of the agricultural and forestry sector

The agricultural and forestry sectors underwent significant structural changes in the last three decades. Great challenges and opportunities had been launched by the transition process of the economy which has started in 1990. This process caused the substantial decline of crop and animal production about one-third in comparison with the year 1989. The majority of collective farms were dismantled, state farms have been gradually privatized, small and family farms appeared among the business units in agriculture. The sectors during this period were heavily underfinanced and minimum investments have been realized. Despite, numerous disadvantages the sectors were gradually prepared for the EU accession in 2004 as well as the preconditions of the market economy's environment have been fully met in this year.

The EU accession was connected with great expectations both from farmers as well as food processors' sides. The EU direct payments despite their starting unequal conditions for EU-15 new member states at least partly inhibited the procurement of the agricultural technologies and brought to the sectors innovation processes. In the first year after the accession, the farmers and food processors could successfully compete with their counterparts from EU-15. The EU accession had also positive effects on crop production which scaled-up about 16, 1 %, on the contrary; animal production has declined about 19,1%.

Great opportunities have been introduced to the farmers with high food prices from 2006-2007, as their income for agricultural production has been significantly upgraded. However, this tendency has converted to the development of volatile prices for agricultural commodities which had once more negative impact on the farmers' income. The most critical development in sectors was connected to the financial crises which have started in 2008 and lasted till 2009. These crises negatively affected first of all small fragile farmers. A large number of small and family farms has disappeared and they were procured or leased by the owners/managers of the larger agricultural enterprises. The overall number of farms has declined reasonably.

The permanent crisis scenarios in these sectors are continuing with the climate changes which lead due to the high temperatures, great droughts, or visa-versa

severe floods or other natural disasters, to the lower yields and hence decreased incomes of primary producers. On top of this, the situation is complicated with the outbreak of the COVID-19 pandemic, which in Slovak conditions so far has no impact on the lower yields of crop or animal productivity, however, the farm-gate prices are staying at their lowest level while the food prices are significantly raising.

The development of the basic macroeconomic indicators in the agriculture, food, and forestry sector in the economy of the Slovak Republic in 2017 is continuing in its decline.

According to the Slovak Statistical Office in 2017 population of the Slovak Republic represented 5, 439, 232 citizens. The share of citizens employed in agriculture represents – 2, 99% (47.7 thousand persons 2017). Before the transition of agriculture till 1990 the number of employees working in agriculture was 301 thousand. The share of employees working in the food processing industry is achieving 2,18 % (in total 32 100 persons).

The contribution of forestry to employment is 0.7% (2017). The number of employees both in agricultural primary production farms and in the forestry is dramatically declining since 1990 when this indicator represented more as 330 thousands citizens. By this process, the agricultural production was significantly scaled-up, but it was not embodied to the positive trends of the efficiency indicators' development.

- The average wage in agriculture increased to 735.00 Euros from 718.00 Euros in 2016. In the same year, the average wage in the food processing industry was 882 Euro There is still a significant wage disparity between the agri-food and forestry sectors and the other branches of the national economy in Slovakia. Compared to the average of the other branches of the Slovak economy, the wages in agriculture were lower about 22.96 %.
- GDP per capita in the national economy achieved 15.600 EUR (2017). The share of agriculture on GDP is sharply scaling-down by achieving the result 1, 6 % in 2017. The strong decline was most visible after the EU accession.

- According to data, in 2017 the number of agricultural holdings was 18 840 Eur. Especially, after the financial crisis, 2008-2009 in this field is noted the continuous decline of the number of the agricultural holding.
- Concerning the age of agricultural holders, it is noted the similar development as in the other part of the world. The average age of the agricultural holdings' owners is about 58 years. The Government of the Slovak Republic is introducing various measures to attract young people to agriculture. Among the other incentives is dominating the financial support of 50 000 Euro to the farmers up to age 40 provided in two tranches. Nonetheless, there is the challenging issue of access to the land, low wages, crucial working conditions, and overall underestimation of the sector from the societal point of view.
- In 2017, the acreage of the total utilized agricultural land accounted for 1 910 654 ha. A decrease in acreage was recorded in all types of land, namely in the case of permanent grassland to 17, 761 ha (3.16 %), arable land to 1, 342, 885 ha (0.33 %), permanent meadows and pastures to 517 679 ha (0.72 %) and home gardens to 32 329 ha (by 0.09 %) compare to 2016. The average rent paid by agricultural entities in selected regions of Slovakia accounted for 50.26 Euro.ha⁻¹. The highest rent per hectare of leased agricultural land was paid by entities in the districts of Dunajská Streda 125,00 Euro.ha⁻¹, Nitra 83.17. Euro. ha⁻¹ and Trnava 78.94. Euro. ha⁻¹. On contrary, the lowest rent was paid by agricultural entities in the districts of Liptovský Mikuláš 22.45. Euro. ha⁻¹, Banská Bystrica 24.70 Euro.ha⁻¹, Prešov 27.63.Euro. ha⁻¹ and Žilina 29.43.Euro.ha⁻¹.
- The average size of one agricultural holding is 80,7 ha (in EU-28 – 16,1 ha). The highest number of the agricultural holdings - 7,826 is cultivating in total 19,910 hectares, while those who are operating farms with higher acreage than 500 hectares (1003) are in total cultivating more as 1, 336 995 hectares. From table one is clear that owners/farmers/farm managers do have an interest in the farms with higher acreages, as from this is stemming advantage connected with higher incomes linked to the direct payments. Besides for utilization of modern, smart, and data-driven technologies, is more favorable the environment of the larger agricultural holdings.

Table 1 Agricultural Holdings by Size in Hectares, 2017 (number of holdings)

Interval of agr.land	Up to 5	5-10	10-50	50-100	100-250	250-500	Above 500	TOTAL
Number of enterprise	7,826	3,370	4,295	928	897	524	1,003	18,843
Total managed agricultural land in ha	19,910	24,117	94,508	65,524	142,624	187,571	133,699	1,871,249

Source: Eurostat, 2018

In 2018, the area of forest land (forest stands) was 1,947,752 ha. In addition to forest land covered by forest stands, the forest land registry also includes plots with temporary restriction of forest functions (e.g. forest road network, depots, forest nurseries, seed orchards, etc), which altogether accounted for 2,020,926 ha in 2018. In 2018, forest cover reached 41.2 %, which can be considered as a high share.

In 2018, the state-owned 784,684 ha (40.3%) of forest land and managed 1,005,208 ha of forest land (51.6%). The remaining area of forest land was managed by non-state forest enterprises that own and manage private, municipal, church, and community forests as well as forests of agricultural cooperatives (Table 2).

Table 2 Ownership and Use of Forest Land

	Forest land		
	Owned	Managed	Managed
	area (ha)		share (%)
State	785,000	1,050,000	51.6
Private	233,000	152,000	7.8
Cooperatives	384,000	596,000	30.6
Church	47,000	16,000	0.8
Agri-cooperatives	5,000	7,000	0.4
Municipal	157,000	171,000	8.8
Unknown	372,000	-	-

Source: Green Report, 2019

According to preliminary data for 2017, agriculture reached a positive economic outturn, i.e. profit before tax of 60.2 mil. Euro compared to 2016, its level slightly increased by 11.5 mil. Euro (23.6 %). The positive development was affected by a price factor – an increase in prices, with a weight decrease in gross agricultural production, especially plant production. The positive economic outturn was also reached due to the influences of stability in the payment of subsidies with a simultaneous year-on-year improvement in the sale of animal production, which partially compensated the total decrease in sales from plant production. Without subsidies, most enterprises would be loss-making (Table 3). In 2017, agricultural enterprises optimized their cost factors to achieve a more favorable economic outturn. The economy of product industries was decisive in the changes in the production structure. Revenues reached 2,389.4 mil. Euro, costs accounted for 2,239.2 mil. Eur and they were growing with slower rates (3.5 %) than revenues (4.0 %). The increase in the prices of inputs, especially energies, was reflected in the cost of revenues (99.60 mil. Eur). Revenues from the sale of own agricultural products reached 1,650.2 mil. EUR, of which the sale of plant products reached 921.0 mil. Eur and the sale of animal products noted 729.2 mil. Eur.

Table 3 Economic Data for Agricultural Enterprises – Legal Entities in 2017, In Eur. ha-1 of a.l., in %

Indicator	Legal entities	Agricultural cooperatives	Trading companies
Value added	305	253	349
Total subsidies	315	321	307
Production	1251	1 041	1436
Income costs	95,7	98,5	93,8
Debt to equity ration, in %	46,8	37,8	52
The profit share of enterprises in %	72	70	76

Source: Green report, 2019

In 2018, forest sector earnings and revenue amounted to 1,105.05 million Eur. The largest share of earnings was from forest enterprises' products and services (79.8 %). The total earnings and revenue of forest enterprises reached 595,610 million euros. The largest share of earnings and revenue generated by forest enterprises originated from the sale of timber (79.2 % of the total market production). Other earnings and revenue represent income from the trading with other forest-based products, transplants, by-products of forest production, hunting, tourism, and

forest services, as well as revenue from leasing and selling of forest properties, commercial activities, fiscal capital, and bonds.

Service providers in the forest sector reported earnings of 509.44 million Euro, of which 73.5% were earnings for their own products and services, 22.2 % earnings from the sale of goods, and the rest were other earnings and revenue (Table 4).

Table 4 Earnings and revenue of forest enterprises in current prices (in million Eur)

Indicator	Forest enterprises			Service providers			Forest sector
	State	Non-state	Total	Business companies	Self-employed	Total	
∑ Earnings and revenues	300.66	294.95	595.61	228.56	280.88	509.44	1,105.05
Goods sale	0.25	9.68	9.93	68.88	44.19	113.07	123.00
Earning from own products and services	266.42	241.45	507.87	148.37	226.09	374.46	882.33
- of which timber earnings	245.82	225.95	471.77				471.77
Other earnings and services	33.99	43.82	77.81	11.31	10.6	21.91	99.72

Source: Green Report 2019

Timber is the most important source of income for maintaining forest functions and sustaining employment in the forest sector. Timber sales account for approximately 80 % of earnings and revenue achieved by forest enterprises. In addition to the forest sector, timber is also a basic raw material for the timber processing industry, thus securing employment, earnings, and revenue also in this sector of the national economy. In 2018, the volume of timber supply in total was 9,603,000 m³. In supplies of softwood log grades, 58.2 % of the total volume was the saw logs and 28.5 % the pulpwood. Hardwood supplies have long been dominated by pulpwood which in 2018 accounted for 53.2 % of the total supply. The supply of hardwood sawlogs was 37.5 %. Out of the total supplies, some 2,099,000 m³ of timber was exported; most of it by timber trading companies. In 2018, the total volume of domestic timber consumption was 8.899 million m³ (Table 5).

Table 5 Consumption of timber in Slovakia (1000 m3)

Log grade	Production	Import	Export	Consumption
Softwood (I-III grade)	3,855.67	305.00	860.00	3,300.67
Softwood (IV-V grade)	1,671.59	152.00	632.00	1,191.59

Hardwood (I-III grade)	1,514.63	436.00	468.00	1,482.63
Hardwood (IV-V grade)	2,037.34	319.00	81.00	2,275.34
Fuelwood	523.62	183.00	58.00	648.62
Total	9,602.85	1,395.00	2,099.00	8,898.85

Source: Green Report 2019

Crop production

The cereals market is one of the most important markets in Slovak agriculture. Currently, cereals account for approximately 55% of arable land and 37 % of the value of gross crop production. The basic crops are wheat, barley, and maize. The supply of cereals consists, on the one hand, from domestic production and, on the other hand, on the output from imports. In 2018, 1,928 thousand tones of wheat were produced, 487, 000 tones of barley and 1,516 tones of maize, with wheat and maize production reporting 2,000 growing trend (Table 6).

Table 6 Crop production in 2017-2018 in the Slovak Republic [th.t]

Crop	2017	2018
Cereals total:	3484,1	4037,8
Wheat	1770,7	1927,9
Barley	545,3	486,9
Maize	1066,2	1515,8
Sugar beet	1230,7	1311,9
Potatoes	149,7	170,0
Oilseeds	775.9	794,7
From which: rape	448,6	480.0
Sunflower	246.4	218.8
Legumes	1.07	17.9
Fodder roots	4.1	6.6
Fruits	38,1	51.7
Vegetables	96.2	105.6

Source: Green Report, 2019

From table 6 is clear that Slovak agriculture is not marked with the main traits of industrial agriculture. To the sector are dominating 8 crops alongside fodders, fruits and vegetables. Diversification tendencies in this sector are obvious.

Animal Production

In cattle farming, there was a slight decrease in the number of cattle rearing in 2018. The number of cattle decreased year-on-year, with dairy cow populations remaining at 2017 levels. Numerous conditions of suckle cows have been significantly strengthened. At the end of 2017, there were 438, 9 thousand bovine animals (Table 7).

Table 7 The Structure of Animal Production in the Slovak Republic in 2017-2018

Commodity	Unit of measure	2017	2018
Slaughter animal total	t.slau. w.	103, 667	102,893
Of which: Bovine animals	t.slau. w.	25, 872	24, 853
Pigs	t.slau. w.	79,575	76, 558
Sheep	t.slau. w.	1,090	1, 150
Goats	t.slau. w.	335	331
Slaughter poultry	t.slau. w.	91, 874	92, 158
Cow milk	T	938, 004	932, 592
Eggs	th.pieces	1, 232, 901	1, 248, 055
Sheep milk	T	12, 811	10, 553
Sheep wool	T	592	609

Source: SO SR-figures

2. Characteristics of AKIS

2.1. AKIS description

The entire system is created by public authorities (Ministry of Agriculture and Rural Development (MORD) and its organizations/agencies), public research and education institutes (universities, secondary and vocational schools, research institutes), private sector companies and freelancers, farmers, forest owners based organizations (associations, chamber, unions) and the third sector non-governmental organizations (EKOTREND, EKOPOLIS, forest certification bodies, ENGOs, etc.).

From a legal and institutional point of view, the main coordinator of agricultural extension is MOARD. De facto the all respective works are delegated to Agroinstitut Nitra or in the field of forestry to the Institute for Forestry Extension and Education (IFEE).

For initiation and approval of legislative activities are responsible:

- MOARD,
- Government of the Slovak Republic,
- National Council of the Slovak Republic.

It should be noted, that in this regard important role is played by the initiatives/guidelines, of the European Union and especially prior the each EU programming period, the respective legislation is adopted or accepted. The key methodological and managerial activities including planning, programming, implementation of FAS, monitoring, and evaluation are under the responsibility of Agroinstitut and IFEE. However, in their respective areas with the analogical activities are dealing with cooperating research and academic institutions, furthermore self-governing bodies, as well as advisors and agricultural extension agencies. The target groups are farmers, forest owners, and other stakeholders in the agrifood sector.

2.2. AKIS actors and knowledge flows

As the main actors of the agricultural extension are involved following institutions:

- Ministry of Agriculture and Rural Development,
- National Paying Agency

- Agricultural and Food Chamber
- Food Chamber
- Agricultural Chamber
- Chamber of Forestry
- Chamber of Veterinary Doctors,
- Agroinstitut at Nitra,
- National Agricultural and Food Centre,
- National Forest Centre,
- Slovak Agricultural University at Nitra,
- University of Veterinarian Sciences at Kosice
- Technical University at Zvolen
- Slovak Technical University in Bratislava
- Institute for Forestry Extension and Education,
- Agricultural, Forestry and Veterinary Vocational Schools
- Union of Cooperatives and Business Association
- Youth Farmers Association
- Agency for Rural Development
- Trade Unions, NGOs, NPOs
- Advisors
- Upstream and Downstream Industries

Except for the Ministry of Agriculture and Rural Development and financial/bank institutions, the all above-listed institutions are fulfilling the tasks of dissemination of knowledge and information, as well as the transfer of knowledge/innovations and new technologies. Notwithstanding, they all are dealing with education and training activities. Agroinstitut in Nitra is responsible for:

- coordination of the agricultural extension,
- operating the internet portal – Agroporadenstvo (Agro- Extension),
- taking responsibility for organization and administration of agriculture extension,
- dealing with education activities directed towards advisors,
- is responsible for the accreditation of advisors and certification of extension service's agencies,
- taking care of Central Register of agricultural advisors and advisors.

The Institute for Forestry Extension and Education fulfills analogical activities as Agroinstitut except for Central Registry.

Other cooperating institutes are specialized research organizations, or specialized public agencies, universities, secondary professional schools, vocational schools, farmer's associations, NGOs, NPOs, and private extension service organizations. The receivers of the knowledge, information, education/training, innovations, and new technologies are individual holdings, agricultural enterprises (cooperatives, share-holding companies), food processing factories, farmers' associations, and the other organizations dealing with farmer's activities and their needs. The recent national structure of agricultural extension governance and coordination structures is deployed in the diagram (Figure 1).

2.3. AKIS diagram

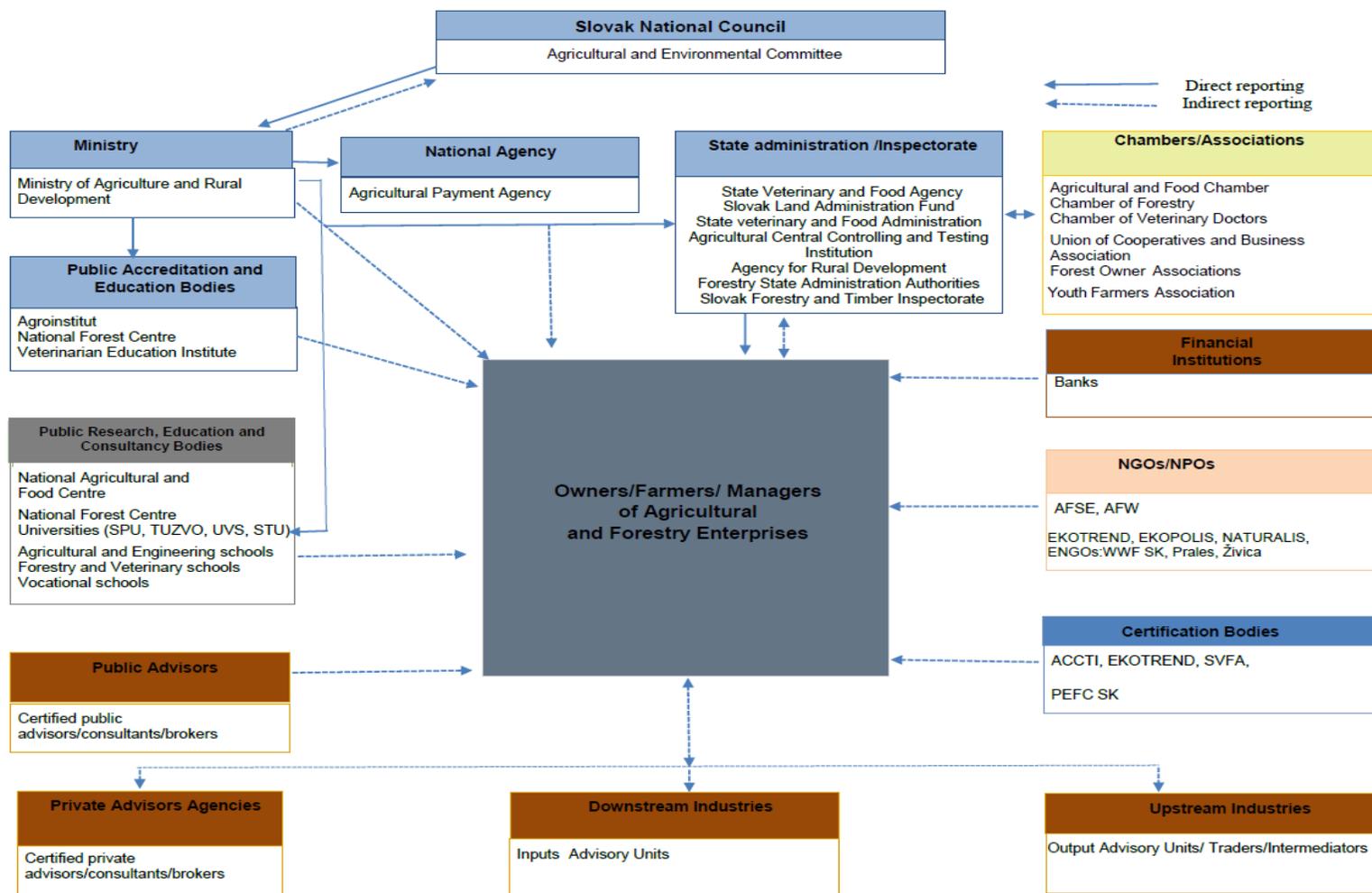


Figure 1 Structure of the Slovak National Agricultural and Forestry Knowledge Information System

The architecture of the Slovak and forestry Advisory System is built upon two pillars from which the first has almost state nature, it is directed from upward to downturn and represents a major driving force in this field, while the second one is composed of the stakeholders with a private business background, or they are formed by the volunteers grouped to the NGOs/NPOs, etc. The management and initiative relationships have the nature of all directions from upward to downturn and vice versa, vertical, horizontal and diagonal. Especially, in the last 15 years, the second pillar is becoming an important driving force in the development of advisory services.

In the frame of the first pillar, the most important task is played by the Ministry of Agriculture and Rural Development, under which direct supervision are three institutions, originally established for continuing education. At the outset of the official advisory system's appearance in Slovakia, these three institutions had been empowered to coordinate legal, professional and educational activities in the field of extension. Agricultural advisory services are coordinated by Agroinstitut located at Nitra. Forestry advisory services are coordinated by the National Forest Centre at Zvolen and in the field of Veterinarian activities the responsibility is undertaken by the Veterinarian Education Institute at Košice.

The second group of public institutions is comprised of public, research, education, and consultancy bodies, which are playing important role in the field of research outputs, knowledge and education. In this respect leading role is with the National Agricultural and Food Centre which is managing all research institutes under the responsibility of the agricultural and forestry sectors.

Within the educational institutions generating new knowledge system in Slovakia are dominating four following universities: the Slovak University of Agriculture at Nitra, Technical University at Zvolen, the University of Veterinarian Sciences at Košice, Slovak Technical University in Bratislava. Into the transfer of knowledge, especially with such an activity as the training of farmers are involved in secondary agricultural /forestry/veterinarian schools, as well as the vocational schools.

The third group of this pillar is created by public and private certified advisors/consultants and brokers. The financial flows supporting three main institutions in the field of advisory services are directed from the MOARD, while to the receivers of the advisory services as well as to advisors the financial supports are provided from Agricultural Paying Agency.

Dominating roles in the second pillar belongs to the three chambers: Agricultural and Food Chamber, Chamber of Forestry and Chamber of Veterinary Doctors. The strengths of the above chambers are in their ability to negotiate policy matters and budgetary issues with the Ministry of Agriculture and Development. They are also directly supported by MOARD, except for the activities with concrete advisory tasks.

The significant and very influential role is fulfilled by downstream industries, namely with inputs suppliers, which are alongside the delivery of inputs undertaking the related advisory services costs of which are incorporated into the procurement prices.

Among the important advisors in the financial field are belonging to various financial and insurance institutions, which are continuously more open towards the agricultural/forest enterprises' needs.

NGOs/NPOs are becoming reasonable providers of advisory services, especially in the field of organic farming and agro-ecological approaches to agriculture. The recent structure of the Slovak public agricultural and forestry advisory services still require further improvements, namely the competencies have to be more precisely defined, on the other side, significant progress was made so far and the needs of primary producers in agriculture and forestry are gradually met by public and private advisors.

2.4. Policy framework at national level

In the Slovak Republic, AKIS is representing a triangle composed of agricultural and forestry science and research, agricultural and forestry education, and agricultural and forestry extension. These main three players are focusing their respective activities on farmers, forestry owners, owners of land (arable, grassland, etc.), food processors, and other involved stakeholders.

The architecture of the Slovak agricultural and forestry knowledge system was built upon the three pillars represented by Ministry 7.

3. History of the advisory system

Broad changes are taking place in the food and agricultural systems worldwide and the Slovak Republic is not an exception. Since 1990, several changes have had a significant impact on the performance and role of the Slovak agricultural sector. The transformation process, building of institutional support, the accession process to the EU global financial crisis, and the increased world commodity prices are the most crucial facts that the agricultural sector faced during the last 30 years. Up to 1990, the innovation system in former Czechoslovakia was developed under the supervision of the Ministry of Agriculture. In Slovakia, the main role in this regard was played by the so-called Institute for Systems Management in Agriculture. Besides, a significant function was undertaken by the sector's research institutions and universities, which collaborated first of all with departments for science and development, usually located next to large-scale production companies and economic units. In 1990, the one year after the socio-economic changes, next to the Livestock Production Research Institute at Nitra has been established the first agency dealing with agricultural extension entitled AGROSERVIS. This was the central leading agency for coordinating all research institutions acting in the field of agriculture. During the same period a new teaching subject, "Business Consultancy", was introduced at the Slovak University of Agriculture, Nitra. In 1991, British ADAS, in cooperation with the British Know-How Fund, organized a two-year intensive course on agricultural extension in former Czechoslovakia. From an institutional viewpoint, to achieve the next development stage, a very significant role was played by the EU PHARE Programme: "Development of Extension Services to Improve Primary Agricultural Production (DESIPAP)". This project initiated institutional capacity-building in the field of agricultural extension in collaboration with the Government. The philosophy and architecture of the Slovak advisory system stemmed from the experiences of EU countries, particularly of Great Britain, the Netherlands, and Austria. In 1998, the public extension system was established. Within this system, 22 extension service centers have been created. Out of these, ten centers were placed next to research institutions, 10 next to regional seats of the Slovak Food and Agricultural Chamber, and two were placed in private companies. From the very beginning, the Agroinstitut (a public institution operating lifelong education in the food and agricultural sector) was responsible for the education and certification of advisors. Despite this positive initiative developed by the Government and the EU, the activities of the above-mentioned centers have never

been fully developed. Due to financial problems and overall supply constraints, these centers were continuously compelled to interrupt their activities. It is important to note here that the extension activities undertaken during this period are now positively evaluated. This refers to the preparation of Slovak farmers on EU accession, to the successful utilization of SAPARD funds, to the transition from a centrally planned to a market-oriented economy, and the development of the rural economy and organic farming. However, up to the time of accession to the EU, this system was never developed in its real terms.

Agricultural knowledge and innovation system has become more important following the accession of the Slovak Republic to the European Union. This is connected to the requirement to meet the conditions for Cross-Compliance. According to Council (EU) regulation number 1782/2003, the agricultural extension system must focus its activities on the minimum requirements defined in the legal norms of production (Statutory Management Requirements – SMRs) regarding the maintenance of land in good agricultural and ecological conditions. Since this is linked to the direct payments system, this fact led to the new, however still not completed, architecture of the advisory system in 2007. It is characteristic that so far no single institute exists to deal with the structure and organizational management of agricultural extension or innovation centers. Such an institute would be in a position to ensure the revival of the agricultural extension system, its modernization, and its comprehensive institutional reconstruction in an effective way, with the aim that such a system would then fulfill all the functions which are expected from modern extension in the field of transmission of new knowledge, innovation and technologies into agricultural practices and to rural areas.

Apart from the forestry educational system (forestry colleges, forestry vocational school, and forestry university) the history of forestry knowledge and innovation system is practically linked to the Institute for the Education and Training of Forestry and Water Management Workers (IETFWMW), which was established in 1978 as a specific unit of the Ministry of Forestry and Water Management of Slovakia. The institute was solely responsible for the preparation of youth for manual occupations through ensuring the educational process at forestry vocational schools. The institute also focused on lifelong learning aimed at increasing and maintaining the qualification of forestry and water management staff in public institutions. Additionally, by organizing specialized training courses

this institute educated experts and advisors for educating and training forestry and water management staff. Furthermore, the institute has elaborated conceptual methodological documents for the management activities of the Ministry of Forestry and Water Management in the area of education and training in the field of basic and further education of workers, provided necessary study materials, and controlled the implementation of educational programs. In the nineties of the last century, the institute was separated from the Ministry and became an individual institution. During this period, it provided lifelong courses, training of managerial staff, professional courses for state administration staff, for rest workers requalification courses, IT and language courses, forestry consultancy for non-state forest owners and managers, and short-term courses aimed at public relation and forestry pedagogy. In 2006, when National Forest Centre was established in Zvolen, the institute became an organizational unit of the Centre as the Institute for Forest Consulting and Education (NFC – IFCE). As a professional educational institution, it ensures further expert education in the field of forestry. By approving Act no. 280/2017 on the provision of support and subsidies in agriculture and rural development and the amendment of Act no. 292/2014 Coll. on the contribution provided from the European Structural and Investment Funds and on the amendment of certain laws as amended, the legal framework for the development of the agricultural advisory system in Slovakia was amended in 2017. According to Section 22 of this Act, the farm advisory system is a system of advisory services for agriculture and forestry, which ensures the transfer of science and research results into practice to improve the management of agricultural and forestry enterprises while complying with sustainable agricultural and forestry requirements.

4. The agricultural and forestry advisory service(s)

4.1 Overview of all service suppliers

The structure of service suppliers reflects the regulatory and voluntary requirements for agriculture and forest management in Slovakia. The most robust system of advisory, educational, training, and knowledge organizations is linked with the institutions providing legislative and professional advice in the area of agriculture and forest management and management planning, which are represented mainly by the state administration bodies, public research, and educational institutions, agricultural, forestry and veterinary schools and agricultural, forestry and veterinary universities. Due to the legislative requirement for each forest owner and manager to ensure professional forest management in the line with the forest management plans, this public system is complemented by a large group of private persons acting as certified forest managers. Additionally, there is a group of private companies providing advisory services for the forest owners regarding particular forest management issues.

Among the agricultural extension services which are listed as suppliers of advice, educational/training activities, information, technologies, etc. are listed 99 advisors in agriculture and 37 in forestry. The largest group is formatted by research institutions followed by academic institutions/universities and secondary vocational schools. The third group is represented by public organizations under the supervision of MOARD (Agroinstitut, IFEE, etc.). The fourth group is composed of self-governing organizations, such as the National Agricultural and Food Chamber which is playing within the Slovak conditions a meaningful role. Furthermore, this group also includes Individual Farmers Association, Agricultural Entrepreneurs Association, Slovak Food Chamber, Youth Farmers Association, Cooperative and business Organizations Union. The fifth group is comprised of suppliers of agricultural services, such as providers of feeds and feeding components, chemical fertilizers, herbicides, insecticides and other chemicals, agricultural machinery, and technologies, IT services suppliers, etc. The sixth group is composed of individual advisors, private extension organizations, including NGOs and NPOs. The important role of extension services' suppliers is fulfilling the Association of organic product producers entitled EKOTREND, EKOPOLIS, and NATURALIS.

The information processed in this section is partly based on a questionnaire survey, which was conducted in September and October 2020 in Slovakia. The survey involved 13 advisory organizations and 9 freelance advisors. The answers of the respondents are included in the following subchapters.

4.2 Public policy, funding schemes, financing mechanisms, advisory service providers

For agricultural extension systems to operate effectively is extremely important to be a timely response to the current and future needs and requirements of farmers. If it is envisaged that agricultural extension should be effective and pose with innovative dimensions, then it is clear that the government will be compelled to pay greater attention to such services. The policymakers of agriculture have to take into consideration the decisive impact of agricultural extension on primary agricultural production through its effective services focused on farmers today's needs and challenges. In this respect, the important role is played by the public financial support provided to the farmers through the target-oriented agricultural services. Among the best practices are included in various kinds of funding schemes.

Funding schemes depend on the legal status and organizational position of advisory institutions. The main public bodies are involved in financial relations with the budget of the Ministry of Agriculture and Rural Development of the Slovak Republic and with the EU through the Agricultural Paying Agency). Alongside this, there are several allowance organizations (the significant part of their budget is provided from the MOARD and the rest of the finances has to be generated from the organization's own activities). Among this kind of organizations belong the following: Veterinarian Education Institute, National Forest Centre, Research Station of the High Tatras National Park, or public enterprises such as Agroinstitut Nitra and the Forestry State EU Administration Authorities. Regardless of this, there is no extra financial chapter assigned to financial advisory services on a systematic basis. In certain cases, however, there are financial resources allocated for specific activities (e.g. publishing specific training materials). The majority of the provided advisory services are financed on a project basis (e.g. Rural Development Programme, Operational Programmes).

The use of certified advisory services supported by the state (scheme de minimis) is for many agricultural farms and forest owners and managers limited by the maximum financial aid of 200,000 EUR over three fiscal years. One of the strategic objectives of the National Forestry Program, which follows the vision and strategic goals of the EU Forest Action Plan and the FOREST EUROPE initiative, is “Increasing long-term competitiveness of forestry and improving the sustainable use of forest products and services”. Under this objective, there is a Priority 13 specified as follows: “To support cooperation of forest owners and to improve education in forestry”. This priority reflects the fact that there are a changing forest ownership structure and the increasing share of forest owners with a lack of skills and capacities for sustainable forest management. Fragmentation of private forest holdings may lead to further difficulties and higher costs in forest management, reducing mobilization of wood and undermining the provision of forest services. Therefore, a well-trained and adaptable workforce is necessary.

4.3 Clients and topics and methods

The main groups of clients receiving consultancy and advisory services are (i) farm and forest owners and managers and (ii) certified advisors and forest managers responsible for the compliance of forest managers’ management practices with the legislative requirements. Certified agricultural and forest advisors, therefore, act, on one hand, as knowledge receivers and, on the other, as knowledge providers. For the AFKIS diagram, they are considered knowledge providers for agricultural and forest managers, who represent final receivers of knowledge. In this line, the main content of knowledge transfer is as follows:

Agroinstitút Nitra provides:

1. training of agricultural advisers
2. issuing a certificate to advisers authorized to provide advisory services
3. administrating public portal of the register of agricultural advisers
4. provides information concerning the register of agricultural advisers to the Ministry of 5. Agriculture and Rural Development of the Slovak Republic and the Agricultural Paying Agency based on their request and cooperates with the National Forestry Center - Institute of Forestry Consulting and Education Zvolen (IFCE)

National Forest center provides:

1. Compulsory training:
 - Certified forest manager
 - Forest reproduction material
 - Eligibility for the elaboration of forest management plans
2. Other training and education:
 - Education in the field of plant protection products
 - Determination of the age of selected game species after hunting
 - Timber quality classification
 - Forest pedagogy
 - Advanced seminar of forest pedagogy - Module A (music therapy, applied zoology and documentary photography)
 - Postgraduate seminar of forest pedagogy - Module B (creative drama, forest botany, project teaching)
 - Advanced seminar of forest pedagogy - Module C (environmental ethics, media communication)
 - Forest guide
 - Symposium of forest pedagogy
 - Forestry minimum
 - Learning about the forest
3. Advisory services:
 - Advisory and consultancy services for forest owners and managers
 - Elaboration and implementation of rural development projects
4. Other forms of knowledge exchange:
 - Direct consultancy for forest owners in the area of forest protection (Forestry Protection Service and RS TANAP)
 - Issuing publication "NFC Research Results for Forestry Practice"

Agricultural advisors registered in the Central Register of Advisors

Currently are registered 99 agricultural advisors who provide extension services in the following areas:

- Crop production
- Animal production
- Food industry

- Economics
- Plant nutrition and pedology
- Mechanization
- Forestry
- Meadows and pastures

The extension agencies present in Slovakia are usually providing advice and consultancy in the following fields:

1. Cross-compliance
2. EU project design
3. Rural development
4. Organic farming
5. Livestock nutrition
6. Crop nutrition
7. Animal breeding and livestock registry
8. Horticultural production
9. Financial, taxation and accounting consultancy
10. Education, training, skills courses in agriculture, food processing, and rural development
11. Information technology
12. Development of farm and rural tourism
13. Development of human resources
14. Inputs and outputs quality standards
15. Fruit production
16. Quality standards and finalization of products
17. The development of agribusiness activities
18. Formulation of marketing strategies and others.

Small commercial farms are using advice and consultancy in the following fields:

1. Livestock nutrition
2. Crop nutrition
3. Rural development
4. Cross-compliance
5. EU project design
6. Organic farming
7. Animal breeding and livestock registry
8. Financial, taxation and accounting consultancy
9. Fruit production

10. Horticultural production
11. Information technology
12. Development of farm and rural tourism
13. Inputs and outputs quality standards
14. Quality standards and finalization of products
15. The development of agribusiness activities
16. Development of human resources
17. Education, training, skills courses in agriculture, food processing and rural development
18. Formulation of marketing strategies and others.

Medium commercial farms are using advice and consultancy in the following fields:

1. Cross-compliance
2. EU project design
3. Formulation of marketing strategies and others
4. Animal breeding and livestock registry
5. Livestock nutrition
6. Financial, taxation and accounting consultancy
7. Crop nutrition
8. Rural development
9. Organic farming
10. Fruit production
11. Horticultural production
12. Information technology
13. Development of farm and rural tourism
14. Quality standards and finalization of products
15. Inputs and outputs quality standards
16. The development of agribusiness activities
17. Development of human resources
18. Education, training, skills courses in agriculture, food processing and rural development

Large commercial farms are using advice and consultancy in the following fields:

1. EU project design
2. Cross-compliance
3. Quality standards and finalization of products

4. Formulation of marketing strategies and others
5. Biofuel station
6. Animal breeding and livestock registry
7. Crop nutrition
8. Livestock nutrition
9. Financial, taxation and accounting consultancy
10. Organic farming
11. Rural development
12. Fruit production
13. Development of human resources
14. Horticultural production
15. Information technology
16. Inputs and outputs quality standards
17. Development of farm and rural tourism
18. The development of agribusiness activities
19. Education, training, skills courses in agriculture, food processing and rural development

Private forestry advisors registered in the Central Register of Advisors

Currently registered advisors for the forestry sector (37) provide services in the following areas:

- Improving the conservation status of species and habitats of European and national importance and strengthening the original biodiversity in the normal management of forest land, especially in NATURA 2000 sites
- Improving the economic performance of forestry by introducing nature-friendly forest management in Natura 2000 sites
- Possibilities of resolving the settlement of unknown forest landowners within the managed real estate in Natura 2000 sites
- Increasing public awareness of the possibilities and benefits of nature-friendly forest management in Natura 2000 sites
- Improving the management of forests damaged by biological and abiotic pests in Natura 2000 sites
- Improving the economic performance of forestry by optimizing the recovery of raw wood assortments in Natura 2000 sites
- Improving the economic performance of forestry by processing less valuable biomass arising from the extraction and handling of wood on forest and non-forest land in Natura 2000 sites

- Possibilities of using advanced technologies for integrated forest protection in stands in the Natura 2000 sites
- Increasing the efficiency of forest regeneration by using new technological procedures and innovations in the production of planting material and forest regeneration
- Marketing and investment support of decision-making in the conditions of forest management in terms of nature-friendly management of forest stands in Natura 2000 areas
- Development of principles and advice for maintaining the favorable status of aquatic habitats in connection with agricultural and forestry activities
- Nature-friendly forest management and the competitiveness of the forest enterprise.

Based on realized research the most often provided advisory services are plant production, vegetables, fruits, vines, herbs, insects, construction design, livestock production, farm machinery, forest protection, conservation, but also entrepreneurship and farm management, use of digital equipment and decision support systems, agri-environmental stewardship measures and nature conservation. The advisory services were offered by freelance advisors and by the advisory organization. 13 advisory organizations involved in research employed 129 employees out of which are 55 women. Out of 129 advisors, 95 of them have more than 10 years of professional experience in offering advisory services. 30 advisors involved in research have from 3 to 10 years of professional experience and only 4 advisors have less than 3 years experience. Most of them have an engineer or master degree. 4 of them have a Ph.D. degree. 4 advisory organizations have national advisory certificates and 21 employees have national advisory certification and others, such as lead auditor in FSC and PEFC certification. In these organizations are regularly planned staff strategic plans and human resources are dedicated to the back-office activities. These advisory organizations permanently watch new developments and updates in certification standards and react to necessary needs for new training of advisors. The main sources of funding advisory services are from National/Regional government funds (public funds); cost-recovery from farmers (fee for service financing) and EU CAP projects and funds.

Other actors in the private sector provide consultancy and advice according to their professional orientation (forest management and nature protection issues,

marketing, tax and legal advice, support with grant applications, etc.). Forest management planning companies provide information on forest management practices through the elaboration of forest management plans for forest managers and certified forest managers. Forest certification body PEFC Slovakia provides regular training for PEFC certified forest managers about the requirements of the Slovak Forest Certification Scheme. Associations of forest owners organize training and consultancy for their members in the area of revised legislative requirements for forest management. Some ENOs requiring passive forest management in protected areas advise forest owners on possibilities to apply for financial compensations.

4.4 Human resources and methods of service provision

The advisory services and training programs in the field of agriculture, food processing and rural development, are organized by **Agroinštitút Nitra**, which was entrusted by these activities Slovak Ministry of Agriculture and Rural Development. Agroinštitút Nitra provides training of agricultural advisers in the above-mentioned fields issuing a certificate to advisers authorized to deliver advisory services. Furthermore, this institution administrates the public portal of agricultural advisers' register. Also provides information concerned with to register of agricultural advisers to the MOARD and the Agricultural Paying Agency based upon their request. In addition to this, Agroinštitút cooperates with the National Forestry Center - Institute of Forestry Consulting and Education Zvolen (IFCE).

The Institute for Forest Consulting and Education as a consultancy body of the Forest National brings together the leading experts from practice, science and research, universities and secondary/vocational schools, as well as the representatives of state administration bodies.

Training methods used in cooperation with owners, farmers, or agricultural managers are as follows:

1. Workshops,
2. Vocational training,

3. Face-to-face meeting,
4. Field/farm days,
5. Agro portal – web page information about legislation, new projects/program calls, professional information, new varieties of seeds, fertilizers and other chemicals, feeds, animal genetic resources, quantitative measures, information about seminars, conferences training, smart technologies, climate, smart technologies, data-driven agriculture, etc.
6. Phone helpline,
7. Field schools,
8. Helpdesk for individual questions through the website,
9. Publication (leaflets, etc.),
10. Online meetings (Zoom, MS Teams, Skype, etc.)

One of the most important prerequisites of a well-functioning agricultural extension system is that advisors are good professionals; they are competent in communications with their clients and have a positive approach towards them. These two pre-conditions are essential requirements for the establishment of a professional and market-oriented extension system. The concept of an extension system in Slovakia is stemming from the demands based upon the tasks, the direction of the service, and quality of communication. Applied research requires impetus from farmers and other stakeholders to know which fields should be explored. On the other hand, for an extension, it is important to know what kind of information and knowledge are needed for its clients. Alongside this, both consultants and researchers should know that they have to use clear and understandable communication language. The acceptance of the advice provided by the consultant depends, to a great extent, on his/her communication skills. Furthermore, extension services have to take into consideration the fact that different groups of clients would require diverse types of information and agricultural and food technologies.

The research showed up those freelance advisors as well as advisory organizations apply most frequently advisory methods individual face to face advice on the farm/enterprise; individual face to face advice outside the farm/enterprise (e.g. advisory office); individual advice via telephone; individual advice via digital apps (e.g. skype call, WhatsApp chat, telegram). The pandemic COVID – 19 changed methods of providing advisory service to offering individual advice via digital apps

(e.g. skype call, WhatsApp chat, telegram, emails) and group advice via webinars. The advisory services and training programs organized by the Forestry State Administration Authorities and respective research and consultancy bodies (Forest Protection Service Centre and Control of Forest Reproduction Material of the National Forest Centre and RS TANAP) are provided by their staff. Educational programs are implemented in the form of lectures, conferences, seminars, workshops, but also the form of practical training. Teaching processes are taking place in specialized classrooms equipped with teaching aids and audiovisual technology.

4.5 Programming and planning of advisory work

The programming and planning of advisory works are in a great deal depending on the planning period. The most important and frequently used is **planning per annum**. This is initiated by MOARD and has an upward-downward direction alongside the institutional verticals. During this process are allocated financial resources to the individual AFKIS players/suppliers and the concrete tasks are expressed as the purchase order. The research and agricultural public organizations/institutions are upon the budget and task allocation preparing their annual plans with concrete activities, methods, and communication with targeted groups.

Second kind of **Programming and Planning for 7 years time horizon** in connection to CAP for given time horizon 2021-2027, the FAS with a purpose to use advisory services by farmers, or to establish them and last but not least, there is the Concept for Agriculture and Rural Development. This is usually formulated for the period which is matching with the implementation of CAP. The agricultural extension is its organic part.

The monitoring and evaluation of the implementation of the programming process are realized through the so-called „Green report“ which is prepared by MOARD every year following after the implementation period. This report is submitted for approval to the National Council of Slovak Republic.

There are systematic programming and planning of advisory work in the area of compulsory training and education provided by the forestry state administrations and public bodies for certified forest managers and forest owners and managers

in order to meet the legislative requirements for forest management. In particular, the training of certified forest managers is governed by a ministry regulation required regularly.

In case of changes in forestry and forestry-related legislation, there is additional training organized for forest owners by the forestry state administration and public educational and research bodies. Similarly, forest owners associations organize training for their members. In case of any revision of the national sustainable forest management standards, PEFC Slovakia organizes training for the holders of certificates.

Other services provided by private companies and other actors are applied on an ad hoc basis depending mainly on the available funding schemes and grant project calls.

4.6 Advisory organisations forming the FAS and evaluation of their FAS implementation

The coordinating bodies in the frame of FAS are organizing knowledge sharing activities among all actors, farmers, other stakeholders and advisors. The other function is also to enhance synergies between various instruments such as advice, training, information, extension services and research. Agroinštitút and IFEE at Zvolen, are organizing basic and regular follow up training for each advisor. The best practices are provided to users of agricultural extension services through an internet portal. The list of accredited advisors and certified organizations with contact details is provided on the webpage of Agroinštitút, IFEE and the National Food and Agricultural Chamber, as well as the Forest Chamber.

The main body covering the area of forestry education, training and knowledge transfer is the National Forest Centres (NFC). NFC is a state-owned public-benefit corporation, which is governed by the Ministry of Agriculture and Rural Development of the Slovak Republic and methodically guided by the Ministry Section of Forestry and Wood Processing. The center merges forestry science, research, consulting, education and forestry practice and consists of four institutes professionally oriented on a particular area within forestry - Forest Research Institute (FRI), Institute for Forest Consulting and Education (IFCE), Institute for

Forest Resources and Information (IFRI) and Forest Management Planning Institute (FMPI).

The Forest Research Institute implements the tasks in the field of forestry research and development, especially deals with environmental issues linked to forest ecosystems. It resolves research projects, mostly upon the request from national and international grant agencies and research programs following the initiatives of the project's founders. It is directly taking part in the implementation of the forests health's monitoring, the national inventory of forests and also monitors the state of forest ecosystems and their components. It is providing the operation of the Forest Protection Service Centre and Control of Forest Reproduction Material. The Forest Research Institute carries out the following activities: review, expertise, educational, librarian, editorial, advisory and public relations functions. It assists and ensures the realization of results of research and utilization of current scientific knowledge in the management of forests by state and non-state owners.

The Forest Management Planning Institute resolves tasks regarding the future development of forest management, creation and updating of methods and implementation procedures, creates a concept and methodical procedures of forest management planning; evaluates, assures quality and continues the work of Forest Management Plans; ensures and performs finding of data of complex detection of the state of forests and ensures the process of public procurement for Forest Management Plans.

The Institute for Forest Resources and Information is the administrator of the Information System of Forest Management. It ensures the creation and management of maps with thematic forest management content. It collects and manages information about the state of forests and those required for forest mapping.

The Institute for Forest Consulting and Education is a professional educational institution that delivers continuing expert education in the field of forest management. The target group for the education programs consists of the employees of state and non-state forestry institutions on various levels of supervision. Around 1500 people take part in the educational activities that the Institute for Forest Consulting and Education conducts, mostly employees of forest management. The insurance of quality is the accreditation of the educational courses via the Ministry of Education, Science, Research, and Sport of

the Slovak Republic. There is a range of extra activities aimed at the work with the public and forestry education. Forestry education appears in exhibition activities at various fairs such as AGROKOMPLEX or LIGNUMEXPO, but also in natural science-oriented competitions or competitions related to special events e.g. European Week of Forests or International Day of Forests. Some programs within forestry education are dedicated to special groups – children in healthcare institutions, clients with special needs, seniors in centers of social services.

The role of private advisors and independent consultancy companies is mainly in the elaboration and implementation of forestry development projects (usually financed within the project calls under the Rural Development Programme).

So far, there is no system for monitoring and evaluating the efficiency of individual methods, forms, or measures promoting advisory services regularly. The efficiency of advisory services provided for forest owners is evaluated only for specific grant projects (e.g Rural Development Fund projects).

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5. Summary and conclusions

5.1 Summary and conclusions on sections 1 - 3

The establishment and foundation of agricultural extension advisory services in the Slovak Republic was very diverse concerning its development during the transition period from centrally planned to the market economy, preparation for EU accession, as well as after the post-accession period. From the very outset, scientists, university professors and teachers of the secondary/vocational schools were very eager to start with the establishment of the public and private agricultural advisory services. The significant state support for this activity was launched in 1998 when the first public agricultural and forestry extension systems were introduced. Regardless of this, receivers of advisory services were fully relying on the free of charge services, especially due to their unfavorable financial situation. As this their intention was only partly realized, the interests of clients in advisory services have declined. The driving force for the dynamic revitalization of advisory services was the EU programming period 2007-2013 in the frame of which was posed the fulfillment of the Cross-compliance requirements. As a consequence of this, the advisory system did moderate progress and continuously is improving. Its more significant development was braked by the adverse economic situations of the agricultural holdings. From 1994 up to 2000 all of the Slovak agriculture farms experienced negative economic results. Net profits were only achieved in 2005, the first year after EU accession. This trend continued up to 2008 but later as a result of the impact of the world financial and economic crisis and the extensive floods in 2010 total expenses rose higher than net profits. From 1990, the share of agriculture, forestry and fisheries of the gross domestic product has continuously declined and in 2011 it was recorded to be only 2.69 percent (as a comparison, in 1990 this indicator was 6.60 percent). In 2017 the share of agriculture on GDP dropped even by 1.6% The analogical trend was also noted for food processing, the share of which was 2.67 percent of the national GDP in 1995, while in 2010 it was only 2.00 percent. In the year 2017 this indicator scaled-down to 1.3%.

One of the most important priorities of the Slovak agricultural and forestry system must be to support the innovation processes on the agricultural holdings through the modern technologies, knowledge and information transfer to the farmers, owners, agricultural managers and forest owners. This priority reflects the

changing production and ownership structures and the increasing share of land and forest owners who lack competitiveness and required skills/ capacities for sustainable agricultural and forest management. Fragmentation of private holdings caused mainly by heritage's processes may lead in agriculture and forestry to further challenges, such as higher costs, lagging innovation processes and lower ability to compete for both on domestic as well as on the foreign trades. Moreover in the forest, this is reducing the mobilization of wood and undermining the provision of forest services. Therefore, a well-trained, adaptable and younger workforces are necessary. The structure of service suppliers reflects the regulatory and voluntary requirements for agriculture and forest management. The most robust system of advisory, educational, training and knowledge organizations/agencies are linked to the institutions providing legislative and professional advice in the area of agriculture and forest management and their planning, These are represented first of all by the state administration bodies, public research and educational institutions, vocational schools and agricultural/forestry universities. An additional group is formed by associations, trade unions, and chambers. There are also several non-profit organizations, such as certification bodies or environmental NGOs and NPOs.

Funding schemes depend on the legal status and organizational position of advisory institutions. The main public bodies involved in financial relations with the budget of the Ministry of Agriculture and Rural Development of the Slovak Republic are either budgetary organizations (Agricultural Paying Agency), allowance organizations (Veterinarian Education Institute, National Forest Centre, Research Station of High Tatras National Park) or publicly owned enterprises (Agroinstitut Nitra). Forestry State Administration Authorities are from an account point of view included under the budget of the Ministry of Agriculture and Rural Development. However, in all cases, there is no extra financial chapter/line directly assigned to financial advisory services on a systematic basis. In specific cases, however, there are financial resources allocated for certain activities (e.g. editing/publishing specific training materials). Most of the provided advisory services are financed on a project basis (e.g. Rural Development Programme, Operational Programmes).

The advisory services and training programs organized by public and private actors are provided with the utilization of leading experts from the fields, science and research, university teachers and teachers of the secondary/vocational schools, as

well as representatives of state administration's bodies. Specialized training is provided by registered certified agricultural and forestry advisors. Educational programs are implemented in the form of lectures, conferences, seminars, workshops, farm days, field days, exhibitions, excursions but also in the form of practical training.

The main groups of clients to whom are a consultancy and advisory services provided (i) farm and forest owners and managers and (ii) certified advisors and agricultural/forest managers responsible for compliance of forest managers' management practices with the legislative and institutional requirements. Certified agricultural and forest advisors, therefore, act, on one hand, as knowledge receivers and, on the other hand, as knowledge providers. According to the AFKIS diagram, they are considered as knowledge providers for agricultural and forest managers, who are the final knowledge receivers.

5.2 Summary and conclusions on sections 4

The advisory system in the Slovak Republic has its number of pros and cons. From institutional, financial, legislation and human resources points of view, the advisory system has all preconditions for sufficient transfer of knowledge into agricultural primary production and to forestry. However, a serious shortcoming is the absence of a systematic approach to monitoring and evaluation of advisory services 'efficiency. Also, it has to be highlighted that the existing advisory system both in forestry and agriculture has to undergo substantial reform.

The substantial gaps can be summed up in the following points:

- there is no stable and systematic way of financing advisory and consultancy services for farmers, agricultural and forest owners and managers, So, from an entrepreneurial point of view the provision of advisory services is up to date not providing a stable business environment and it is connected with several uncertainties.
- Current system does not allow to support integrated projects aimed at global problem resolution,
- The needs of agricultural and forest owners/managers in the area of advisory and consultancy services are not monitored and on regular basis,

therefore advisory services do not reflect on farmers' and foresters' needs in time and with perspective visions.

- a share of finances from the total budget for agricultural projects allocated to development projects in the sector is only 7-8 %. However, this is the main driving force to the advisors and consultants to do the business in this area,
- the entire system is complicated, due to demanding requirements for certification, furthermore not very clear financial supporting measures, and also many actors play compromising roles in the area of education and training, while on the other side the services with the delivery of progressive technologies and research knowledge transfers are missing,
- in Slovak agricultural and forestry environment is a lack of institutions providing innovative solutions and orientation on innovations (e.g. bioeconomy, robotic technologies, smart climate technologies, etc.). Also has to be highlighted that implementation of new technologies advised by advisory services is limited by the insufficient agricultural holdings financial resources caused by their low efficiency embodied to the low profit and hence to moderate incomes.
- grant projects for farmers, agricultural and forest owners are supported under the “de minimis” scheme, which is financially limited (once the financial limit is used for the project implementation, there are no financial means left for agricultural and forest owners to pay for advisors and consultancy services for other projects,
- Except for legislative and institutional requirements for management, the system of planning other advisory work does not exist,
- there is no well-operating monitoring system implemented measures' efficiency of the advisory system,
- the number of passive agricultural and forest owners/farmers who are not interested in any advisory services is increasing. The main reason for this is connected first of all to the low attractiveness, especially of agriculture, due to its low profitability. Therefore, farmers and forest owners strive to minimize their costs as much as is reasonable. Such an approach that compromises the provision of effective advisory services has an adverse effect on the enhancement of agricultural production, and accordingly on the higher incomes.

The identified positive aspects and future trends are as follow:

- the whole sector of advisory services is moderately developing, and its quality is increasing, due to the EU CAP programming activities and to the increasing capacity of advisors to benefit from the various supporting measures.
- advisory and consultancy services are provided for free unless they are related to the design of projects which are going to be submitted for approval to the Agricultural Paying Agency, upon the call in certain programming activities. Also, the advisory agencies are frequently involved in the implementation of the EU projects, if they have been approved,
- the existing structure of state administration and public bodies is satisfying to the advisory work-related to legislative, institutional and professional requirements for agricultural and forest management,
- advisory services in the traditional management topics are well covered by the current institutional capacity,
- in light of the recent challenges related to climate change, it is expected that the advisory services will be oriented on the area of ecosystem adaptation to changing conditions as well as new legislative requirements,
- . furthermore, advisory services have to inhibit agricultural and forestry sectors to implement agroecological approaches, agroforestry trends, organic farming, precision agriculture, data-driven agriculture, as well as smart agriculture and climate-smart agriculture because of the protection of natural resources.

6. Acknowledgement of partners, information sources and gaps

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8. Appendix

Annex 1 - List of organizations identified in AFKIS

Status	Type	Organization
Public authorities	Slovak National Council	Agricultural and Environmental Committee
	Ministry	- Ministry of Agriculture and Regional Development of the Slovak Republic (MOARD)
	State administration/Inspectorate	- State Veterinary and Food Agency - Slovak Land Administration Fund - State Veterinary and Food Administration - Agricultural Central Controlling and Testing Institution - Agency for Rural Development - Forestry State Administration Authorities - Slovak Forestry and Timber Inspectorate
	National agencies	- Agricultural Payment Agency
Public accreditation, research and education institutes	University/ Research Institutes	- Slovak Agricultural University in Nitra (SUA) - Technical University in Zvolen (TUZVO), Centre for Continuing Education of TUZVO - Slovak Veterinary University - National Agricultural and Food Centre (NAFC) - National Forest Centre (NFC) – Forest Research Institute (FRI) - Research Station of the State Forests of the Tatra National Park (RS TANAP)
	Public accreditation and educational bodies	- Agroinštitút Nitra - National Forest Centre (NFC) – Institute for Forest Consulting and Education (IFCE) - Veterinarian Education Institute
	Agricultural and Forestry Vocational Schools	- Vocational Agricultural Schools (Bratislava, Levice, Trnava, Nitra, Lučenec, Topoľčany, Zvolen, Liptovský Mikuláš, Košice) - Veterinary Vocational Schools (Košice, Trenčín, Trnava, Nitra, Žilina, Kežmarok, Bratislava) - Forestry Colleges (Banská Štiavnica, Liptovský Hrádok, Tvrdošín) - Vocational Forestry Schools (Banská Štiavnica, Bijacovce, Ivanka pri Dunaji, Prešov, Poltár)
Private sector	Upstream industries	- Output Advisory Units Producers, Traders, Intermediators
	Downstream industries	- Inputs Advisory Units - Forest-based industries (solid, panels, pulp and paper)

	Independent consultants and advisory companies	<ul style="list-style-type: none"> - Private consultants and companies - Certified consultants and companies - Publishing house LESMEDIUM
Owners /Farmers/Managers of Agricultural and Forestry Enterprises NGOs	Associations/Chambers	<ul style="list-style-type: none"> - Union of Cooperatives and Business Association - Youth Farmers Association - Council of the Non-state Forest Owner Associations (CNFOA) representing the interests of the members: Slovak Union of Diocese Forests, Slovak Association of Municipal Forests, Union of Owners of Private, Community and Municipal Forests of Banská Bystrica Region, Slovak Union of Regional Associations of Non-state Forest Owners -Agricultural and Food Chamber (AFC) -Slovak Forestry Chamber (SFC) -Chamber of Veterinary Doctors Slovak (CVD)
	Trade Unions/NGOs/NPOs	<ul style="list-style-type: none"> - EKOTREND - EKOPOLIS, - NATURALIS - ENGOS (WWF Slovakia, Prales, Živica) - Association of Forest Sector Employers (AFSE) - Association of Forestry Workers (AFW)
	Forest certification schemes bodies	<ul style="list-style-type: none"> - ACCTI - EKOTREND - SVFA - PEFC Slovakia

AKIS and advisory services in *Slovenia*

Report for the AKIS inventory (Task 1.2) of the i2connect project

Date: December, 2020

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Executive summary

Agricultural production in Slovenia is predominantly taking place on small-scale farms. This is also reflected in terms of standard output distribution: almost 70% of farms fit into the class of 2.000 - 5.000 € of standard output. The demographical and educational structure of farm managers present a challenge: 30% of them are older than 65 years and only 1.3% of farm managers have completed their studies on agronomy on university level. And additional important issue is small family farms low market orientation.

The basic characteristic of Slovenia's agriculture is that for a long time it developed in exactly the opposite direction than taken by agriculture in the majority of other European countries. This applies especially for the agrarian structure and its development. While in developed western European countries, together with the improvement of agricultural technology, the process of enlargement of farms and concentration and specialization of production were going on relatively fast, in Slovenia the exact opposite process occurred right up to the beginning of the 1990's, largely in the private sector of Slovene agriculture. This process is characterized by permanent decrease and fragmentation of the land property, by low working intensity of production and, in some areas, by gradual abandoning of production and the consequent overgrowing of farm land. Although Slovene agriculture is forced to manage in more difficult production circumstances due to the natural conditions, it is primarily socio-economic factors such as poor size and property structures of farms, the low level of professionalization, and the still relatively low work intensity, that decisively obstruct more rapid technological progress and modernization.

We can recognise lack of permanent monitoring system on AKIS in Slovenia. There are no special analyses done yet of the national AKIS in Slovenia. Anyway we estimate that knowledge, creativity and innovation are deficient factors of Slovenian sustainable development, similar as perceived in other European countries, and in particular the following shortcomings are evident: duplication of tasks between various knowledge-creating institutions, sporadic, random forms of cooperation, which are predominantly the result of informal ties between individual experts from different institutions, a relatively slow transfer of knowledge to end-users, and thus the transfer of knowledge into practice, and in



particular the practically weak return flow of information on the needs from practice to the research sphere.

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Abbreviations

AKIS	Agricultural Knowledge and Information Systems
CAFS	Chamber of Agriculture and Forestry of Slovenia
FADN	Farm Accountancy Data Network
FAS	Farm Advisory System
FAService	Farm Advisory Service
NGO	Non-governmental Organisation
RDP	Rural Development Programme

1. Main structural characteristics of the agricultural and forestry sector

Due to the distinctive dissection of the relief, Slovenia most certainly does not rank among the countries with natural assets favorable to agricultural production. On the contrary, in the European space Slovenia belongs to the circle of countries with the most unfavorable production conditions because of its diverse and mountainous relief and large proportion of karst areas. While poorer production conditions do not necessarily make agricultural production impossible, they result in the lower production capability of farms and a smaller choice of cultures and production orientations, and in general, they weaken the adaptability and competitiveness of Slovene agriculture.

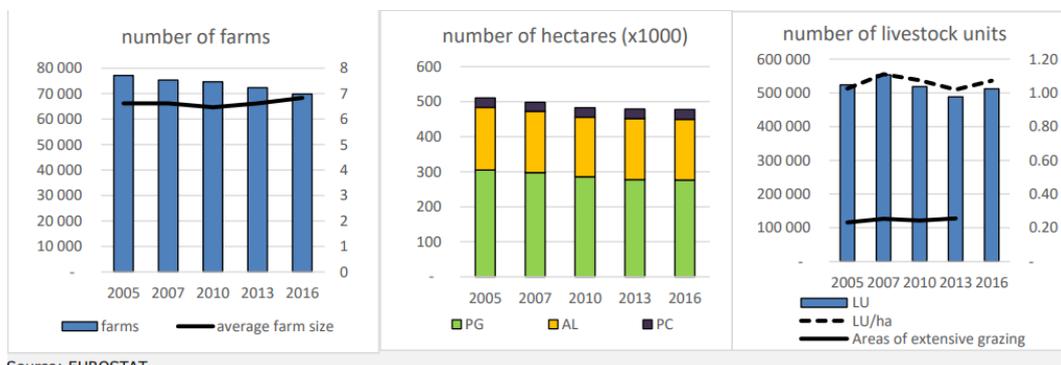
The quite specific and variegated structure of the use of farmland also influences the low level of adaptability of agriculture. With the exception of the flatlands of the sub-Pannonian region in the north-east and smaller consolidated areas in the bottoms of valleys and plains, Slovenia has no significant areas suitable for crop production. In spite of an advantageous geographical position that allows extensive and mostly qualitative production in fruit growing and winegrowing, the proportion of land under permanent orchards and vineyards is much lower than in countries with similar production conditions. Some two thirds of all farm land is grassland that is poorly exploited on the average relative to the frequency and the manner of use, which is dominated by two- and three-harvest meadows, extensive pastures, and hayfields.

Farm Structure in Slovenia, there were 70,063 agricultural holdings in Slovenia in 2016. Although the **number of agricultural holdings decreased**, the utilised agricultural area was stable and was in 2016 476,682 hectares, but the number of livestock units (LSU) has increased (to 418,512 LSU in 2016).

An average agricultural holding in Slovenia in 2016 used 3,91 hectares of permanent grassland, 2,51 hectare of arable land and 0.38 ha. Agricultural holdings in Slovenia use 898,365 hectares of land, approximately 53% of land is utilised agricultural area, about 44% is forest, 2% is unutilised agricultural area and 2% is barren land.

Among 476,682 hectares of utilised agricultural area the largest share is permanent grassland (57.5% or 274,251 hectares), followed by arable land (36.8% or 175,519 hectares) and permanent crops (5.6% or 26,913 hectares). While the area of permanent crops remained almost the same in 2016 as in 2013 (1.3% less than in 2013), the areas of individual permanent crops changed quite a bit. The area of olive groves increased by 14.7% (to 1,038 ha), the area of orchards by 4.6% (to 10,245 ha), while the area of vineyards decreased by 5.6% (to 15,331 ha).

80% of agricultural holdings breeds animals. 55,814 agricultural holdings in Slovenia are breeding animals in 2016 (7,5 LSU). The most common type of livestock on agricultural holdings is still poultry, since it is bred on more than half (54%) of all agricultural holdings. The second most common type of livestock is cattle; it is also bred on almost half of all agricultural holdings (47%). Pigs are bred on 32%, sheep on 9%, horses on 8% and goats on 7% of all agricultural holdings.



Source: EUROSTAT

Figure 1 Number of farms, number of hectares and number of livestock units

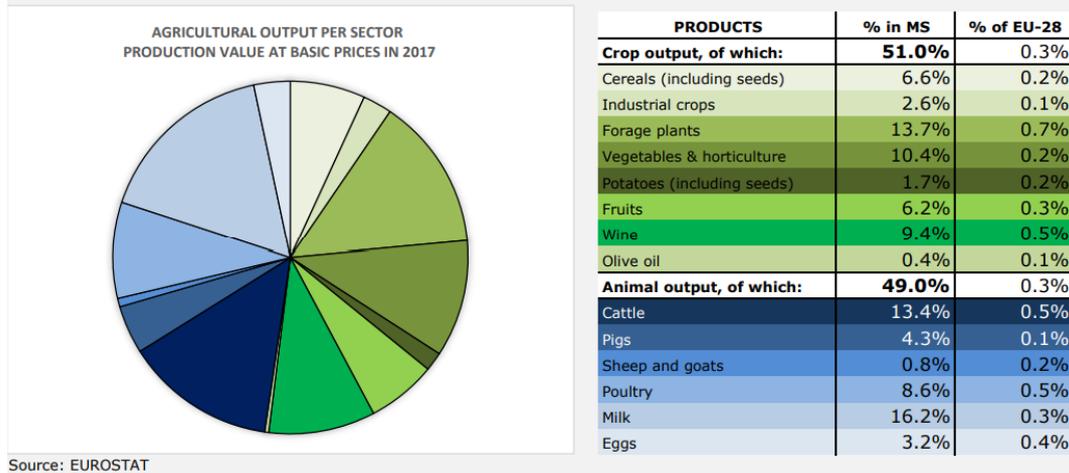
In Slovenia, the agricultural income per worker is on average about 22% of the average wage in the whole economy between 2005 and 2018. This share ranges from 25% in 2015 and 2018 to 19% in 2009 and is below the EU-average. At EU level, the gap between the agricultural income per worker and the average wage in the economy seems to be closing over time. The average agricultural factor income per worker fluctuates around EUR 5 200 between 2005 and 2018. Agricultural income per worker is rather stable with small peaks in 2011, 2015 and 2018 above EUR 5 500. Direct payments form about 31% of the agricultural factor income in Slovenia in 2017. Total CAP payments form about 60% of the agricultural

income in Slovenia. ANC payments are important for livestock farming sectors. The income per worker is above average for (COP) field crops, granivores, and wine and milk farms. Income per worker is on average lower in the livestock sector (sheep and goat, cattle and mixed livestock). The average income for mixed livestock farms is negative in 2012 and 2015. Currently, Slovenia uses 15% of their direct payments to provide coupled support to small grain cereals, beef fattening, milk production in mountain areas, vegetables and protein crops. The income per worker is lower for smaller farms. Income per worker increases with farm size. The share of direct payments in the income per worker decreases with farm size.

The average economic farm size in Slovenia is the highest in the age class of 25 to 34 years old. The economic farm size increases in all age cohorts, but it grows faster in the lower age cohorts.

Agricultural output per sector

The circle diagram gives an overview of the importance of different sectors based on the output at production value. Milk (16.2%), forage plants (13.7%) and cattle (13.4%) are the most important sectors in terms of production value in Slovenia in 2017.



Source: EUROSTAT

Figure 2 Agricultural output per sector

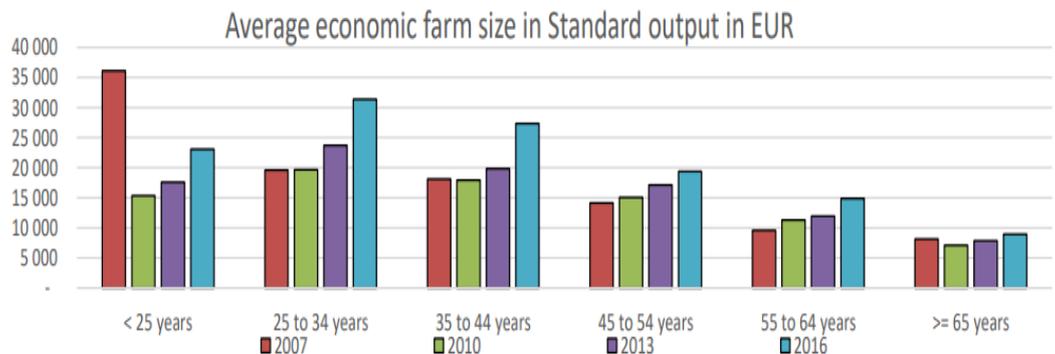


Figure 3 Economic farm size per age class

Source: DG AGRI - EUROSTAT

Agricultural training of farm managers 59% of farm managers below 35 years of age had at least a basic level of agricultural training in Slovenia in 2016. This is higher than the share of total farm managers in Slovenia (50%) in 2016. The share of 'young' farm managers with at least a basic agricultural training in Slovenia is higher compared to the EU average.

In Slovenia, 50% of the total farm managers attained basic or full agricultural training in 2016. This share increased over time. Compared to the EU, the share of farmers that attained full agricultural training (meaning any training course continuing for the equivalent of at least two years full time training after the end of compulsory education and completed at an agricultural college, university or other institute of higher education in agriculture) is higher in Slovenia.



Figure 4 Agricultural training of farm managers

Source: DG AGRI - EUROSTAT

The rural employment rate in Slovenia steadily increased from 67% to 74% in 2008. However, after the crisis in 2008 the (rural) employment rate decreased to 68% by 2012, and after 2012 climbed again back to 2008-level in 2017. The employment rate in predominantly rural areas is a little higher than the average employment rate in Slovenia. The employment rate in rural areas in Slovenia is above the EU-average rural employment rate in 2017 (74% vs. 72.6%).

Biodiversity in Slovenian agriculture: In Slovenia, only 28% of agricultural habitats were in a favorable status in 2012. 50 % of grassland had an unfavorable-bad conservation status. The more favorable areas are located in the northwest of Slovenia. To improve biodiversity, 55.6% of land is under contracts to improve biodiversity and/or landscapes in Slovenia in 2017. In Slovenia increase the number of organic farming from year 2015 to year 2020. Around 10% of agricultural land is covering by organic farming.

Agricultural holdings and area with organic farming					
	Ø 2005-09	Ø 2010-14	2015	2016	2017
Number of agricultural holdings	1,951	2,722	3,417	3,518	3,635
• with organic farming	1,573	2,154	2,699	2,933	3,190
• in conversion to organic farming	378	568	718	585	445
Utilised agricultural area (ha)	27,709	35,568	42,188	43,579	46,222
• with organic farming	22,329	28,978	32,488	36,353	40,349
• in conversion to organic farming	5,381	6,590	9,700	7,226	5,874
Area with organic farming by land use (ha)					
Arable land	2,186	3,923	5,359	5,700	5,942
of which: vegetables and strawberries	114	181	281	267	227
Orchards	611	1,008	1,466	1,608	1,870
Vineyards	154	346	495	536	561
Olive groves	24	157	214	240	243
Nurseries	-	0	-	0	0
Permanent grassland	24,733	30,132	34,653	35,494	37,607

Source: SORS (Organic Farming), calculated by AIS

Figure 5 Agriculture and environment

Forestry

Slovenia is characterized by a very high degree of natural diversity. In addition to its varied topography and geology, the continental, Alpine and Mediterranean

climates converge in Slovenia. The forest has always been present and important in this environment. Today, we are aware not only of its economic significance but also of its role in conserving the biological diversity of the landscape and alleviating the impact of natural disasters and human pollution; equally it is important in the balanced development of the countryside and as a natural environment for human recreation.

Slovenia is one of the most densely afforested countries in Europe. Forests cover 58,1 percent of the surface area, or 1 100 000 ha, and dominates as much as three-quarters of the landscape. Much of the present forests originate from overgrown farmland, since in 1875 only 36 percent, and in 1947 44 percent of the surface area of Slovenia was covered by forest. According to the objectives of rural development, no substantial increase in forest coverage is expected in the coming decade. Most of Slovenia's forests are in the region of beech (44 %), beech-fir (15 %) and beech-oak (11 %) sites, all of which have a relatively strong productive capacity (Table 1). Thermophile deciduous and pine sites, which account for only about 12 percent of the total surface area of the Slovenian forest land, are poorer or arid.

In 2018, the removal in Slovenian forests was about 22% larger than in 2017. 6,060,959 m³ of timber was felled, of which 4,367,576 m³ of coniferous trees and 1,693,383 m³ of non-coniferous trees. There was still a lot of wood that had been felled due to damage from the 2014 ice storm and bark beetles, and the wind damage in 2017. Thus, sanitary felling amounted to approximately 67% of the total timber removals. The total removals represented 89% of the allowable removals under forest management plans.

Common agricultural policy and budgetary support

In 2017, in the framework of direct payments the implementation of schemes continued: the basic payment, green payment, additional payment for the new entrants to Young Farmers scheme, and optional payment in the framework of Small Farmers scheme. Additionally, the agricultural holdings could apply for production coupled payments for small grain cereals, vegetables, cattle and milk production in mountain areas, whereas the coupled payment for protein crops was abolished. In 2017 subsidies for protein, crops were abolished and a new payment for the areas with natural constraints based on the slope steepness (eligible agricultural area in mountainous areas with slope steepness of 35 %-50

%, or above 50 %) was introduced. Due to the external convergence, the national envelope for direct payments decreased to 136 mill. EUR (137 mill. EUR in 2016). The implementation of the measures defined in the RDP for the period 2014–2020 also continued. By the end of 2017 approximately 460 mill. EUR had been granted for twelve measures and technical assistance (42 % of the program's available resources; 1,107 mill. EUR) of which 291 million (26 %) had been paid out. Most of the payments (81 %) were paid for the measures implemented under the subsidy campaign and were related to the annual payments for agrienvironment-climate measures, animal welfare and payments to farmers with areas with natural and other constraints, while for some measures (basic services and village renewal in rural areas, setting up of producer groups and organizations, co-operation) public tenders had not been published till the end of 2017.

Total budgetary support to agriculture (322.8 mill. EUR) increased by 3 % in 2017 compared to 2016, whereas the share of co-financing from the EU budget declined to 71 % (from 73 %). The biggest share of budgetary support was directed to market and direct support measures (52 %) and to structural and rural development measures (36 %). The executed payments for the CAP first pillar measures increased by 2 % compared to 2016. Significantly more funds were earmarked for disaster and other extra compensations to producers (frost damage 2016), as well as for variable input subsidies that lower the costs of farming (co-financing of insurance premiums). There were one percent less payments executed for direct payments. Executed payments for structural and rural development measures increased by 3 %, which is mainly due to the execution of several bigger payments in the framework of the measures for improving the competitiveness of agriculture and supporting rural economy and population.

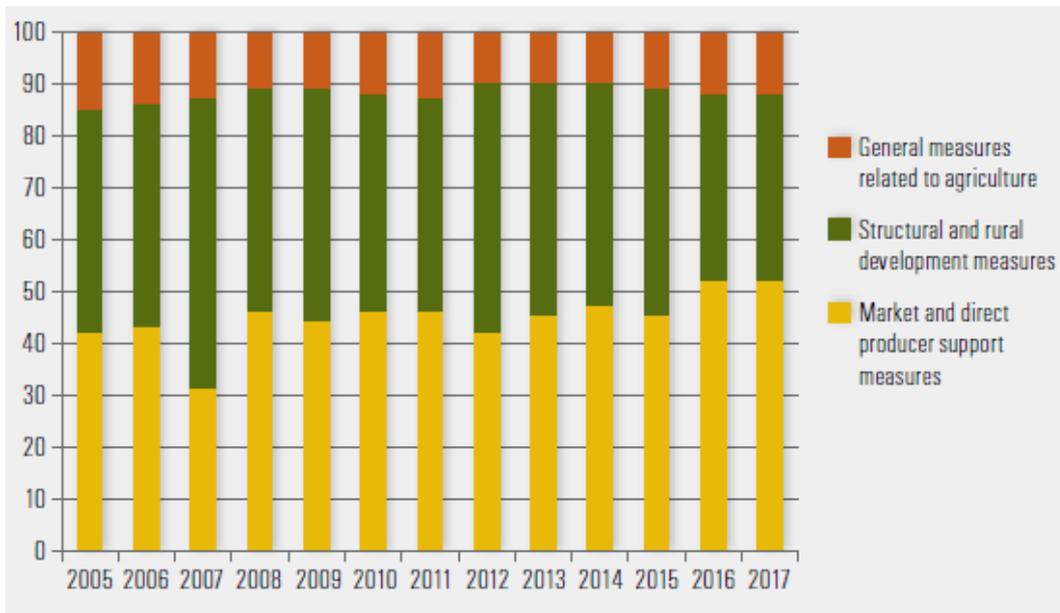


Figure 6 Budgetary support in agriculture

The general measures include also support for advisory service and other public services in agriculture and forestry, also support for education, research and development in agriculture and forestry.

Under the programming period 2014-2020, Slovenia programmed 4% of their total rural development envelope (EAFRD + national contribution) under M01: knowledge transfer and information actions, M02: advisory services, farm management and farm relief services and M16: Co-operation-EIP. This is above the EU-28 average of 3.6%.

Share of co-financing of budgetary support to agriculture from the EU budget (%; calendar year)					
	Ø 2005-09	Ø 2010-14	2015	2016	2017
Market and direct producer support measures	41	70	86	86	83
Structural and rural developments measures	72	77	76	75	75
General measures related to agriculture	6	7	11	11	12
TOTAL BUDGETARY SUPPORT TO AGRICULTURE	51	66	73	73	71

Source: MAFF, AKTRP, calculated by AIS

Figure 7 Share of co-financing of budgetary support to agriculture from the EU

2. Characteristics of AKIS

2.1. AKIS description

The structure of institutions that forms advisory service within agricultural knowledge and information system (AKIS) in Slovenia is diverse. In general, they can be classified into six groups according to their purpose and contribution to agriculture. In general, they can be classified into six groups according to their mission and contribution to agriculture. The first three groups are comprised of a) the public sector with the Ministry for Agriculture and affiliated bodies, b) 18 research and education institutions and c) a group of public institutions that provide public services. Next, three groups are private interest-driven institutions that consists of a) farmer-based organisations, b) private advisory organisations, and companies and c) NGOs. As presented further on in detail, the organisations of all six groups operate on national level, some of them also on regional or territorial and local levels. Regarding the geographic point of actors division, it is important to stress that regions in Slovenia still do not perform their political and economic functions in terms, common to EU regions. Consequently, institutions territorial units operate on territories that diverge from the official regional division of the country. For this reason the term “regional or territorial level” is used.

2.2. AKIS actors and knowledge flows

Public institutions

The Ministry of Agriculture and Environment is a governmental institution that performs tasks on the field of agriculture. Its affiliated bodies on the field of agriculture are Agency of the Republic of Slovenia for Agricultural Markets and Rural Development, Slovenian Environmental Agency, Inspectorate of the RS for Agriculture, Forestry, Food and Environment, and The Administration of the RS for Food Safety, Veterinary and Plant Protection. Given the small size of the Republic of Slovenia, its ministries operate just on national level, though some affiliated bodies have territorial units. Public services in agriculture are implemented by different public and private organisations, such as Chamber of Agriculture and Forestry of Slovenia (CAFS), and Slovene Forest Service.

Research and education institutions; there are 15 educational institutions on the field of agriculture in Slovenia; three faculties operate within two universities (Biotechnical Faculty and Veterinarian Faculty within the University of Ljubljana, Faculty of Agriculture and Life Sciences, University of Maribor), other 12 institutions are secondary schools and/or colleges. Faculties operate on national level and later on regional or territorial level. Key national research institutes are Agricultural Institute of Slovenia with two experimental centres, Slovenian Forestry Institute and Slovenian Institute of Hop Research and Brewing.

Slovene Forest Service was established by the state in order to perform public service for forest owners, irrespective of ownership. Its main tasks and activities are forest management planning, silviculture, forest protection, forestry technique, forest wildlife and hunting, hunting reserves with a special purpose and also public relations, and education of forest owners. The organisation's headquarters are situated in Ljubljana, while its numerous units are spread all over the country (regional and local units and forests districts).

There are also some **other public institutions** that contribute to agriculture knowledge and information exchange such as: public institutions officially responsible for public service on rural development, forestry, nature preservation (e.g. national parks) and regional and regional/local institutions involved in rural development, and other issues important for the development of their territory (e.g. local development agencies). The situation differs from region to region.

Private Organisations

Farmer based organisations: there are two agriculture chambers - CAFS and Chamber of Agricultural and Food Enterprises. The first one represents farmers and forest owners and the second one represents companies and entrepreneurs in the business of production and processing of agricultural and food products. The latter has already transformed into a voluntary association though membership for farmers and forest owners in CAFS is still obligatory. In addition to representation of members' interests, CAFS co-established 8 Agricultural and Forestry Institutes. Through those institutes and local units, CAFS performs public farm advisory service (FAS) as well as other activities, such as research, implementation of services of national interests, trainings, seminars and promotion activities.

The second group of farmer-based organisations, based on voluntary membership, consists of: Cooperative Association of Slovenia, territorial or local

cooperatives, and Farmers' union. Cooperative Association of Slovenia is a voluntary umbrella organisation of cooperatives with

73 members and works just on national level, the same as Farmers' union. Agriculture cooperative is the most common and traditional form of business cooperation in the agriculture sector. Its primary focus is on purchase and sale of agricultural products, and operates on national, territorial or local levels. As an intermediate link between producers and retail chain and consumers they also play a role in AKIS in terms of farmers' adaptation to market conditions and demands.

Beside those there are also some organisations/associations of farmers within the agriculture and food processing sector (e.g. producers of food products protected within EU or national food quality schemes, eco products, small cheese producers, goats and sheep breeders, etc.). Most of them are non-commercial organisations/associations and their scope of activities for members differs, though all of them provide some technical support, organise promotion activities and events etc. Quite often FAS advisors and persons employed at regional and local development institutions provide support in their annual program implementation.

Private professional advisors: The small market for private advisory service in Slovenia is due to centralization of advisory service within two organisations mentioned above, but the situation started to change a few years ago. Today, there are private consultants that provide help to different producers' groups with the main focus on marketing and organisation; additionally some veterinarians give support to farmers on basic agriculture issues.

An important channel of support to farmers are also upstream and downstream industries - advisors employed by commercial producers of seeds, farm machinery etc. and advisors that help farmers to meet technical standards i.e. quality standard, labelling requirements etc. set by purchasers.

Non-governmental sector: This is a diverse group of entities with different interests and political power that in some cases also facilitates development. There are two traditional groups: Slovenian Rural Youth Association with 52 local associations and Association of Country Women with 80 local associations. In addition to above mentioned, there are also professional associations, NGOs that focus on environmental issues, etc. NGOs organise different seminars, excursions, events, and round tables, but in general they are non-commercial organisations.

Quite often FAS advisors and persons employed at regional and local development institutions provide support in their annual program implementation.

It is a fact that knowledge and innovation transfer from research institutions through FAS and interest organisations to the end user, farmer, is low and insufficient. All public institutions also agree that they do not have sufficient information on farmers and forest owners' actual needs – reverse information flow is also not operational. There are several reasons for the lack of cooperation between institutions. One of key issues is the research system which promotes basic research. Researchers are not stimulated to do applied researches as they do not contribute to indicators that they have to reach to preserve their status. Another obstacle is a system that doesn't allow persons without researcher status (as most of FAS advisors) to be involved in research projects financed by EU or national funds.

We can recognise lack of permanent monitoring system on AKIS in Slovenia. There are no special analyses done yet of the national AKIS in Slovenia, anyway we estimate that knowledge, creativity and innovation are deficient factors of Slovenian sustainable development, similar as perceived in other European countries, and in particular the following shortcomings are evident: duplication of tasks between various knowledge-creating institutions, sporadic, random forms of cooperation, which are predominantly the result of informal ties between individual experts from different institutions, a relatively slow transfer of knowledge to end-users, and thus the transfer of knowledge into practice, and in particular the practically weak return flow of information on the needs from practice to the research sphere.

2.2 AKIS diagram

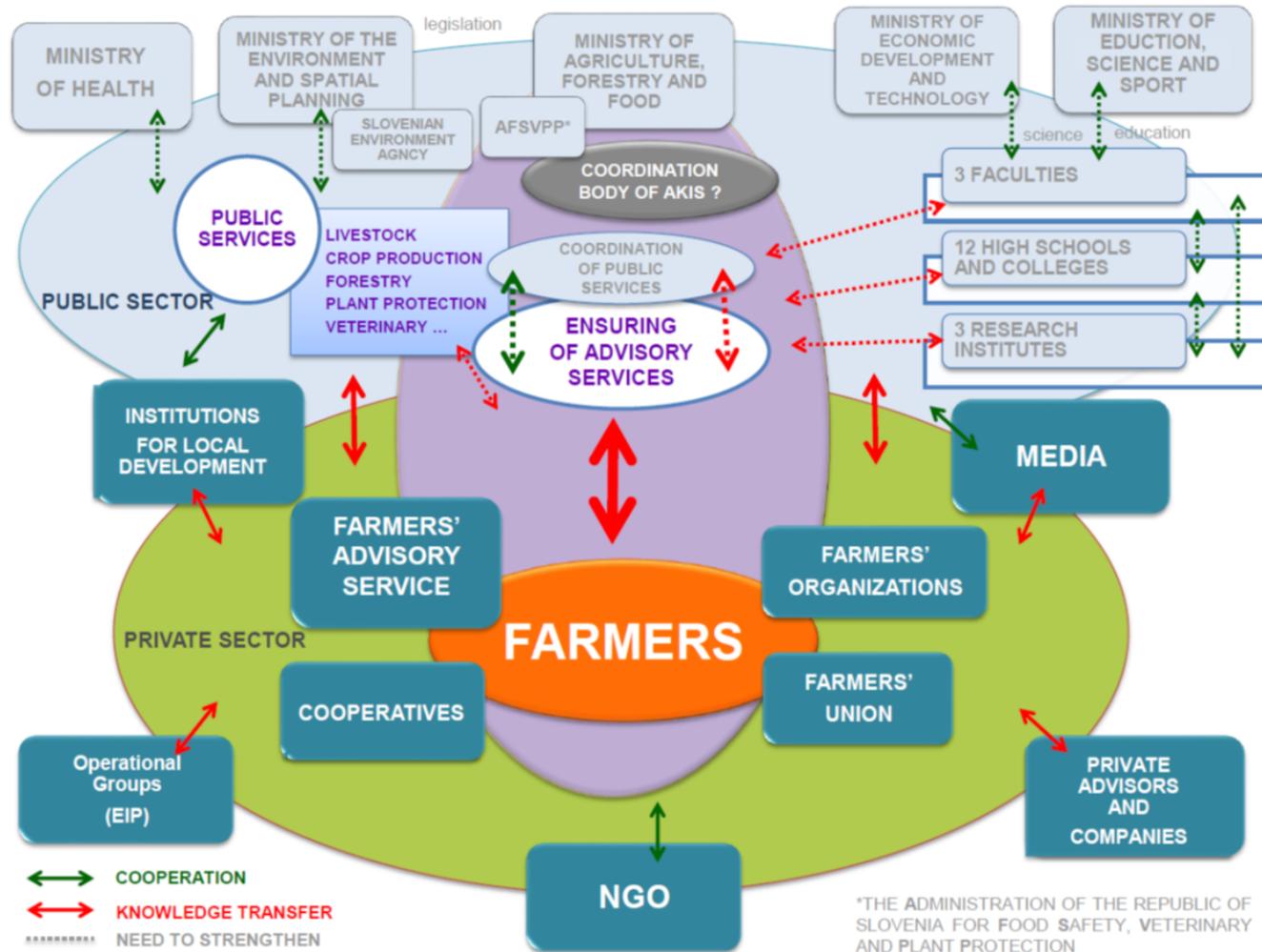


Figure 8 Slovenian AKIS

2.3. Policy framework at national level

In all production orientations within Slovenian agriculture (the same applies to the food processing industry and forestry), there is a need to improve transfer technologies and technological know-how into practice, applied research, development and upgrading of research infrastructure, stronger links between professional services, researchers and the academic sphere and the increase in the specialization and competence of consultants and primary producers

2.4. Coordination structures

Slovenia established a core working group working in the field of AKIS, also preparing data and organizing a workshop with relevant actors. Within the Target Research Project V4-1608: Effects and Perspectives of the CAP on Slovene agriculture and rural areas, a study “Evaluation of Slovenian Agricultural policies in the period 2015-2020, Research support for strategic Planning after 2020 was created (<https://www.program-podezelja.si/sl/knjiznica/287-vrednotenje-slovenske-kmetijske-politike-v-obdobju-2015-2020/file>). This study includes some chapters connected to AKIS issues. The CAP strategic planning is not in the stage that actors of AKIS are involved. Now Slovenia is the middle of discussion on resolution regarding development of agricultural sector in future. Managing Authorities are supported by outside methodological support from Agricultural Institute of Slovenia, University of Ljubljana, University of Maribor.

3. History of the advisory system

In the seventies, extension service in Slovenia was organised on three levels: 1) field advisors within agricultural cooperatives on municipality level, 2) advisors - specialists on regional level within seven regional agriculture institutes (today in the structure of CAFS) and, 3) on the level of Republic of Slovenia (at that time part of former Yugoslavia) – by the Republic Centre for Farm Advisory Service operated under Agricultural Institute of Slovenia. There were approximately 100 experts from the institute, faculties and cooperatives working together as expert groups. At that time (data reference to year 1972), advisory service within agricultural cooperatives was co-financed by the municipality (in average 20 %), and other two segments of FAS were co-financed by funds from the Republic of Slovenia.

In 1972, the Cooperative Union of Slovenia (for agriculture) was established and three years later the services of Republic Centre for Farm Advisory Service came under its authority. In the following year the first Regional Agriculture and Animal Breeding Centre (i.e. an institute with specialized advisory service) was established.

In 1992, after the adoption of the new legislation on cooperatives, FAS was organised as a public administration within ministry for the field of agriculture, though the slow process of transition of the advisors (official employment status) from the cooperatives to regional agriculture institutes began a few years earlier. The key issue was that advisory service should be available to all farmers, not just to members of cooperatives. This point was probably also the beginning of the slow separation process of the advisory service and research and education institutions.

At the turn of the century, CAFS was established to represent and protect the interests of agriculture, forestry and fishery. It was constituted in May 2000 after the adaptation of The Chamber of Agriculture and Forestry Act in June 1999. Regional institutes, formally independent legal entities, became part of its organisation's structure and so all different types of advisors were united in one institution and this led to the acquisition of a legal status.

Today CAFS is the umbrella interest organisation of natural and legal persons in the Republic of Slovenia engaged in agriculture, forestry and fishery. Its central task is to protect and represent their interests, to consult them and accelerate

economical and environment friendly activities. Its preferential tasks are the acceleration of the development and the improvement of economic conditions, the assurance of specialist services operation, the co-formation of legislation, the improvement of social conditions of life, keeping settlement of Slovenian rural areas and the promotion of the Slovenian agriculture at home and abroad. Its specialist services are agricultural advisory service, selection and monitoring production in stockbreeding, forestry advisory service, and centres for fruit-growing and nursery.

4. The agricultural and forestry advisory service(s)

4.1 Overview of all service suppliers

FAS in Slovenia is centralised and is organised within national chamber of agriculture and Forestry (CAFS).

CAFS operates on three levels. The first level is the Chamber's Headquarters in Ljubljana, the second level consists of 13 district subsidiaries established throughout Slovenia (see Appendix 2), and 59 local units operating on a local (third) level. Such divided organisation structure provides accessible service in every part of the country.

Organisational structure of CAFS is divided into general sectors (coordination of elected bodies, PR & international cooperation and general affairs), and the Sector for Agriculture and Forestry. The latter consists of four sectors (livestock production, plant production, rural development, forestry and renewable sources) and provides three public services: FAS, selection and monitoring production in stockbreeding, and public forestry service.

FAS operates within the Departments for Agricultural advisory at 8 Agricultural and Forestry Institutes, though farmers can also get support in 59 local units throughout Slovenia.

Table 1 Structure of FAS within Agricultural and Forestry Institutes

Institute	Description
Agricultural and Forestry Institutes Celje	11 branches, 13 locations, 54 advisors
Agricultural and Forestry Institutes Kranj	5 branches, 10 locations, 22 advisors
Agricultural and Forestry Institutes Ljubljana	13 branches, 21 locations, 46 advisors
Agricultural and Forestry Institutes Maribor	1 branches, 3 locations, 23 advisors
Agricultural and Forestry Institutes Murska Sobota	4 branches, 12 locations, 39 advisors
Agricultural and Forestry Institutes Nova Gorica	9 branches, 15 locations, 45 advisors
Agricultural and Forestry Institutes	8 branches, 9 locations, 44 advisors

Novo Mesto	
Agricultural and Forestry Institutes Ptuj	5 branches, 6 locations, 37 advisors

Source: Report on the state of agriculture, food, forestry and fisheries in 2011, page 100.

Core tasks of FAS are defined in Agriculture Act and Chamber of Agriculture and Forestry Act (OJ RS No. 41/99 and 25/04) and are further defined in detail in the annual Programme of Activities and in the financial plan. The programme is confirmed by the government.

4.2 Public policy, funding schemes, financing mechanisms, advisory service providers

Advisory service for agriculture has a public service role. It got concession from year 2018 to year 2025. Ministry ensure funds and also with yearly program, define the activities of service. FAS is funded from different sources according to annual plan of service agreed by the ministry. Nevertheless, the majority of funds are provided from national funds, though its share and the total amount for public service is gradually lowering down.

Funds that were available for FAS in 2020 was 9.252.417,00 € financed from national budget. FAS is also financed by end users for services defined by ministry of agriculture and services provided as public tender for M01, M02 and M 11.

In Slovenia exist as public advisory service the advisory service for bee keeping which is organized inside the National association of Slovenia for bee keeping.

4.3 Clients and topics and methods

FAS is provided to all types of farmers and forest owners. The methods used by FAS are all concerned typical/classic, thus they use: one-to-one advice on the farm, one-to-one advice outside the farm, small group advice on the farm (study tours for a specific group of intersects), and small group advice outside the farms, printed handbooks and brochures (Manual for meeting cross-compliance requirements, Catalogue of calculations for management planning on farms in Slovenia, Fourth Edition, August 2011, etc.). Farmers can also contact the advisor or the specialist via telephone or e-mail. As for the use of internet options, they are set simply. On their webpage one can find their contact information and

information on seminars and events, though just some basic expert guidance, recommendations and brochures are available there.

FAS in Slovenia provides wide scope of service to farmers and forest owners. They are presented in the table below.

In year 2018 the CAFS, advisory service got the accreditation as a regional office for CECRA certificate. Training for mostly new advisors to use different methods, is organized with CECRA standards.

One of special tasks of FAS is Project “Traditional Slovene breakfast”; the key goal of this free breakfast for 84.692 children on 707 locations (data for year 2011) is the promotion of quality local food and the increase of consumption of local products in public institutions; all employees of CAFS are involved in the organisation and delivery of free apples and milk to children in the kindergartens and primary schools.

FAS is also involved in the preparation of national strategies and supporting documents to its implementation. One of them is the Catalogue of Calculations for Management Planning on Farms in Slovenia, a key document for farm business plan.

FAS is also involved in different projects with topic for advisory service and digitalization (HORIZON 2020, Fairshare and i2Connect) and it is an active partner with major role in EIP projects. IT is involved in more than 60 EIP projects till now.

4.4 Programming and planning of advisory work

The Annual Programme of Activities and the Financial Plan of CAFS is the main document of this institution and is approved by the council of CAFS. It contains all Chamber activities, including the operation of public services within the organisation.

Annual Programme of Activities and the Financial Plan of FAS is also confirmed by government. In the programme for 2013, seven priority tasks are defined:

- Management, planning, monitoring and control of public FAS (programming, development of IT tools, etc.)

- Consulting and education on technical, economic and environmental fields of agriculture activities (personal and group consulting, seminars and trainings for farmers and consultants, publications, cooperation with different institutions, etc.)
- Consulting and support for preparation of development programmes and projects (preparation and coordination of development programmes and projects, implementation of FADN and National Vocational Qualifications, etc.)
- Consulting and support for implementation of agriculture measures
- Consulting and support for organisation and management of professional organisations (producer groups, associations, etc.)
- Activities in the field of agriculture and agriculture related regulations
Advisors work plan bases on the annual programme and is coordinated by the central office in Ljubljana. Procedures for reporting are uniform and set in the protocol. Advisors submit report on special forms in e-version that is archived for their own statistics and are inaccessible to the control system.

4.5 Linkages with other AKIS actors/knowledge flows

As clearly stated by all parties involved - FAS, ministries, and research and education institutions linkages between different AKIS actors on knowledge flow and also on joint research are very low. All system players also agree that their awareness of farmers' and forest owners' needs is getting weaker. Cooperation between institutions basically relies on good relations between the individuals¹. However, the information technology allows farmers to find information on the Internet and they often prefer direct contact with producers or organise visits to farms with advance technology by themselves. One of the reasons for the situation could also be the absence of demonstration centres and technology innovation centres at advisory and research institutions in Slovenia.

There are several reasons for the lack of cooperation between institutions. One key issue is the research system that promotes basic research. Researchers are not stimulated to do applied research as they do not contribute to indicators that they have to reach to preserve their status. Another obstacle is the fact that the system does not predict greater involvement of people without researcher status (as most

of FAS advisors are) in research projects financed by EU or national funds. Apart from this, it is necessary to point out that institutes and faculties provide support if asked for, organise seminars for FAS employees each year and that there are several other joint activities such as publishing handbooks, brochures, etc.

4.6 Advisory organizations forming the FAS and evaluation of their FAS implementation

The Farm Advisory System (FASystem) in Slovenia is organised within CAFS and FAS operates in eight regional agricultural forestry institutions and 59 local units are very accessible to all farmers, especially to small farmers. Advisors are employed in 8 Agricultural and Forestry Institutes (independent legal entities co-established by CAFS), though FAS is coordinated by central office in Chamber's Headquarters. FAS control is organised as a separate service within CAFS.

In addition to official national FAS there are several institutions and organisations that provide different support to farmers. They can be divided into four groups: institutions officially responsible for public service on rural development, forestry, nature preservation (publicly financed), regional and local institutions involved in rural development and other issues important for the development of their territory (financed by municipalities or funds from different projects/funds), and private companies providing support to farmers (commercial activities).

Officially CAFS is responsible for providing advices also to forest owners, though just three of their advisors are forestry specialists. Support on this field is also provided by the Slovenian Forest service. Activity is financed as a public service (almost 100 %). One of the reasons for the situation is that this institution is also in charge of the supervision for this sector (conflict of interests).

The later organisation is responsible for providing expert support to forest owners in forest management, though all economic issues regarding the forest are managed by the Farm Advisory Service (FAService) within CAFS. The institute is organised within the Central Unit in Ljubljana and has 14 regional units. Regional units are divided into local units, and furthermore into Forest Districts (see Appendix 2). Slovenian Forest service employs less than 700 people, mostly forestry experts

There are very few private companies and private consultants that provide

support to farmers on basic agriculture and forestry issues, as the market for this type of service is centralised. The biggest reason for this is the political influence of national institutions. However, the consultancy support to the organisation and management of producers groups, marketing, etc. is established.

5. Summary and conclusions

5.1 Summary and conclusions on sections 1 - 3

Agricultural production is taking place on predominantly small scale farms and is reflected also in the terms of standard output distribution. Almost 70% of farms fit into the 2.000 -

5.000 € of standard output. Slovene farms are run by managers with unfavourable ageing and educational conditions (30% of them are older than 65 years) and only 1.3% of farm managers have completed their studies on agronomy on tertiary level.

The structure of the institutions that form AKIS in Slovenia is diverse. The first three groups are comprised of a) the public sector with the Ministry for Agriculture and affiliated bodies,

b) 18 research and education institutions and c) a group of public institutions that provide public services. Next, three groups are private interest-driven institutions that consists of a) farmer-based organisations, b) private advisory organisations, and companies and c) NGOs. Cooperation and knowledge transfer among AKIS actors is very diverse and it varies from traditionally strong cooperation to more declarative.

In chapters that refer to the FAS and FASystem, it is clearly stated that the adaptation of service to the changed situation on the market must accrue and this is also the issue in research, especially in education sector. The researches focus is on the basic research while work on the applied research is significantly smaller. Another issue is that the key focus of education programs on faculties and in secondary schools is technology, though students do not get enough knowledge on farm management (economy) as well as sustainable management. The whole knowledge (priorities) chain must be rebuilt.

Also the supply chain should be organised as a system of strong interdependent stakeholders. It is not possible to have a successful food processing industry without farmers that will cost-effectively grow quality agricultural commodities. Farmers will need to put more efforts into adopting to the market conditions.

CAFS is key farmers-based organisation, but farmers' membership in this organisation is defined by the law. It is an organisation that represents farmers' interests (to the government and society) while on the other hand it provides

public FAS including implementation of CAP and national regulations (in the name of the government) to the farmers. According to an expert opinion, this organisation has strong political power and it has a very difficult task in balancing farmers' interests with government's interests.

5.2 Summary and conclusions on sections 4

FAS has operated within CAFS for over a decade and is well recognised by the farmers. It is organised within eight territorial Agricultural and Forestry Institutes and 59 local units and employ over 300 advisors with different type of specialisation. As such it is very accessible to all farmers, especially to small farmers. In addition to the EU regulated basic requirement, Slovenia FAS provides wider scope of services as economic diversification, FADN, support to agriculture associations, organisation of different national competitions, etc. Its Annual Programme of Activities is confirmed by the government who also provides funds for the implementation.

One of the key Slovene FAS system characteristics is centralisation. FAS and public service in forestry are assigned to two public institutions with very strong political position. As a result, private consultancy market is literally undeveloped. Changes in this sector started and will be in greater scope implemented in the next RDP programming period. It is necessary to stress that public FAS is important and some of today services must be preserved, yet opening the market for private consultants could contribute to faster development of farms as well as to the development of advisory service.

Information campaign on subsidies and later support to farmers is one of the tasks performed by FAS advisors. Farmers can enter data in digital information system themselves or exclusively with the help of FAS advisors (CAFS). One could argue that this is monopole situation, as service is (this year) in full paid by farmers, but others claim that this is part of advisory service to farmers (directing the development of farm) that assures efficiency in measure implementation. It is also common opinion that FAS advisors put too much importance and their time to subsidy campaign instead of work on development of farms.

All institutions, including CAFS, agree that FAS advisors competence and knowledge will need to be improved in addition to more close cooperation with farmers and use new communication tools. Situation on the market, at least as big

farmers are concerned, has changed. Although farmers are relatively conservative, it is evident that the most successful farmers are willing to pay for good advice and that they are able to find information on new technologies by themselves (e.g.: via internet, compare offers of different technology producers or visit farms with advanced technologies). Another issue is that farmers need support that will provide holistic approach to the farm development, therefore support must be provided by group of experts that cover all relative issues. This amongst others is one key change that also must be adopted in FAS.

The key issue in all public sectors is also the average age of employees, which results from the restriction of employment in the public sector. This approach prevents employment of new young people that would bring new knowledge and new approaches to the service. Consequently adoption of FAS to changed market situation and different farmers' needs would be even harder.

On national level, legal ground documents for change in AKIS are strategic documents that determine Slovenia's vision and goals in agriculture by 2020 - Resolution on strategic guidelines for the Slovenian agriculture and food sectors by 2020 – "Food for Tomorrow" and Research and Innovation Strategy of Slovenia 2011-2020. This also reflects in the first draft of the Rural Development Programme of the Republic of Slovenia for period 2014 – 2020, as in line with the article 36 the support to European Innovation Partnership is predicted and the key partners (food processing industry, NGO, farmers, consultants and researchers) are clearly stated. The obligation to encourage this process probably rests on research and education institutions.

Last but not the least important is the fact that Slovenia must clearly define its priorities. It is not possible to achieve a higher level of self-supply with food and at the same time protect mayor share of land with very strict environmental measures (e. g.: Natura 2000). We must find some kind of compromise. In addition, it is also necessary to ensure coherent politics (planning) of different sectors (e.g.: forestry and rural development) and lead consistent long- term politics in the sector as well as with AKIS on all levels, as structure changes are a long- term process

6. Acknowledgement of partners, information sources and gaps

Chamber of Agriculture and Forestry of Slovenia, within which the advisory service for agriculture operates, is an independent organisation, yet financed from public funds. As such it is obligated by the law to publish the Annual Programme of Activities and Financial plan, and also an Annual Report. Official information is therefore accessible, though just few researches are published on this topic.

FAS is centrally organised and regional units do not have much autonomy, so information provided is on national level. More detail research of the situation would need to be officially approved by Chamber of Agriculture and Forestry of Slovenia.

As stated in chapter five, there are several public and private organisations that provide advisory service in agriculture in Slovenia. On one hand this leads to duplication of services (especially within public organisations), but on the other hand several independent service providers mean competition and foster the development of services. Having this in mind it is hard to precisely evaluate the quality of work and results of public advisory service in agriculture.

The comprehensive questionnaire for the survey was prepared to conduct a detailed and also comparable survey in several countries. Due to the different systems and with national specificities the significant reduction of questionnaire to a table with key information has simplified our work. Even without this, detailed information on advisory system in the country was drawn from structured interviews with national experts. As official information provided by Chamber of Agriculture and Forestry of Slovenia is publicly available, we wanted to get additional information from experts that work in institutions that are each from its own side closely connected to public advisory service. All five interviewed national experts have been working in this field for several years and have excellent references. List with names of institutions and interviewed experts is in Appendix 3.

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AKIS and advisory services in *Spain*

Report for the AKIS inventory (Task 1.2) of the i2connect project

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Executive summary

The i2Connect project aims to strengthen the capacity of advisors to support the interactive innovation process and improve the exchange of knowledge in regional and national AKIS, allowing the farmer to make a transition towards a more productive, sustainable and climate-smart agriculture. This strengthening is intended to be carried out within the project by training the advisor and his organization, to involve farmers and foresters in the interactive innovation process.

In this report *AKIS and advisory services in Spain*, the aim is to characterize the AKIS, the different actors that compose them and the relationships that exist among them. In addition, a brief review of the evolution of such systems and a description of the agricultural and forestry advisory services is included. This allows obtaining an overview of how AKIS are structured in Spain, serving as an information reference for subsequent work carried out in this area.

In addition, the i2connect project has been encouraged to launch a parallel survey aimed at advisory providers. The results of the analysis have been incorporated in the 4th section of this document.

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Abbreviations

AES	Agricultural Extension Service
AKIS	Agricultural Knowledge and Innovation System
CAP	Common Agricultural Practice
CECRA	Certificate for European Consultants in Rural Areas
CSIC	Spanish National Research Council
CDTI	Centre for the Development of Industrial Technology
CC.AA.	Autonomous communities
CMEF	Common Monitoring and Evaluation Framework
EAFRD (FEADER)	European Agricultural Fund for Rural Development
EEC	European Economic Community
EIP	European Innovation Partnership
EUFRAS	European Forum for Agricultural and Rural Services
EU	European Union
FAS	Farm Advisory System
FG	Focus Group
FSC	Forest Stewardship Council
FPO	Farmers Professional Organizations
GDP	Gross Domestic Product
GVA	Gross Value Added
ICT	Information and Communication Technologies
IEC	Innovative Enterprise Clusters
INE	National Institute for Statistics
INIA	National Institute for Agricultural and Food Research and Technology
INTIA	Institute for Knowledge Transfer and Innovation of Navarra
MAPA	Ministry of Agriculture, Fisheries and Food of Spain
MCI	Ministry of Science and Innovation
MINECOTUR	Ministry of Industry, Trade and Tourism
NEC	National Emission Ceilings
NGO	Non-Governmental Organizations
NUTS	Nomenclature of Territorial Units for Statistics
OG	Operational Group
OPA	Professional Agricultural Organization
OPI	Public Research Organism
PEFC	Programmed or the endorsement of Forest Certification
PNTD	National Technology Dissemination Plan
RDI	Research Development and Innovation
RDP	Rural Development Plan
SME	Small and medium-sized enterprises
UAA	Utilized Agriculture Area

1. Main structural characteristics of the agricultural and forestry sector

Spain, with a population of 47 million (2019), and an area of 505,983 km², represents an important agricultural market at EU and international level (GDP 1,212,685 million euros¹, 8, 1 % of EU-28 in 2018).

From the territorial and social point of view, Spanish rural areas, where mainly the agricultural activity occurs, occupy 84% of the land but only 16% of the population live there. In Spain there is 66,000 km² of continuous land with population densities of fewer than 8 inhabitants/km², which the EU classifies as “very sparsely populated areas”.

In economic terms, agri-food sector is strategic for the Spanish economy (2, 9 % of total GVA in 2018²). At international sphere, regarding international market, Spain has an export potential of around 50 million euros³, mainly focused in the EU countries (81 % of the exports).

At national scope, the Spanish agri-food sector contributes to create wealth and employment (2.6 million jobs⁴), the fact that it is the main economic activity in rural areas and its direct relationship with the success of other sectors such as tourism and services. It is made up of more than 900,000⁵ holdings and over 31,000 food companies⁶, of which 95% are SMEs, with 80% of the companies employing fewer than 10 workers⁷. Most of the holdings are run by farmers who are more than 60 years old. The average economic size is 42,194 €/holding, and 58 % of the holdings have and economic size less than 8,000 €.

¹ Statistical Factsheet. Spain. June 2019. European Commission

² Statistical Factsheet. Spain. June 2019. European Commission.

³ Data drawn up by the General Sub-Directorate for Analysis, Coordination and Statistics, MAPA (the Agri-Food System's Contribution to the Spanish Economy), 2018.

⁴ Data drawn up by the General Sub-Directorate for Analysis, Coordination and Statistics, MAPA (the Agri-Food System's Contribution to the Spanish Economy), 2018.

⁵ This number can be up to 1.003.816 holdings according with the latest data and national authorities.

⁶ Number of food companies according to CNAE codes 10 and 11. 2018.

⁷ Central Business Register, INE, 2018

The agricultural area⁸, in total (total utilized agricultural area, UAA) is 23.84 million of ha. From this total, 51, 57 % is arable land, 20, 39 % is permanent crops (in contrast with EU average, 6, 73 %) and 27, 56 % are permanent grasslands and meadows. The irrigated land is 13, 2 % of the total utilized agricultural area (similar to other Mediterranean climate EU countries). The organic production represents the 8, 7 % of UAA, higher than EU average (7%). Half of the area under organic production system has not any specific CAP support.

The Spanish agricultural goods output is 51,359 million of euros⁹ (12, 4 % of EU-28). It can be divided in crop output, 62, 5 % (12, 4 % of EU-28) and animal output 36, 5 % (10, 9 % of EU-28). Some relevant (in terms of constant prices) crop output are vegetables and horticultural products (17, 2 % of EU-28), fruits (35 % of EU-28), cereals (8, 9 % of EU-28), olive oil (52, 5 % of EU-28) and wine (7% of EU-28). Regarding animal output can be highlighted pigs (20, 3 % of EU-28), cattle (9, 7 % of EU-28), poultry (10, 4 % of EU-28), eggs (12 % of EU-28) and sheep and goats (20, 1 % of EU-28). On the other hand, the agricultural input (total intermediate consumption) was 23,204 million euros in 2018 (9, 2 % of EU-28).

From the environmental point of view, the total emissions of greenhouse gasses from agriculture (including emissions from cropland and grassland) remained stable between 1995-2016, (-12% in EU-28), although it fluctuated between a maximum of 39.4 million CO₂ eq in 2004 to a minimum of 30.6 million in 2016. Also, the share of agriculture in the total net emissions has fluctuated and, since 2004, is below the EU average. The emissions of CH₄ and N₂O per hectare of UAA in Spain are below the EU-average.

Regarding to ammonia emission from agriculture, in Spain is rather stable over time, fluctuating between 400 000 and 500 000 tonnes. There is a decrease in the ammonia emission between 2003 and 2012, but it increases again as of 2013. Spain is behind to achieve the NH₃ emission targets for 2020 (-3% compared to 2005) and 2030 (-16%) as established by the NEC Directive. In 2016, NH₃ emissions increased by 0.8% compared to 2005.

Another impact on environment to be considered is water quality. There are two indicators that show the potential impact of agriculture on water quality due to

⁸ CAP Context Indicator C.18. Data 2017. European Commission.

⁹ Statistical Factsheet. Spain. June 2019. European Commission.

pollution by nitrates and phosphates. In 2012, 46% of the ground water stations were of high quality and 32% of poor quality. Under rural development, 14% of agricultural land has contracts to improve water management in 2017. The nitrogen surplus in Spain varies between 27 to 40 kg N/ha per year between 1995 and 2015. The phosphorus surplus decreased over time from 6 kg/ha/year in 1995 to 4 kg/ha/year in 2015.

As far as soil erosion is concerned, it is considered agricultural area at risk of soil erosion the one that losses over 11 tonnes per hectare per year. The estimated erosion rates are linked to agricultural practices and reflects the effects of policy measures to prevent erosion by agriculture. At the national average, the share of agricultural area at risk of soil loss in 2012 was 9.6%, higher than above the EU average (6,7 %). At regional level, the highest soil loss rate is located in the south of Spain.

With regard to forest and other wooded land, it represents more than the half of the Spanish total land area (28 Mha, 54,60%) growing during the last 30 years either in area (annual rate of 2,2 %) and in biomass quantity. The total forest area¹⁰ is around 18, 5 Mha. According to some studies¹¹, the estimated value of natural forest is 649 €/yr per ha (this includes water provision, CO₂ sequestration, biodiversity conservation, leisure, grassland for cattle, erosion prevention...).

In terms of ownership, most of the forest and wooded land are private (72 %), with around of 2 million of land owners.

From the economic point of view, wood and wood related products (including the pulp and paper, timber, veneer, cork and furniture industry) represents the 1,9 % of 2016 GDP. The negative trade balance of wood and wood related products, shows an important deficit in paper and cardboard (279 M euros in 2017). According to the national records, in 2013, there were 36,150 forestry companies. Nevertheless the last data available shows a drop in the number of forestry companies until 2019 (28264), most of theme SMEs (nearly 90%). Only around 20 companies employ more than 200 people. In 2018, the forestry sector in Spain employed 226,000 people.

¹⁰ Canopy cover higher than 25%, which excludes other wooded land.

¹¹ VANE Project. Ministry of Environment of Spain. 2009.

https://www.miteco.gob.es/es/biodiversidad/temas/conservacion-de-la-biodiversidad/valoracion-y-aspectos-economicos-de-la-biodiversidad/cb_vae_valoracion_activos_naturales.aspx

Regarding CAP specific measures for forestry, in the current period (2014-2020), two measures were ahead of the public expenditure within rural development measures (funded under EAFRD): measure 8, investments in forestry, and measure 15 environmental services and climate. Spain is the country of EU-28 with highest CAP expenditure (EAFRD) allocated to forestry. Only the measure 8, represents 2,099 million of the programmed budget, 30 % of the UE-28 allocated to measure 8.

One of the main advisory activities within forestry is related to the elaboration and monitoring of forestry plan (mandatory in order to receive EAFRD funds) but, in 2017, only 18.33 of the forest and wooded land had an approved forestry plan. There are two main schemes for forestry sustainable management certificates, FSC (Forest Stewardship Council) and PEFC (Programmed or the endorsement of Forest Certification). The forest area under PEFC represents 11.7 % of the total forest area in Spain; for FSC is only 1.5 %.

Globally, the demand for forest products is estimated to grow by 15% until 2030, rising to 35% in the case of wood for bioenergy (Ortuño et. al, 2019). The current consolidated trend, driven by climate agreements and support for the bioeconomy to advance in the decarbonization of the energy and production model are factors to be considered as drivers in the coming years for greater use of forest products under a sustainability paradigm. In Spain, only the 37 % of the annual growth of forest is harvested, so it means, there is a potential to respond the future needs nationally.

2. Characteristics of AKIS

2.1. AKIS description

The current political and territorial organization of Spain (based on Spanish Constitution), shape a decentralized system in which the regions (NUTS-2 according to Eurostat) have much of the responsibilities and decision-making powers. This makes a difference between others EU-28 countries, in terms of AKIS configuration, with intermediates bodies linked to the regional public administrations.

On the one hand, the Spanish Constitution establishes that the regions may assume competences in the promotion of research but the central government has exclusive competences in the promotion and general coordination of scientific and technical research, as well as international –scientific- relations. And on the other hand, all regions have established, in their Statutes of Autonomy (the main legal reference in each region) the assumption of competences in the field of agricultural research.

The decentralization of competences and responsibilities to the regions marked an intense period of negotiations between the new regional governments and the central government during the end of 70s and early 80s.

The current regulatory allows regional governments to define and carry out the regional research priorities within a national framework. Meanwhile central government reserved itself mainly the definition of basic national objectives and guidelines of the policy of agricultural research, the overall coordination of the projects collected in national programs of agricultural research and international scientific relations in the field.

An important factor to be considered in AKIS description is the CAP related measures. In 2014-2020 CAP period, the rural development measures, such as cooperation or agricultural training, have been an important part of rural development plans. These plans were designed by each region (regional body with competences in agricultural field) according to their own needs. The Ministry of Agriculture, as a part of the central government, designed its own national rural development plan, in order to achieve common objectives in a national scale.

In the decentralized system of Spain, regional bodies play an important role in terms of links between farmer needs and public authorities. Furthermore, as any complex system, there is an important need of coordination between regions and central government in order to be efficient and effective.

The fragmentation of the Spanish AKIS, with different characteristics and relevant actors depending each region, does not mean that advisory and knowledge transfer are not taking place successfully. The number of operational groups (557) and innovative projects (307) funded by EAFRD in Spain proves there is a relevant information flow taking place through cooperation between actors of the AKIS.

Nevertheless, there is still several barriers to the developing and consolidation of the AKIS in Spain. Some of them are common and general to the sector but others are more specific and have a strong influence in the AKIS configuration nationally, such as advisory services.

The Ministry of Agriculture, Food and Fisheries (MAPA, in advance), in relation to the relevant role of advisory services within AKIS, created a Focus Group on AKIS and advisory services whose activities has taken place during 2019 and 2020. Its aim was to identify the main barriers, needs (present and future) and possible ways to face the current AKIS situation and the potential role of the advisory services at national level in order to strengthen the AKIS. There were involved 33 experts from: professional agricultural organizations; agri-food cooperatives and their federations; private foundations; advisory services (public and private); R+D+i institutions such as public research centers and universities; various technology, input and agricultural service companies; as well as technicians from regional authorities and the Ministry of Agriculture, Fisheries and Food itself.

The discussion was organized in 4 challenges:

1. **Governance.** Improvement of the governance and coordination of agricultural knowledge and innovation systems in the Spanish context and their interconnection with the EU.
2. **Interactions.** Knowledge flows and the role of advisors in strengthening AKIS (vision of farmers, advisors, researchers, businesses and administration).

3. **Advice and innovation.** New formulas for agricultural advice within the Spanish diversity. Agricultural advice and its role as a facilitator of innovation support services.

4. **Impartiality advice.** Impartial advice vs. commercial advice. How to ensure the impartiality of the system by allowing the participation of all actors?

Some of the final results and works are also presented in this report, resulting in the up-to-date AKIS knowledge in Spain.

2.1.1. AKIS actors and knowledge flows

The main AKIS actors are: farmers (including farmers organizations and cooperatives), advisors (in most of the regions Farmers Based Organizations-Cooperatives owned), training centers, technological centers, universities, public administrations, input and service companies, agri-food industries, financial entities focused on agriculture and food value chain retailers. These main actors and their importance can vary from one region to another.

According to the diagram presented in section 2.2. actors in the Spanish AKIS mentioned before, can be classified into the following categories:

1. Public Authorities.

1.1. Central government.

Under the decentralized competence system, the central government, still have competences in EU relations and the establishment of the national targets, and coordination among regions, in general.

To take into account which public authorities have some influence in AKIS, we considered that some Ministries have certain competences related to transversal topics such innovation, research and training, which in the end influence to the agricultural activity and AKIS configuration. For this reason, three main Ministries are considered.

1.1.1. Ministry of Agriculture, Food and Fisheries (MAPA)

The main body with competences in agriculture, food chain, CAP regulation, including rural development. MAPA, through its administrative activity, shape the legal framework. In order to encourage the flow

knowledge, several networks have been established at national level. The major network is National Rural Development Network (RRN), which is a part of the National Rural Development Program, funded under FEADER (2014-2020).

1.1.2. Ministry of Science and Innovation (MCI)

Through the national competences in research and innovation, agencies and research institutions, this national body support a huge part of the research and innovation activity in agriculture. Linked to the MCI, the Spanish State Research Agency is the higher institution which promotes the scientific and technical research in all areas of knowledge through the efficient allocation of public resources, the encouragement of collaboration between agents in the R&D&I system and support for the generation of knowledge with a high scientific and technical, economic and social impact, including that oriented towards the challenges of society and the monitoring of funded activities.

Furthermore, there are eight public research organism (OPI) which belong to MCI and are important actors in the Spanish System of Science, Technology and Innovation. According to the Law of Science, Technology and Innovation 14/2011 the OPIs are created to execute directly activities of scientific and technological research, of technological services and any other activities with a complementary character that are necessary for the scientific and technological progress of the society. Two of these OPIs are relevant in terms of AKIS flows and interactions:

- National Research Council (CSIC).

The Spanish National Research Council (CSIC) is a State Agency for scientific research and technological development, with distinct legal personality, its own patrimony and treasury, functional and managerial autonomy, full legal capacity and indefinite duration. Is the 7th public research institution at global scale with 11,00 people 120 institutes, centers and units, 14,000 articles published per year, more than 3,500 ongoing projects and is the first Spanish organization by number of projects and economic return in the Framework Program of the European Union. At a European level, among public research organizations, positioning is also noteworthy, since it ranks third for the number of projects awarded. According to 2018 annual report, there are 10 CSIC centers and 6 joint centers focused

on agricultural sciences. This represent an expenditure of 80 M€, distributed in the 16 institutes and with more than 1000 people in scientific and technical positions (see figure below).

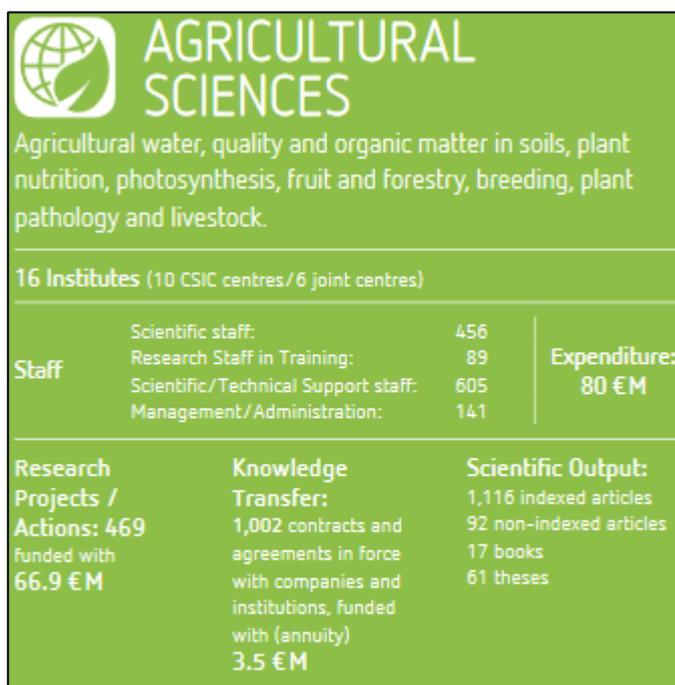


Figure 1. Agricultural research within CSIC in numbers.

- National Institute for Agricultural and Food Research and Technology (INIA).

It is the only public research organization of the National State Administration exclusively dedicated to agrifood and forestry research. Established by the Government Decree 17/1971, it develop its action under a strategic plan, assuming three main responsibilities: (1) Manage and execute scientific research projects in the agricultural, food and forestry areas and promote technology transfer; (2) Promote cooperation and coordination of agricultural and food research, especially with the regions, through the Coordinating Commission of Agricultural Research; (3) Represent Spain in agricultural and food scientific and technological platforms in matters of agricultural and food research and foster national and international cooperation.

In addition, in order to achieve coordination and cooperation between the central government and the regional governments it was created the Agricultural Research Coordinating Committee (1987), chaired by INIA and involving several ministries as well as

representatives of the seventeen regional bodies or institutes with competences in agricultural research.

The importance of these bodies and their coordination is underlined by the proximity of the research activities developed applied to the demands of the territory and to the new challenges and productive situations arising from uncontrollable factors such as globalization or climate change.

In addition to their work in technology transfer and, on many occasions, they work in collaboration with the advisory services and to the demand of regional needs in research or pilot experiences.

This system includes the Regional Public Agrifood Research Centers, created as a result of the process of transferring powers to the Autonomous Regions, which began in 1981.

- Centre for the Development of Industrial Technology (CDTI)
The Centre for the Development of Industrial Technology (CDTI) is a Public Business Entity, answering to the Ministry of Science and Innovation, which fosters technological development and innovation activities of Spanish companies. It is the entity that channels the funding and supports applications for national and international RDI projects of Spanish companies. The CDTI carries out the following activities: 1) Financial and economic-technical assessment of R&D projects; 2) Managing Spanish participation in international technological cooperation programs; 3) Fostering international business technology transfer and support services for technological innovation; 4) Supporting the setting up and consolidating technological companies.

In AKIS terms, the calls and loans founded by CDTI are the most relevant for AgriFood Industry.

In addition, CDTI is the National Contact Point for H2020 and the coming Horizon Europe, and provides all kind of advisory services to the applicants for research and innovation EU projects.

1.1.3. Ministry of Industry, Trade and Tourism (MINECOTUR)

– ENISA

A state-owned company that falls under management of the General Directorate of Industry and SMEs, itself integrated into the Spanish Government's Ministry of Industry, Commerce and Tourism. It provides to small and medium-sized enterprises that wish bolster their innovative entrepreneurial endeavors with financial support.

ENISA promotes a culture of entrepreneurship that pursues pooling and enhancing the keys to innovation, a culture that turns projects and companies into more competitive, more viable, more sustainable and more exportable new production, distribution and consumption models.

It has a role within AKIS due to the flow and interactions with agri-food industry, which can access to better financial conditions that support the innovation process in their organizations.

1.2. *Regional governments*

Due to the Spanish decentralized system, based on Constitution, the regional governments are a crucial part in AKIS configuration. In general, most of the region have organized their departments in three main areas, which shape the AKIS regionally:

– Body with competences in agriculture (markets, plan health, inputs regulation...).

Complementing the national regulation, these bodies are the main administrative contact points for farmers, for CAP subsidies and declarations, regional mandatory records (which later are join at national level). In some regions, this administrative body has county offices.

– Body with competences in regional development (OGs, CAP specific measures...).

As the CAP in the current period (2014-2020) rural development measures are separated from the direct payments and other market-based subsidies, regional administrations, in general, have structured their departments with an independent body in charge of rural development measures.

Most of the regions, have their own rural development plans (which follow the same rules under EAFRD regulation and derivatives). Each region can address their own characteristics, deciding which measures to develop and the budget allocation (from the national assignment). Furthermore, some regions add from their own budget, funds to actions related to rural development measures.

Each region has its own rural development programs under EAFRD regulations (RDPs). So that there are able to address their own characteristics, deciding which measures to develop and the budget allocation (from the national assignment).

- Body with competences in environment protection and forestry.

It is widespread in regional administrations in Spain, that forestry bodies are in close link (integrated or as a part of) with the bodies with competences in environment protection. This reflects a strong link between forests and wooded lands and its role as biodiversity hotspots (one third is included in Natura 2000), environmental services providers, and recreation and landscape values.

These bodies also manage an important area of forest land, public forest, in which commercial thinnings and fellings, forest fires investments (most of them funded by EAFDR) are carried out.

Due to this ownership, and in contrast with private forest (small scale properties, atomized and, in general, without any management plan), these bodies play an important role in wood and wood related products in Spain.

2. Research and Education

2.1. Education and agricultural training

Under this section, we present the national offer for education and agricultural training. This offer can be classified in three levels, each one with different interaction with other actors in AKIS (*this interaction can

vary in each region): higher education (universities), vocational training (which basic, intermediate and advance levels) and public non formal training centers (where depending on the region can play a main role in agricultural training).

- *Higher education.* In 2019, there were 86 bachelor degrees offered by public universities mainly, in six different fields: science and animal production (1); agricultural and agri-food engineer (26); gardening and horticultural engineer (1); forestry engineer (18); veterinary (14). In total 13 of 17 regions have one of these studies. For the next academic level, there were 90 master degrees in 2019, and the share in the fields mentioned before is similar.
- *Vocational training.* According to the recent data, there are eleven vocational training programs in three different levels. In the basic level, agricultural outputs, agro-gardening, and forestry are the main training programs, offered by 236¹² centers, which cover all the regions, and creates a dense offer, which sometimes is difficult to fulfill. In the intermediate level, the offer is complemented with some programs in environmental conservation, and agroecology, having a five training programs offered by 246 centers. In the advanced level, there are three training programs: forestry and environment management, animal welfare, rural areas and landscape management.

2.2. Research

At national level, the public research system is strongly influenced by the Ministry of Science and Innovation. The two main institution in agricultural and forestry research are CSIC and INIA (see 1.1.2.), at national level. INIA, also coordinates the national agricultural system with the regional centers.

Furthermore, another actor to take into account, are the research groups within universities. These groups are specific and dedicated to certain fields of research, combining in the knowledge production with the applied results. A mapping of these research groups will go further the scope of this report, and it will only show a fixed picture of the current groups, that can be modify

¹² This number represents the centers which offer this training program. One center can offer more than a training program.

depending on the research and needs trends of the sector. In addition, there are strong bilateral flow between the universities training programs (teachers, students, new visions to incorporate...) and the results of these research group.

3. Private sector

Private sector plays an important role in terms of innovation boosting in agricultural and forestry. Its close relation with the final products and consumers, encourages all the system to be more efficient, sustainable, covering all the society needs through innovation processes. Also, a public support sometimes is needed, creating some spaces for private-public collaboration.

3.1. Agrifood industries

According to the recent data¹³, the agri food industry (including beverages) represent 3 % of Spanish GDP and 16 % of the national industry. There is a total of 31.342 companies which produce food and beverages as a result of the primary agricultural input transformation.

In terms of employment, the agrifood industry¹⁴ employs 19.638 miles people, 12,6 % of the total jobs in Spain. Within the sector, the manufacturing industry (the one more linked with agricultural outputs, such as, bread, meat, dairy products, oil, fruits...), employs 2.349 miles people, follow by food (433) and beverages (56).

From the regional point of view, the weight of the agrifood industry, vary in each region. Looking at the share of jobs of the sector over the total, in some regions like Cataluña (20,7 %), Castilla y León (11,2 %) or Andalucía (13,3 %), agri food industry represent an important part of their regional economies (see Figure 2).

¹³ Provided by the main association of the sector, FIAB: <http://fiab.es/sector/>

¹⁴ 1st semester of 2019 data. Source: Employment Annual Report. 2019. FIAB.

sense, there are a close link between these main players and some of the technological center focused on agriculture. The developing and innovation processes for new technologies, methods and varieties are pushed by the agri-food industry, but there is not a significant relation with the farmers, as final users and adopters.

In terms of AKIS configuration, input prices represents the second¹⁶ most important concern of the farmers.

3.3. Public-private partnerships

– *Tech platforms*

The tech platforms are public-private teamwork structures, led by industry, in which all the agents in the Spanish science-technology-innovation system interested in a technological field work together in a coordinated manner to identify and prioritize technological, research and innovation needs in the medium or long term.

Its main objective is to achieve the scientific and technological advances that ensure the competitiveness, sustainability and growth of the business fabric, aligning the strategies of the different agents and concentrating the RDI efforts.

The existing platforms with a direct impact on the agri-food and forestry sector are:

- Wine Technology Platform
- Spanish Technological Platform for Plant Biotechnology
- Spanish Technological Platform for Biomass - BIOPLAT
- Spanish Technological Platform for Animal Health. Vet+i
- Spanish Technology Platform Food for Life - Spain

Spanish RDI policy has traditionally encouraged these structures through calls for subsidies to promote the creation and

¹⁶ Source: Survey carry out by Pwc within the report entitled “El futuro del sector agrícola español”. Pag 55. <https://www.pwc.es/es/publicaciones/assets/informe-sector-agricola-espanol.pdf>

maintenance of them as public-private working groups, to foster a fluid exchange of information that facilitates collaboration among those interested in a sector or technological field.

– *Agri-food clusters or Innovative Enterprise Clusters (IEC)*

An IEC is defined as the combination, in a geographical space or productive sector, of companies and public or private research and training centers, involved in collaborative exchange processes aimed at obtaining advantages and/or benefits derived from the execution of specific projects of an innovative nature. The activity of the IEC must be organized around a scientific or technological branch or sector and/or a target market or market segment.

They are encouraged by the Ministry of Industry, Trade and Tourism with specific calls for support as well as an official registration system.

The 10 IECs or clusters registered for "agri-food" type consumer goods are:

- INOLEO, AEI of the olive sector
- ARAGON INNOVALIMEN, Aragon food cluster.
- NAGRIFOOD, Navarra Agri-food Cluster Association.
- CLUSAGA, Food cluster of Galicia.
- FOOD+iFOOD+i
- ASINCAR, Research Association of the Meat Industry of the Principality of Asturias
- VITARTIS, Association of the Food Industry of Castilla y León.
- INNOVII, Catalan Wine Cluster.
- INNOVACC, Catalan Association for Innovation in the pig meat sector.
- AGROFOOD, Agro-food Cluster Foundation of the Region of Murcia
- AVEBIOM, the Spanish Association for the Energy Valorization of Biomass is recognized as an AEI in the energy sector.

3.4. Private financial entities

AKIS must also include the private financial entities, which provides economic support to all the relevant actors and its projects.

In the last decades, as in many other economy fields, business angels and venture capital funds appear in the agricultural economy system. This change has been visible where the benefits rates are higher, especially in food chain retailers and the industry in general.

In addition, within private financial entities¹⁷, new divisions have been created to support some universities RDI groups and research centers. These linkages vary from one region to another because of the evolution of the private financial entities along the last 10 years. After financial crisis, some of the private financial entities which acted regionally started an integration process: some of them kept their foundation and regional divisions but many others disappeared.

4. Farmer based organization

4.1. Agri food cooperatives

In Spain, agri-food cooperatives are key players in providing agricultural advisory services to members/producers with activities linked to the actions of the cooperative aimed at improving marketing through advice on the technical and sometimes also economic management of farms.

As many other relevant actors in AKIS, their presence and importance, vary in each region (see Figure 3), but only 6 regions concentrate 74 % of the total number of cooperatives (Andalucía, Castilla La Mancha, Castilla León, Valencia, Cataluña, Extremadura).

¹⁷ Source: Diagnóstico económico-financiero de las cooperativas agroalimentarias en España (2015-2017). Cajamar. <https://www.publicacionescajamar.es/publicacionescajamar/public/pdf/series-tematicas/informes-coyuntura-coyuntura/informe63-diagnosticocoopespana-web.pdf>

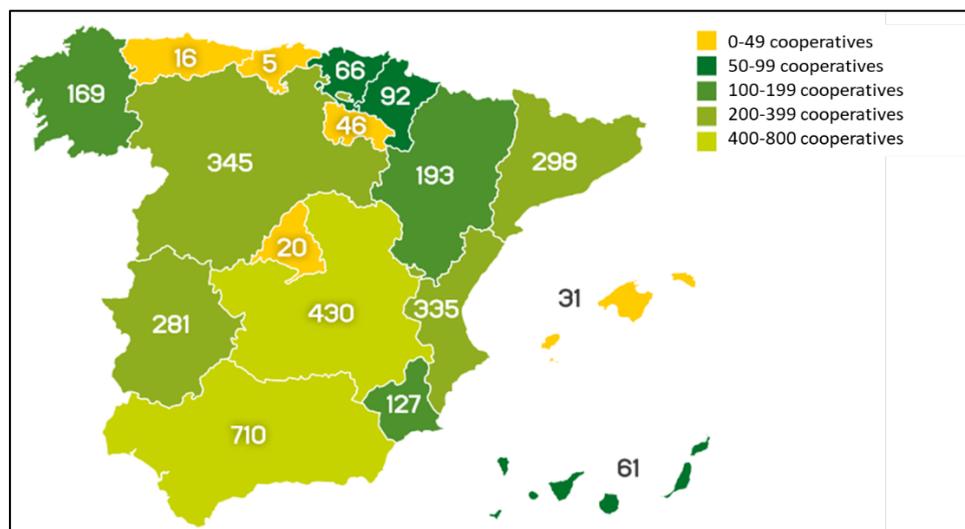


Figure 3. Number of agri-food cooperatives in each region of Spain.

Currently, according to Cooperativas Agroalimentarias, the professionals of the representative organizations of the federations and territorial unions of the cooperatives of the Autonomous Communities and the advisory professionals of the cooperatives themselves include more than 2,000 advisors.

4.2. Farmers professional organizations (FPO)

The farmers professional organizations are entities recognized under Law 12/2014 of 9 July. According to it, among their statutory purposes are the defense of the general interest of agriculture, understood as agricultural, livestock and forestry activities, as well as the defense and promotion of the professional, economic and social interests of farmers, livestock owners and foresters. FPOs definition includes their coalitions and the integration of organizations into another national organization as well.

At national scale, some of the FPO are:

- Unión de Pequeños Agricultores (UPA)
- Asociación Agraria de Jóvenes Agricultores (ASAJA)
- Coordinadora de Organizaciones de Agricultores y Ganaderos (COAG).

The role of these organizations in the farm advisory is relevant. As they are register as providers of advisory services in some regional lists of

recognized entities providing advisory services in the agricultural (or sometimes agri-food and forestry). However they are usually geared towards the advisory topics that are mandatory under the CAP, rather than technical and economic advice.

4.3. Other farmers and forester organizations

In addition to the representation of producers through the figures in the previous sections, there are other kinds of producers' groups such as:

- Irrigation Communities.
- Inter-professionals of the agro-food sector.
- Producers' associations.
- Regulatory Councils.

Forestry as a sector with huge difference in terms of economic relevance between regions, still is not as organized as farmers.¹⁸ Similar to the FPOs, which sometimes cover forestry issues (especially in agroforestry systems), there is a heterogeneous network of forestry associations which act at province level. At national level, the Confederacion de Organizaciones de Selvicultores, COSE, is an example of the aggregation of several of forester regional associations.

5. Non-Governmental Organizations (NGO).

As a result of a participative integration process in all the public authorities, the society express some of the demands through these organizations. In general terms, there are few NGOs with importance at national level. Mostly each one has a regional division, with/leading many agricultural related projects as a result of a collaboration between farmers, land owners, public authorities and public in general.

Some of these NGOs at national level, which participates in many national debates promoted by MAPA:

- Ecologistas en acción.
- WWF.

¹⁸ This time, the term exclude producers of forest related products.



– SEO Bird Life.

2.1.2. A few AKIS regional example: Catalonia and Navarra.

In Spain, the AKIS can vary from one region to another. This main characteristic, reflects the competence distribution according to Spanish Constitution for agriculture, research and innovation.

Cataluña and Navarra are clear examples of a well-functioning AKIS and with representation among the members of i2Connect partnership.

Cataluña.

This northeast region has a long experience in how to configure an AKIS regionally, involving all the relevant actors.

The shaping of the advisory services in Catalonia, is a private model, with a close relation between public authorities, cooperatives and federations and farmers organizations.

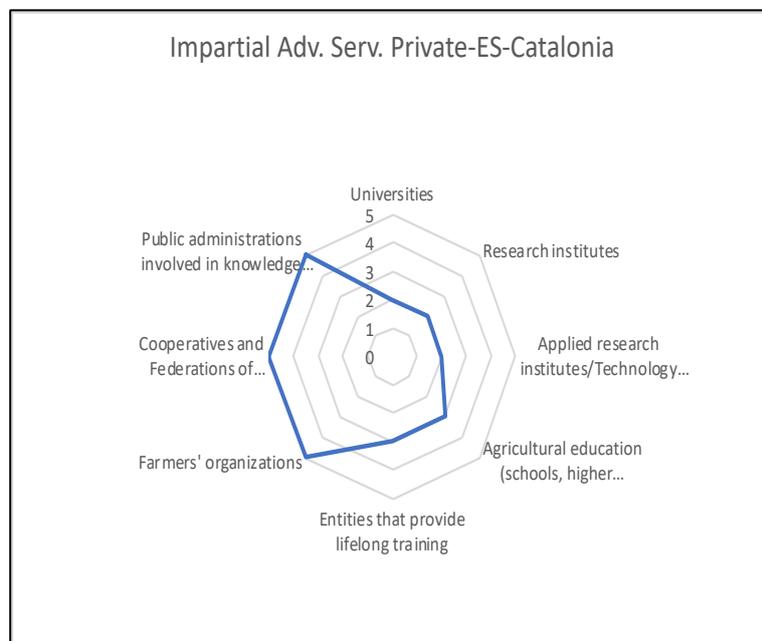


Figure 4: Interactions between Advisory Services and other AKIS actors in Catalonia, Spain.

At strategic level, the main public body with competences in agriculture, the Department of Agriculture, Livestock, Fisheries and Food, have developed the Strategic Plan for Agricultural Research, Innovation and knowledge transfer for

2013-2020 (PRITAC), which also includes an annual training program and an annual plan for knowledge transfer (PATT), including technical seminars, demo activities and field visits to holdings, which are agreed and selected by consultative assembly formed by more of 100 stakeholders of the Catalan AKIS.

Navarra

This region, also in the north of Spain, has a consolidated model of AKIS and advisory system, extremely marked by the relevance of a public advisory organization, INTIA since 1980.

The importance of their *back office* allows INTIA to transfer the needs of farmers to other relevant actors in the region.

This public advisory scheme operates in the framework of advice linked to applied research and training, while private companies cover advice linked mainly to the supply of inputs, resulting in the end in a mixed system.

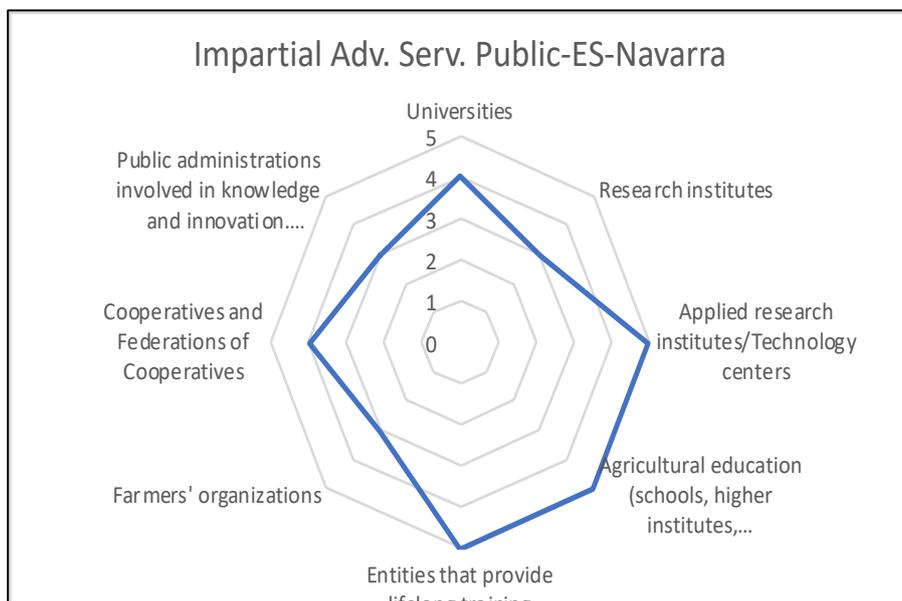


Figure 5. Interactions between Advisory Services and other AKIS actors in Navarra, Spain

2.2. AKIS diagram

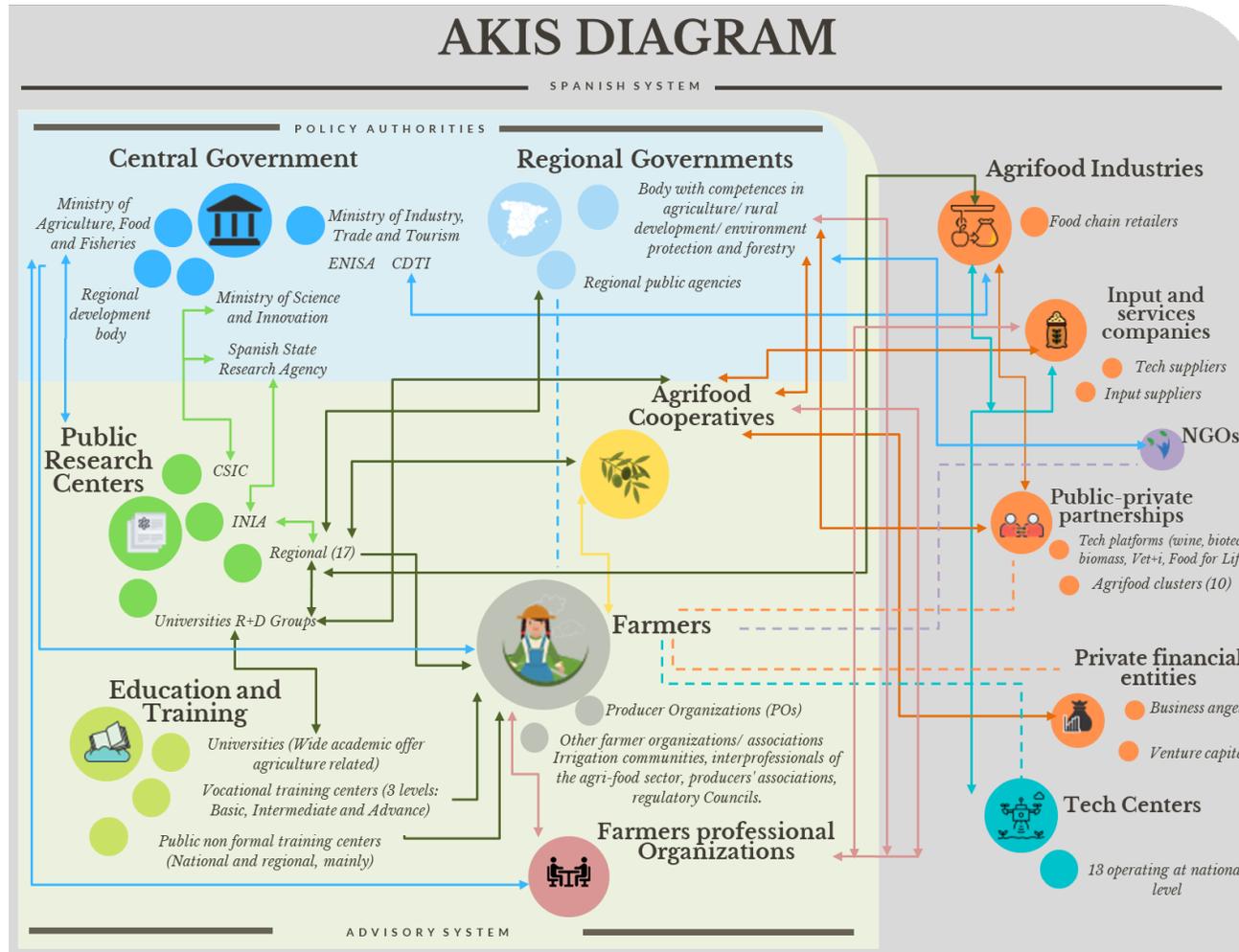


Figure 6. Spanish AKIS diagram. Actor's categories are represented in circles. Under one category, there are several actors (e.g. Education and training). Impartial agricultural advisory system includes some of the relevant AKIS actor's categories (green box). The lines represent the linkages between AKIS actors (dashed lines for weak linkages, and solid lines for strong linkages).

3. History of the advisory system

In Spain, the advisory services to farmers emerged in the mid-1950s, known as Agricultural Extension Service (AES), and were led by the central government. At the end of the 70's (1978), the AES began to be transferred to the recently created administrative structure of regional governments. As long as the transfer of powers to the regions was completed, central services were also losing functions of control and supervision over the regional centers.

In 1981, the Ministry of Agriculture drew up the National Technology Dissemination Plan (PNTD), which was intended to promote the modernization of the agricultural sector and encourage adaptation to new circumstances such as the energy crisis, the revaluation of underutilized resources, the integration into the EEC (1986) as well as the reorganization of the agro-food system. The Ministry gave greater weight in its strategy and objectives to technology transfer, so it began to articulate to the Agricultural Extension Service with INIA, and also decided that the Agricultural Extension Service should stop working at the request of the farmers to make it to the agricultural policies, so, at this time, its functions were focused more towards the modernization of agricultural structures.

Due to the progressive decentralization of competencies in the field of agriculture, at the central level the bodies of the AES were reduced to the former Central Training School, and their functions reduced to staff training, coordination and information and the provision of specialized services. Finally, in 1991, the Agricultural Extension Service disappeared definitively to become an autonomous body

Therefore, due to the administrative structure in Spain, the regions have taken large number of responsibilities and competences since the early 80s, including those referring to agricultural extension services. Regarding the evolution of the concept, the change was much deeper (Table 1), from a concept focused on the development and demonstration of agronomic innovations to the farmers, and to another one focused on a set of services more oriented to the fulfilment of official requirements from the CAP.

Table 1. Process of change from extension services to advisory services approach. Source: PROAKIS Spanish report (2014).

	Process of change	
	From	To
Approach	Extension Service (agronomic demonstration)	Advisory Service (general advice and advice on demand)
Period	Until 80s	To date
Responsible authorities	Central government	Regional governments
Scope of regulation	National	Regional (until 2003/2007)
		Adaptation to EU (2007 to date) - FAS
Type of supplier-s	Public (central government)	Public: regional research centres (decreasing)
		Private: consultants (increasing)
		Non-profit: agricultural farmer organizations and cooperatives (highly increasing)

Besides, the traditional experimental and demonstration farms (coming from the former extension approach) were oriented into the applied research losing, in most cases, the traditional direct contact with farmers. Therefore the traditional extension functions were progressively disappearing since the 80s when new FPOs and federations of cooperatives started to emerge and consolidate themselves as advisory services.

Since then, CAP has deepened on FAS. In Spain every region has implemented FAS and, during the current CAP period (2014-2020), 15 RDPs (14 regional and the national one) established the measure on farm management, farm relief and farm advisory services in 2014. Nowadays, 11 RDPs continue with this measure.

Finally, for the next CAP period 2021-2027, advisory system is going to be reinforced by the Agricultural and Knowledge and Innovation System (AKIS) to bring farmers relevant knowledge and networks around innovations in agriculture having them at the center of the system.

The CAP Regulation 2021-2027 refers to advice, highlighting article 5 on general objectives includes the transversal objective of “modernizing the sector through the promotion and sharing of knowledge, innovation and digitization in agricultural areas and rural areas and promote their adoption”, article 13 on farm advisory services, and article 72 on exchange of knowledge and information.

4. The agricultural and forestry advisory service(s)

Following a common structure within I2connect project, a survey on advisory services was launched during latest October 2020. There have been 37 answers distributed in the three categories of advisors targeted in the survey (advisory organizations, organizations with an advisory component and freelance advisors) and located in different Autonomous Regions of Spain. However, the results are considered as partial so they are not representative at national level

In addition, some conclusions of the Focus Group on the role of advisory within AKIS, coordinated by MAPA on 2020, and some of the information during the process of the Spanish Strategic Plan for CAP 2021-2027 have been included.

4.1. Overview of all service suppliers

The Spanish political and territorial organization, based on a decentralized system in which the regions have a large part of the responsibilities and the power of decision, means that the Agricultural Knowledge and Innovation System (AKIS) is more dispersed and fragmented in relation to others countries of the European Union (SCAR AKIS, 2014).

In Spain, there is a wide diversity of advisory providers. These farm advisory services entities have evolved over the last decades. There are main sources of advisory service providers to farms and forestry: public and private service providers.

The advisory providers that have a closer relationship with farmers are, regarding public entities, national and regional research organizations provide various services while, in the private scope, professional agricultural organizations (OPAs) and cooperatives entities and their organizations. Moreover, there are private consulting companies in the agricultural field, which provide mainly economic, legal, technological and fiscal services.

In the last decade, not only the need to strengthen relationships between advisors and farmers has been highlighted. It has been identified as essential the boost of knowledge flows and interaction among different AKIS actors, at the national and

regional level, in order to ensure the identification and accomplishment of farmers' and foresters' needs.

As conclusions of i2connect survey (38 participants in November 2020), there is an important role of advisory organizations. Most of them have an advisory component but do not have a full-time advisors. They are an important reference for farmers dealing with matters such as market, distribution, input issues, including sector representation to regional and national bodies with competences in agriculture related topics.

In addition, there is a relevant workforce as freelance impartial advisors contributing through their services to the new trends of innovation of the sector.

Nevertheless there are also freelance advisors linked to input companies. This fact that could undermine trust of farmers in the advisory system.

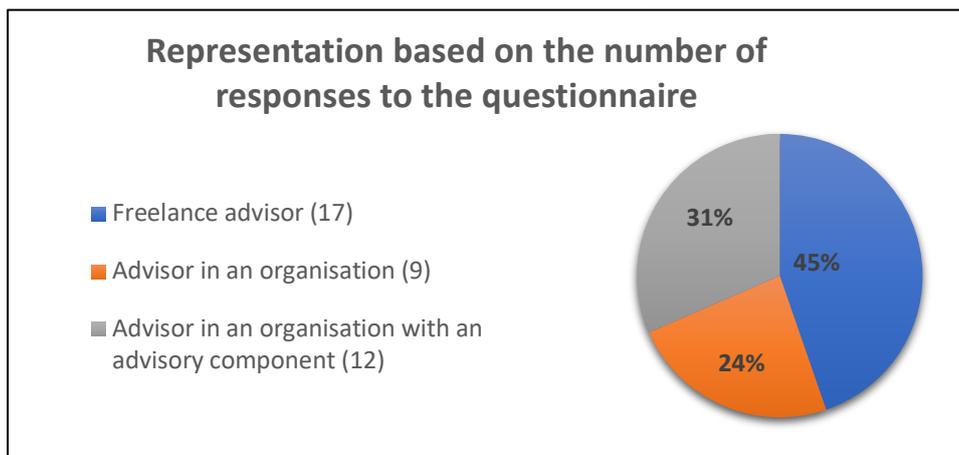


Figure 7. Results of i2connect survey: Percentage of representation of each of the categories to which the survey was directed

4.2. Public policy, funding schemes, financing mechanisms, advisory service providers

Within the 2014-2020 CAP programming, for the measures contemplated in the rural development pillar, the Measure 2. Advisory, management and substitution of agricultural holdings (M2). At the beginning of the 2014-2020 programming period, 15 PDRs included it while in 2019, it is implemented only in 11 (Andalucía, Aragón, Canarias, Castilla la Mancha, Castilla y León, Extremadura, Galicia, Madrid, Murcia, Navarra, La Rioja) of the 18 Spanish PDRs (17 PDRs + 1 PNDR).

In addition, due to the handicap of the obligation to execute the PDRs advisory measure through the public procurement procedure, there are wide differences between the levels of execution between Spanish regions, varying from 42% of execution in La Rioja to 0.01% in Andalusia.

Next table (Table 2) shows the financing scheme of the measure 2, both in the regional RDPs and in the PNDR, as well as the execution percentages in June 2019.

Table 2. CAP Rural Development measure 2 in 2014-2020 period in Spain. Source: MAPA, 2020.

SPAIN (PDRs+PNDR)	PROGRAMMING			ACCUMULATED EXECUTION			
	AMOUNTS SCHEDULED TO JUNE 30, 2019			WITH THE DECLARATION AS OF JUNE 30, 2019			
	FEADER	% ON TOTAL FEADER OF THE RESPECTIVE RDP	TOTAL PUBLIC EXPENDITURE CO-FINANCED	FEADER EXECUTED ACCUMULATED	% execution	PUBLIC EXPENDITURE CO-FINANCED EXECUTED ACCUMULATED	% execution
TOTAL MEASURE 2	86.505.183,00	1,04	132.757.314,07	5.009.805,08	5,79%	11.687.252,22	8,80%

In addition, the results extracted from the survey in this section are:

- Funding varies depending on the kind of advisors: Freelance advisors finance themselves mainly from their clients' payments. On the other hand, the advisors linked to an organization finance by several sources mainly public funds (national / regional) and income of the services provided.
- In the last three years, there are have not been major changes in budgetary terms for advisory organizations (+/- 10%). But it has been detected some influence in budgets due to COVID-19 situation.

4.3. Human resources and methods of service provision

Human resources are quite varied in advisory services. At national or regional level, there is an open labor market without restriction on who can be an advisor. The main disadvantage identified within the Focus Group on 2020, is the lack of professional recognition and the absence of a reference for farmers, in order words, for their clients. The openness of the advisory system in general, affects the trust relationship between farmers and advisors, but also allows newcomers in the system such as digital industry professionals related.

Also it was highlighted a need of professional recognition or identification and a coordinated network for advisory at national level.

Nowadays, there are three types of advice in Spain: Lineal, interactive, mixed advisory model:

- **Lineal model:** Traditionally applied by the agricultural extension services that successfully operated from the public sphere, to improve the productive capacity and profitability of farms in Spain until the mid-1980s. Usually it has an individual objective focused on a productivity-oriented approach. The farmer has a passive role in adopting recommended technology or technique.
- **Interactive model:** opposite to the previous one, farmers have a more active role. They share experiences identifying challenges and the advice is focused on solving problems or needs expressed, providing tailored solutions based on local knowledge and innovations. It aims at groups and organizations, promoting interactions and networking between them, where farmers and ranchers have an active role in solving problems and co-owning the innovation process. In this case the advisor plays a facilitator role.
- **Mixed model:** It is an intermediate model between the previous two, with a holistic approach aimed at promoting farmer entrepreneurship, where the sources of innovation are external and internal. The solutions are co-developed together with farmers, responding to a request for advice expressed by them, to support them in the decision-making process. In this model, farmers and foresters take an active role in solving problems but the advisors remains as a main source of knowledge and information.

All these three models, nowadays, introduce a least few elements to empower farmers in the process of transfer of knowledge and innovation. Interactive and mixed models, more oriented to farmers demand, there is still a certain linearity in the advice. This fact will always happen due to the trust relationship between the advisor and the farmer.

Complementary to the advisory models, some of the main findings from the i2connect survey are:

Human resource

- The number of advisors is higher in full advisory organizations than in organizations with an advisory component. In addition, according to the data provided, in terms of the advisors section, 60% of the total are women.
- Advisory organizations reported significant increases in their advisory staff due to rise in bureaucracy and administrative burdens.
- Regarding the back-office, 7 of the organizations with an advisory component have at least one person dedicated to these activities.

Education level of advisors

- There is a high level of education of advisors. There are not significant differences between advisors within advisory organizations and freelancers. Most of them has an engineer, Master or bachelor degree. Also there is a share of advisors included in the survey with Ph.D. degree.

In this sense, although there has been a rise in the training level in comparison with 2013-2016 period, most of them have training based on experience (78 %¹⁹) and only the 1, 9 % have a full training. So there is still not only a need to increase the training level of farmers, but also advisors have to improve their soft skills in order to be facilitators.

Professional experience in years

- The average of the total answers collected by the survey is around 10 years or more of professional experience.
- Analyzing the years of experience, senior advisors are more numerous than junior advisors. This proves the general aging of the sector, with only the 8, 6 % of the farmers are under 40 years old, in coherence with the advisors dominancy of senior's profiles.

Advisory certification:

Advisors

- Mainly advisors form the category of independent advisors have a certification of advice. It may be due to their need of recognition for the development of their activity as a guarantee of quality of their services.

¹⁹ CAP Context indicator 24. Data from 2016. Source: EUROSTAT.

- At national level, there is not a certificate offer by the Ministry of Agriculture, Fisheries and Food. The answers indicate that there are a few advisors with European level certificates (CECRA, EUFRAS).

Organizations

Very few organizations have an advisory certificate. Certification for advisors and organizations at national level have been one of the topics discussed in the Focus Group. Some of the results are the following:

- As a previous step, there is needed a definition of agricultural advisors that should include the typologies of advisory, models and methods.
- From the point of view of AKIS actors, the main reason for having an advisory certification is that this certificate could ensure the quality of the advisory services. This certificate could include ethical aspects and good practices in advisory based on impartiality, training, experience requirements.
- There is also a need to have space for advisors as individuals and for advisory organizations.
- The system needs to be attractive for farmers and advisors without an important dependency on public funds.

4.4. Clients and topics/contents

Advisory services funded by EAFRD, should cover at least one of the topics included under article 15.4. of the Regulation Nº 1305/2013. This topic limitation influenced the advisory system in Spain in general terms towards CAP compliance and national regulations. On the other hand, the advisory services (public and private) non-funded by EAFRD have not an established content. In addition, advisory services adapt their content according to the main productions of each region. These topics could be classified in similar categories as those in i2connect survey.

According to the survey it can be remarked:

- There is no clear relationship between client groups and the activities demanded by them.

Table 3. Number of responses that each category has assigned to the different topics requested by clients

	Freelance advisors	Advisory organization	Organization with an advisory component
Agri-environmental stewardship measures and nature conservation	7	0	5
Production technologies	8	4	7
Use of digital equipment and decision support systems	3	2	3
Rural development support and diversification (farm/forest)	3	8	6
Support with grant application and compliance with regulation and standards	7	7	8
Accounting/Bookkeeping	0	2	1
Entrepreneurship and farm management	6	5	4
Tax and legal advice	2	4	3

- The average number of clients varies depending on whether they are independent advisors or organizations. The latter are the ones with the highest number of clients, while the average number of clients of independent advisors is 38.
- The main activities provided by advisory organizations are very similar for the three groups surveyed, being: Creating awareness and facilitating exchange of knowledge; Consultancy and backstopping; Training and capacity building; Providing support for the design and enforcement of laws and regulations for agricultural innovation (niche innovation, out-scaling/up-scaling innovation).
- Outsourcing of advisory issues is not very popular.

Advisory methods

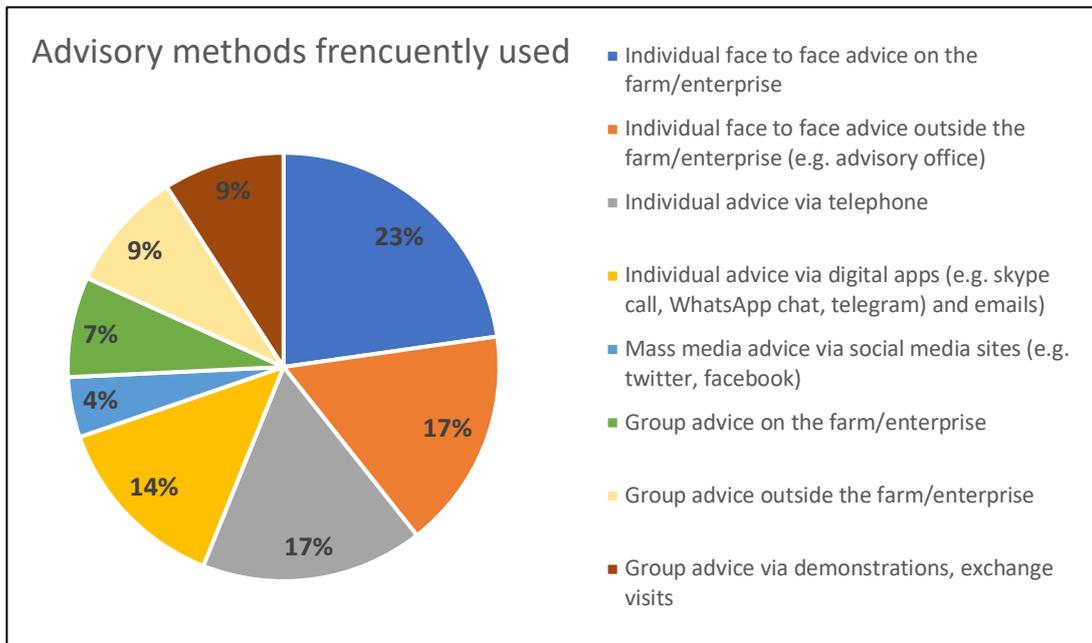


Figure 8. Percentage of advisory methods used by the three advisory provider's categories included in the i2connect survey.

Some of the main insights of the advisory methods from the i2connect survey are:

- All advisors, whether individual or belonging to an organization, employ various advisory methods, mainly individual methods rather than group-based advisory, as shown in the graph above. Individual advisory via digital apps is increasingly used by advisors.
- Freelance advisor uses less group advisory methods than the advisors who represent an organization.
- Of the total of 37 responses, 23 claim to have changed their working method towards more digital formulas implementing the use of different ICTs. It is unknown if in the other 14 answers changes towards, digital formulas have not been made because digital tools were already been used or if they are not used.

4.5. Linkages with other AKIS actors/knowledge flows

The AKIS interaction evaluation exercise developed within the framework of the FG has been completed by a small proportion of the participating experts. The

methodology applied, have been previously used in the SCAR AKIS report “Member States (MS) AKIS implementing tools to bridge the gap between research and practice” by Andres Montero Aparicio.

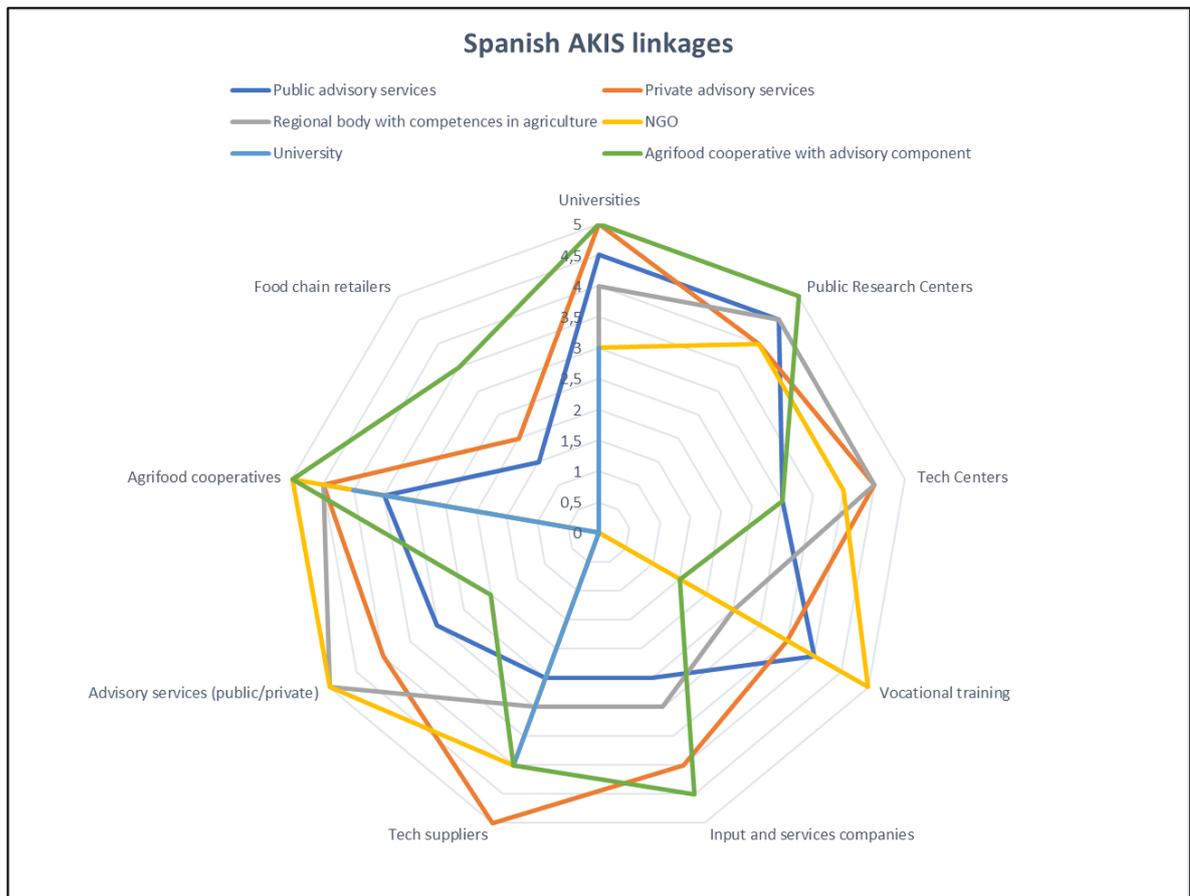


Figure 9. Linkages within some of the AKIS relevant actors. Elaborated within Focus Group on Advisory Services within AKIS.

In most of the cases studied, the mechanisms that have led to a higher level of interaction and exchange of information and knowledge between AKIS actors have been:

- At a more structured level:
 - Actions already developed in previous and current RDPs: Measures such as training or advisory already existed in the 2007-2013 period that have also been included in 2014-2020 period.
 - Relationships established in networks and previous projects financed at European, national or regional level.
- And at a less structured level:
 - Through communication and dissemination actions and informal contacts which allowed the construction of relationships of trust between AKIS actors.
 - Some other mechanisms analyzed in FG: Research and Innovation projects within Horizon 2020 and the coming Horizon Europe; sectorial forums, national platform for sharing knowledge and information for advisory services; demo actions within a structured network; Living labs and thematic networks for advisors.

In addition, the data extracted from the i2connect survey shows:

- There are a strong cooperation linkages between advisory organizations and public authorities, follow by FBOs, and universities. On the other hand, the cooperation with EU projects, NGOs and processing industries have to be reinforced.

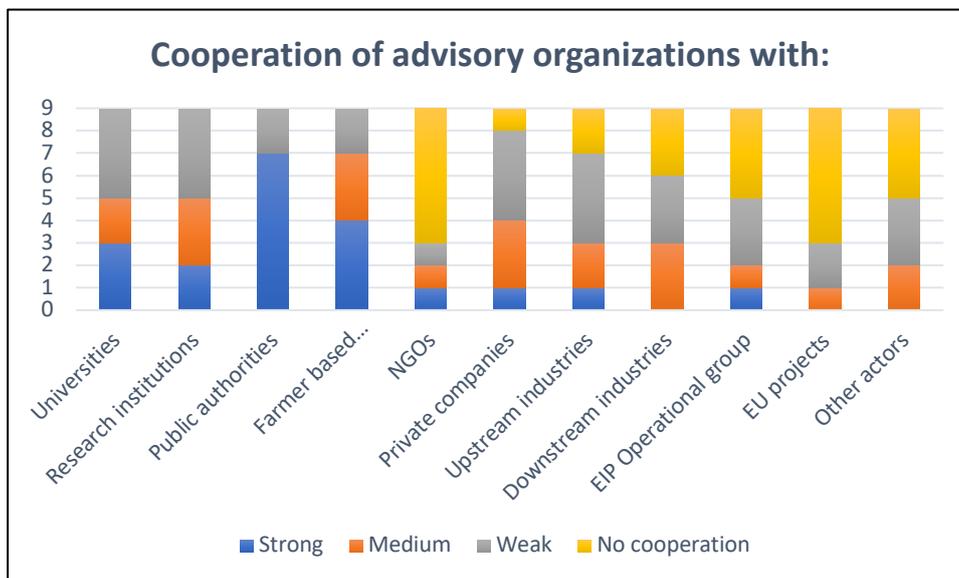


Figure 10. Cooperation of advisory service providers with other AKIS actors.

- There are strong cooperation linkages between advisory organizations with an advisory component with FBOs, follow by public authorities and research institutions. On the other hand, there is a need to reinforce the cooperation with universities, NGOs and downstream industries.

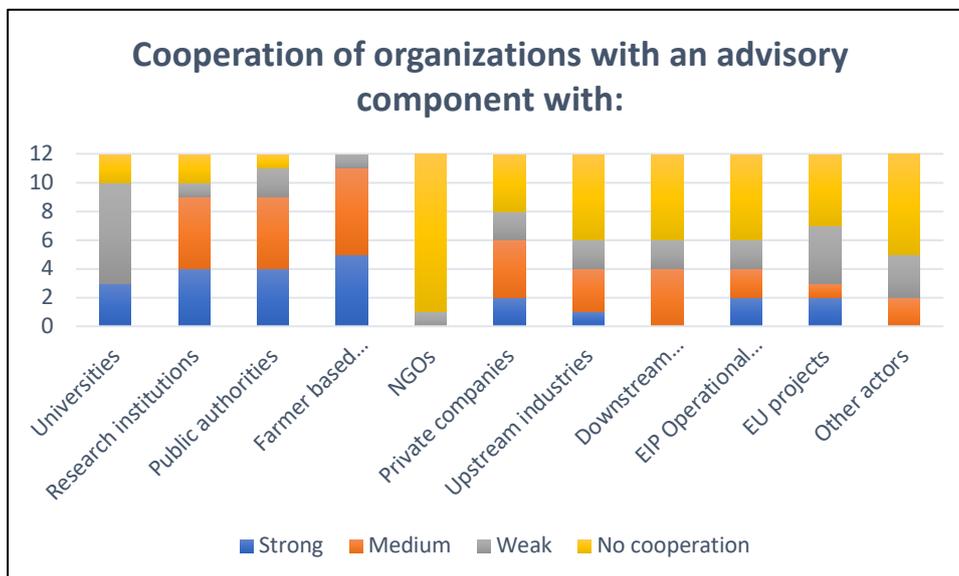


Figure 11. Cooperation of advisory organizations with an advisory component with other AKIS actors.

- There are medium cooperation linkages between freelance advisors with private companies, FBOs, public authorities and research institutions. Besides, there is a need to reinforce the cooperation with EU projects, NGOs, EIP operational groups and industries.

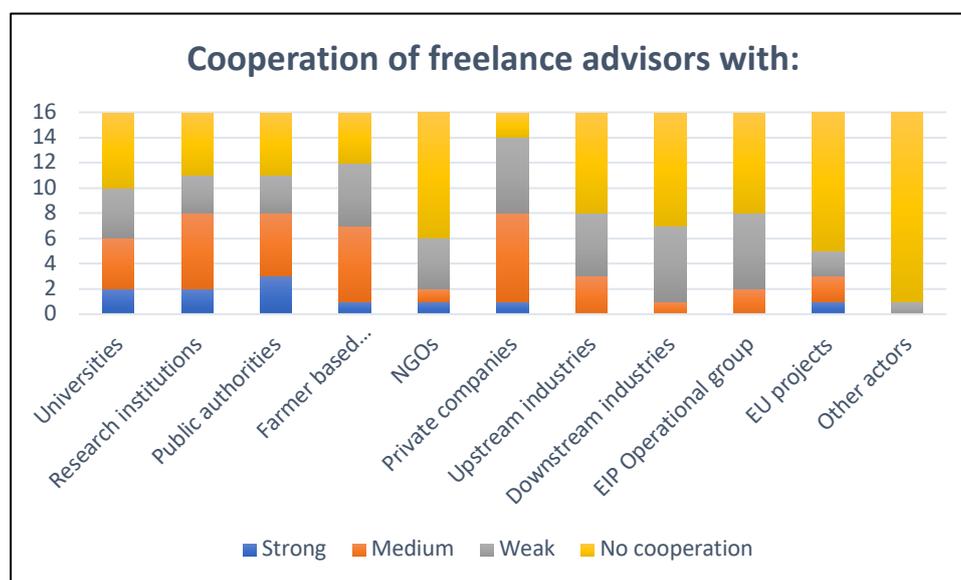


Figure 12. Cooperation of freelance advisors with other AKIS actors.

4.6. Programming and planning of advisory work

Due to the great diversity of people and organizations who provide advice, there is not only a single method of providing advice.

This section includes the analysis of the responses to the survey regarding the strategies used by freelancers and organizations as well as the amount of time they spend on each activity.

Staff development strategy

- 8 organizations have a development strategy for their staff. Nearly all (6), are advisory organizations. Therefore the organizations fully dedicated to advisory are the ones that have the most developed ongoing training tasks for their staff.
- Of the 8 above mentioned, 5 have a trainer / training unit responsible for capacity development. In the other 3 cases, the workers themselves seek the methods to improve their capabilities.
- The average number of days per year that advisors receive training is 10.
- In most cases there is no incentive mechanism when it exists is an economical or promotional reward.

Time allocation for advisory work

The following table describes, in rounded figures, the amount of time (%) an advisor spends for each activity.

Table 4. Sharing of the amount of time that an advisor spends.

	Average (%)
Teaching and training activities	15
Innovation support activities (facilitation, networking, brokerage)	10
Targeted consultation services (business plans, credit/subsidy application, etc.)	20
Information dissemination (face to face, via digital tools)	30
Further development of one's knowledge and skills (participating in training programs)	20
Others; various procedures	5

4.7. Advisory organizations forming the FAS and evaluation of their FAS implementation

In Spain, farm advisory systems are a regional competence, the CCAA are responsible for the organization, configuration and governance of all its aspects. T

his section presents some general information about the implementation of the FAS in Spain, gathered from an EU COM survey distribute in 2018 to all Member States which was also translate for regional authorities:

- Number of designated bodies and advisory agents operating at all geographical levels in which the FAS is organized, on average by type of Autonomous Communities. This parameter is influenced by the size of the different CC.AA:
 - Small-sized CC.AA. (from 1 to 3 provinces, between 5,000 and 12,000 km²):

Nº of designated bodies	5
Nº of advisory agents	85

- Large CC.AA. (more than 3 provinces, between 30,000 and 95,000 km²):

No. designated bodies	99
Nº of advisory agents	227

In addition, the indicators (data source 2018) related to advisory services, within the Common Monitoring and Evaluation Framework (CMEF), show the importance in numbers of CAP support for FAS in Spain:

- Output indicator (pillar II) nº13, number of beneficiaries advise: 94.300 (32 % of the total of EU-27).
- Output indicator (pillar II) nº14, number of advisors trained: 232 (6 % of the total of EU-27).

This shows a gap between the advisory activity and the professional development of advisors through training funded by CAP.

5. Summary and conclusions

5.1. Summary and conclusions on sections 1 – 3

Sections 1-3, shows the wide range of actors in the current AKIS in Spain. The decentralization process in the last decades, since Constitution approval in 1978, results also in the evolution from an agricultural extension model to a heterogeneous public-private mixed model for advisory system. In general terms, there is a significant difference between regions, depending of the relevance of the AKIS actors, and of course, the economic importance of certain agriculture productions and forest species.

5.2. Summary and conclusions on section 4

In section 4, there is a review of the different agricultural and forestry advisory services that coexist in Spain.

In this sense, the Ministry of Agriculture, Food and Fisheries, during 2019 and 2020, create the Focus Group of Advisory Services within AKIS. Some of the main results are included in this document. Also, some of the data used for Spanish Strategic Plan for CAP 2021-2027 have been incorporated.

Additionally, the section 4, also includes the analysis of the answers the survey launched in i2connect Project, serving to provide a partial vision, of the categories of advisors and organizations to which it was addressed.

This information leads to an updated analysis of the advisory services in Spain, at national scope (further regional details will require further studies) that could be used in order to strength and innovate the advisory system.

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AKIS and advisory services in *Sweden*

Report for the AKIS inventory (Task 1.2) of the i2connect project

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Executive summary

Agriculture Knowledge and Innovation Systems (AKIS) is a concept that is used to describe how businesses and organisations jointly share and generate knowledge about agriculture. Today, the AKIS system in Sweden is less hierarchal and more complex than it has been historically. This report is based upon a limited interview study with experts and a limited online survey with advisory organisations.

The advisory system in Sweden can be divided into three categories; the commercial advisory service, the value chain advisory services (upstream or downstream) and the free advisory service. This report does not give a comprehensive view of how the AKIS system is working in Sweden as it is built only on the views of advisory organisations. However, through this report a picture emerges of how Swedish advisory organisations work, which advisory services they provide and how they are financed. It shows that advisory organisations are heterogeneous; their work methods and knowledge sources differ.

Research within the green sector has changed focus from practically applicable research to broader issues such as sustainability, which leads to advisory organisations and farmers turning abroad to find knowledge that they can use in their work.

The expert interviews show that the role of advisory organisations has changed through the years when tools such as social media facilitate the acquisition of knowledge. The new role of advisory organisations is to provide help for the individual farmer to find, sort and value information. There is no actor taking responsibility to synthesise knowledge about agriculture in Sweden today, but suggestions on developing a platform are raised by the experts.

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Abbreviations

AKIS	Agricultural Knowledge and Innovation System
EU	The European Union
LRF	The Federation of Swedish Farmers
SLU	The Swedish University of Agricultural Science

1. Main structural characteristics of the agricultural and forestry sector

Sweden is a country in the northern Europe with a population of approximately 10,3 million people in 2019 (Statistiska Centralbyrån 2020c). Most people in Sweden, around 87 percent, live in urban areas. The country is divided in 290 municipalities and in 60 percent of those more than half of the inhabitants live in a central town (Statistiska Centralbyrån 2018). The GDP per capita in Sweden was 51,610 US dollars in 2019 (The World Bank 2019) and the agricultural sector comprises 1,1 percent of the GDP in Sweden in 2016, which is the newest data (The World Bank 2016). Sweden became a member of the European Union on the 1th of January 1995 after a referendum in 1994 (Smith 2016).

1.1 Agricultural sector

The total land area of Sweden is 40,7 million hectares. In 2015, 8 percent of the total land area was agricultural land (Statistiska Centralbyrån 2020b). In 2020, the total area of agricultural land in Sweden was 3 013 300 hectares, which corresponds to 7 percent of the total land area. Around 2 548 400 hectares was arable land the same year (Statens Jordbruksverk 2020). Sweden is a long country, it measures 1 572 km from the northernmost point to the southernmost point, which makes the regional differences many, as can be seen by differences in use of land. In the southernmost county, Skåne, almost half of the land is agricultural land, whereas in the northernmost county, Norrbotten, only 0,4 percent consists agricultural land. Skåne County constitutes 3 percent of the total land area of Sweden, but 16 percent of the total agricultural land of the country (Statistiska Centralbyrån 2019).

Around 2 percent of the economical active population in Sweden is involved in agriculture, but the amount is decreasing steadily. The average age of farmers in Sweden is high; 74 percent of the farmers are older than 50 years. People who have paid employment within the green sector (agriculture, forestry, fishing etc.) was 92 678 people in 2018. This corresponded to 1,86 percent of the total employment in Sweden the same year, whereas around 1,07 percent of those worked with agriculture. Eight years earlier, in 2010, the employment within the

green sector was 2,26 percent of the total employment in Sweden (Statistiska Centralbyrån 2020a).

Of the paid employees in the green sector in 2018, 34 percent of them worked within family businesses. There were 62 937 holdings within agriculture in 2016 and the average size of an agricultural holding was 41,0 hectares the same year. This can be compared to 71 091 agriculture holdings with the average size of 37,0 hectares in 2010 (Statistiska Centralbyrån 2020a).

In Sweden, the milk sector has the highest productive value within the agricultural sector as it stands for around one sixth of the total value of Swedish agriculture. The milk sector in Sweden has decreased for a long time, and holdings, the amount of dairy cows and the quantity of milk are decreasing each year (Jordbruksverket 2020). In 1990, the number of holdings with dairy cows was 25 921, but had decreased to 3253 in 2019 (Statistiska Centralbyrån 2020a). Since the accession of EU, the production of milk (liters) has decreased with 16 percent (Jordbruksverket 2020).

In 2019, the amount of livestock (in 1000s) was in total 14 448, with 1 466 cattle, 549 sheep and lambs, 1 456 pigs and 10 977 poultry of laying. The crop production was estimated to 6.1 million tonnes of cereals, 381 500 tonnes of oilseed crops (rape and turnip rape), 537 000 tonnes of table potatoes, 129 500 tonnes of peas and field beans and 310 000 tonnes of potatoes for processing of starch in 2019. The share of organic farming in Sweden was 18,5 percent of the total agricultural land in 2019, which can be compared to 2010 when the organic farming was 10,7 percent (Statistiska Centralbyrån 2020a).

1.2 Forestry sector

In 2015, 69 percent of the land in Sweden was covered by forest (Statistiska Centralbyrån 2020b). This makes Sweden one of the most heavily forested countries in Europe (Statistiska Centralbyrån 2019). As the country is long, the conditions for forestry look different on regional levels; in the northernmost county, Norrbotten, the amount of forest land by 1000 hectares was 5,6 million hectares between 2015 and 2019, while the most southern county, Skåne, had 0,4 hectares forest land by 1000 hectares the same period. In Sweden between 2015 and 2019, the division of land area by traditional land use was productive forest

land (58 percent), mires (13 percent), alpine areas (12 percent), arable land (7 percent) urban land (3 percent) (SLU 2020).

The ownership structure for forestry land in Sweden in 2017 was private ownership (48 percent), private owned limited company (24 percent), owned by the Swedish Government (7 percent) and limited company owned by Swedish Government (13 percent). In 2017, there were 319 649 private forest owners in Sweden with the gender division of 38 percent women and 60 percent men (Skogsstyrelsen 2018a).

The forestry sector employs 9-12 percent of the total employment in the Swedish industry (Skogsindustrierna 2019). There are 70 000 people directly employed by the forest industry and around 120 000 people are employed within the sector as employees or as subcontractors (Skogsindustrierna n.d.). The gender division in the forestry sector is not equal in Sweden. In 2017, 15 percent of the employees in large-scale forestry were women and of the forestry entrepreneurs 3 percent were women (Skogsstyrelsen 2017).

The employment in the forestry sector can be categorised in large-scale forestry, forest contractors and small-scale forestry. The work for forest contractors has increased since 1996, while the small-scale and large-scale forestry have decreased. At the same time, the total amount of work hours in the forestry sector is almost the same as in 1996 (Skogsstyrelsen 2018b).

2. Characteristics of AKIS

2.1. AKIS description

Agriculture Knowledge and Innovation Systems (AKIS) is a concept that is used to describe how people and organisations together can share and generate knowledge about agriculture. To create this kind of knowledge, a great diversity of people need to be involved in the process. When collaboration between diverse groups and cross-fertilisation is stimulated, innovation can be stimulated (EIP-AGRI 2018).

Farmers, advisers, researchers, education and training providers, input suppliers, retailers, media services, ministries are all part of a national or regional AKIS since they all either need, produce or exchange knowledge.

Quote from the report *Agricultural Knowledge and Innovation Systems - Stimulating creativity and learning* by EIP-AGRI (2018:3).

The focus on AKIS has grown within the European Union in the recent years, as a response to the failure of linear knowledge transfer. AKIS describes the interaction and link between organisations involved in the innovation system and highlights the knowledge chain between research and practice in order to increase the flow of knowledge to and from EU farmers (EU SCAR AKIS 2019). Gaps between actors affect the knowledge flow which in the long run hinder opportunities for innovation. Barriers in language and understanding between actors can make the knowledge system even harder (EIP-AGRI 2018).

2.1.1. AKIS within agriculture

Yngwe (2014) means that the advisory system in Sweden can be divided in three categories; the commercial advisory service, the upstream or downstream advisory service and the free (public funded) advisory service.

Within commercial advisory services, there are three national main actors; Ludvig & Co (previous LRF Konsult), the Rural Economy and Agricultural Societies, and Växa. They employ between 700-1500 employees, and reach almost all of the Swedish farmers. Besides these three, there are 60-70 minor, local advisory organisations. As to selling advisory services (organisations that sell products and give advice as a part of selling the product) the largest actor is the farmer owned cooperative Lantmännen with a market share of approximately two thirds. Free

advisory services are conducted as a part of the commercial advisory services, but in some regions the County Administrative Boards also conduct advisory services that are publicly financed. Historically the producer organisations and cooperatives have offered free advisory services, but this is not very common today as the profitability of the cooperatives has gone down. The Federation of Swedish Farmers, LRF, sometimes offers free advisory service to their members, and for a few years they have offered a regional coach whose visits support the farmer as an entrepreneur in questions of development or change, to help the farmer see and choose goals and strategies as an entrepreneur. The coaching is financed by money from LRF (Yngwe 2014).

Producer organisations and the farmers' organisation LRF, the Federation of Swedish Farmers, often act as linkages between advisory organisations and farmers. They often arrange meetings and training for farmers, with advisors and experts attending. They are also often the link between farming and research, as elected representatives and officials are often included in boards or steering groups of e.g. research institutions and SLU (Yngwe 2014).

One policy framework concerning improving farmers' knowledge is within the Rural Development Programme. The free advisory services are generally financed by the Rural Development Programme, and there are programmes that cover knowledge transfer to farmers at regional level, and national projects where knowledge transfer is conducted. The main focus of publicly financed knowledge activities during the last programme period is the reduction of the impact of agriculture on the environment and climate. The policy framework identifies the commercial advisory services as their prime provider of knowledge transfer to farmers (Yngwe 2014).

SLU, the Swedish University of Agriculture offer many different forms of training and platforms for an exchange of knowledge. Among them we find Knowledge platforms like Future Forest, Future Food and SLU Future One health, which includes a large number of researchers and actors in the food and forestry system. In recent years, Swedish and European research funding bodies demand a well integrated approach in research projects to allow an improved joint knowledge creation with advisors and farmers.

There are two actors that arrange a lot of meetings and seminars which are platforms for researchers and advisers to meet: Partnership Alnarp and The Royal

Swedish Academy of Agriculture and Forestry. The partnership Alnarp is a partnership between SLU, the business and the society with a focus on agriculture and the green sector. It is financed by membership fees for participating firms and organisations and by SLU. 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 (Yngwe 2014).

There are 14 green clusters in Sweden, scattered across the country. These clusters are important for development of rural areas and the green sector. The aim of the clusters is to strengthen the green sector through cooperation between organisations, business activities and education for developing a region's competitiveness and attractiveness. How each cluster works differs depending on geographical area, cooperation and projects (Landsbygdsnätverket 2020).

Two other important actors in Sweden is Agro Öst and Agro Väst. AgroÖst was created in 2006 and is a regional actor that aim to encourage municipalities, regional associations and county administrative boards to invest in the green sector. AgroÖst is owned by organisations and companies in the counties Östergötland, Sörmland and Örebro and works to get research institutions to become more active within the development of green sector through distributing research and development assignments (AgroÖst n.d.). Agroväst has existed since 1992 and is a development company that aims to contribute to a more sustainable and profitable agriculture in western part of Sweden. The company identifies a need for development and knowledge within the green sector and its actors. Agroväst has a close contact with agricultural practices and generate financial resources to stimulate, initiate and refine activities and projects that benefit the green sector and the whole society (Agroväst n.d.).

2.1.2. AKIS within forestry

The concept of AKIS has not previously been applied to the forest sector. In addition, in recent years the number of claims on what the forest should deliver in terms of economic, environmental, climate and social values have been increasing. The boundaries to 'the forest sector' is thereby under negotiation. It is therefore a challenge to describe the development and flow of knowledge in the sector. As such, this section is a brief introduction to the forestry sector which opens up for further investigation.

The Swedish Government adopted an action plan for the national forest programme in 2018. The plan included a demand on regional authorities to develop, with the help of relevant stakeholders, their own regional forest strategies (Näringsdepartementet 2018). In the process of working with the national forest programme and the development of the regional strategies, new needs for knowledge is developed.

In Sweden, Skogsstyrelsen is the national authority that has the responsibility to implement forest related policies. They maintain contact with forest owners and oversee how forests are managed over time. The forest industry, mainly paper and pulp, puts certain demands both on the management traditions and the logistics. SLU is the leading university when it comes to forestry; each year some 60 students graduate with a MSc degree. A strong bond between university and industry has been identified (Westholm et al). Skogforsk is a central research body for the Swedish forestry sector, and is financed jointly by the government and the members, with a high degree of commissioned research.

Roughly 50% of the forests in Sweden are privately owned, and the regional forest cooperatives (Södra skogsägarna, Mellanskog, Norra skogsägarna) are important knowledge providers for smallholders.

2.2. AKIS actors and knowledge flows

According to interviews with experts in the area, AKIS actors in Sweden are mainly involved in farming, the advisory sector or research. Experts mean that the knowledge development and flow is complex and that the historical view of AKIS as a hierarchical system, with research as the only knowledge producer, is no longer relevant; knowledge is created in many different ways and structures and/or acquired through many different sources.

All of the interviewed experts state that AKIS in Sweden has changed through the years. Today, the AKIS system is less hierarchal and more complex than before. The experts mean that there are still gaps between some actors in the system. One example is the linkage between farming and research which is weak according to one of the experts, meaning that the linkages need to be stronger if the knowledge should be able to flow freely. To achieve this, researchers need to understand the practice. The Swedish University of Agricultural Science (SLU) has historically been the leading university within research of the green sector in Sweden, but other universities in Sweden have stepped forward as a consequence

of SLU's focus on broader issues. The research is rarely focused on practical farming issues according to the experts, which they mean is requested by both advisors and farmers. The lack of practical research by Swedish universities has led to research results often being gathered from abroad; mainly from universities in Denmark and the Netherlands.

As globalisation has become a driving force, the knowledge flow is no longer limited by national borders. According to interviews with experts, knowledge relevant to the agricultural sector can be found through different sources, for example through social media. Social media has become an important tool for gathering knowledge and farmers use social media to get information fast, especially as the knowledge flow is weak within some branches of agriculture. However, it is hard to validate information on social media as it often lacks reliable sources and can be so called 'fake news'. This requires advisors to be constantly updated with new knowledge and methods to be able to answer questions by farmers. One expert states that a lot of knowledge is created between farmers. Farmers talk the same language and understand the world of each other, which is sometimes missing in the interaction between actors at different levels.

2.3. AKIS diagram

The diagram below is based on the interviews with four experts. They describe AKIS as a complex system with many factors that affect how the knowledge flows. The diagram below is a simplified image of the system as three areas are in focus; farming, advisory service and research. These areas interact with each other and within each area. The experts emphasise that the linkage between the actors is either strong or weak.

According to the experts, the knowledge flow between research and farming is poor, which they explain is due to the lack of practical research. Farmers rarely use the research material that is produced in Sweden and the researchers do not focus on practical issues which make knowledge flow weak in both directions. Research results are shared to advisory services and are important for their work as advisors, but the knowledge flow from advisory service to research is considered weak by the experts. They mean that research on practical issues is missing, and therefore gathering of knowledge from advisory organisations rarely

happens. The linkage between farming and advisory service is well functioning and there is an exchange of knowledge between them, thereby the flow is strong.

Vocational education and training play an important role in providing the sector with labour, but also functions as important local/regional knowledge platforms between farmers and advisors. The network of agricultural colleges have 63 members, vocational schools in all possible fields of gardening, agriculture, animal husbandry, animal welfare, rural tourism and forestry.

As the AKIS system is complex and there are many other factors to consider; influences from outside, such as Internet and social media, policy, customers and contractors are important for understanding AKIS in Sweden as they affect the system.

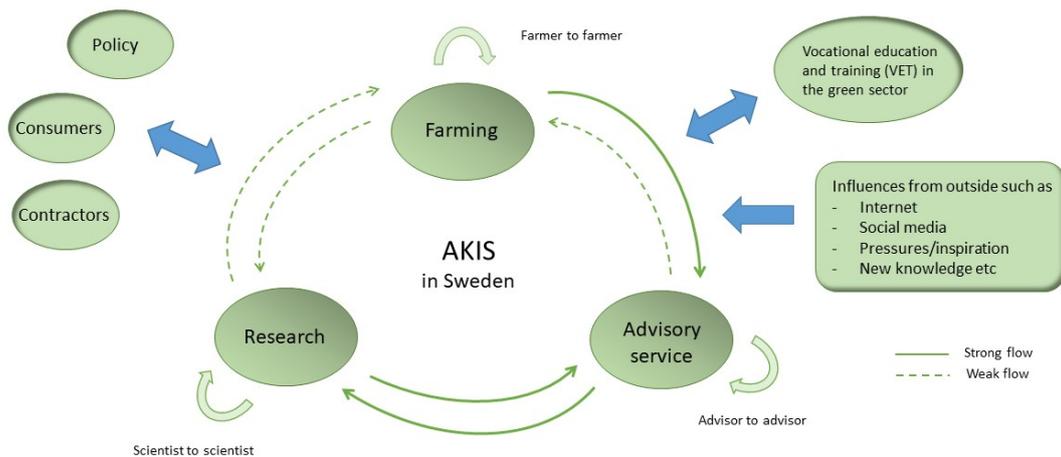


Figure 1: Sketch over AKIS in Sweden based on interviews with experts within the green sector. The diagram has been sent to all experts before publishing.

3. History of the advisory system

Advisory services and training to farmers have a long history in Sweden. The Swedish Rural Economy and Agricultural Societies (Hushållnings-sällskapet in Swedish) is the oldest advisory organisation; the first regional society was formed in 1791 and during the first half of the 19th century more regions started their own Rural Economy and Agricultural Society. Today there are 18 societies all over Sweden (Yngwe 2014).

In the beginning the societies were mainly financed by membership fees from the farmers, but in 1855 the parliament introduced a tax on alcohol production, and one fifth of this tax was given to the societies. In the beginning of the 20th century the advisory service in the societies became more specialised, and they hired advisers on e.g. animal husbandry, dairy and buildings. During this time the societies also developed field trials, which also today add a value to the advisory services of the Rural Economy and Agricultural Societies. The field trials were financed by their own assets, funds and donations and did not depend on public financing. It was not until the 1940s that production organisations, the farmers' organisation and cooperatives started to develop their own advisory service within their specific segments (Yngwe 2014).

In 1967 the Swedish Parliament decided that the publicly financed advisory services should be taken over by the Country Administrative Boards, and the objective of the advisory work was to make Swedish agriculture more efficient and rational. Before 1967, about 65% of the advisory services of the Rural Economy and Agricultural Societies were financed by the state, and with the withdrawal of public support the Rural Economy and Agricultural Societies struggled to survive and to find out how to relate to the publicly financed advisory service. This led to a reorganisation of the advisory services of the Rural Economy and Agricultural Societies. With the weakening of the Rural Economy and Agricultural Societies' advisory services in the beginning of the 1970s this opened up the system for other actors such as cooperatives, producers' organisations and farmers' organisations to strengthen their advisory services (Yngwe 2014).

For a long time, the advisory service was very much focused on intensifying the production, with higher yields, higher level of fat in the milk, etc. During the 1970s one can see the beginning of a change of focus towards the economy. The farms grew bigger and more complex and the costs of input goods increased with higher speed than the price of produced goods which led to a demand of better connection between production and business. This was the start of the 'intense advisory service' that is now common in many advisory organisations. Intense advisory does not mean that the advisory service was focused on an intense production, but means that the adviser had close contact with the farmer in order to do the measures needed at the right time instead of doing them according to a set plan, which had been a common method of producing before the 1970/1980s (Yngwe 2014).

During the 1990s the focus of the Swedish government started to shift from wanting to promote rationalisation and change of structure in agriculture to promoting a more environmentally friendly production. Therefore the public financing has been very much focused on agriculture and environment during recent decades. Especially since entering the European Union in 1995, the publicly financed production advisory services have ended and the County Administrative Boards are no longer great actors in advisory services (Yngwe 2014).

When the public production advisory service ended in the 1990s, it allowed for more commercial advisory organisations to enter the market of production advisory work, and in 2014, there were 60-70 actors on the market. At the same time one could see yet another shift in focus on advisory services, as more and more actors within the Swedish AKIS talked about management, leadership, LEAN production, and to develop the farmers from being producers to becoming entrepreneurs (Yngwe 2014).

4. The agricultural advisory service(s)

This chapter, beside sections 4.1 and 4.2, is based on interviews with experts who all have connections to the advisory sector in Sweden.

4.1. Overview of all service suppliers

In general one can divide the Swedish advisory services into three groups;

- the commercial advisory services that have agricultural advisory service as their main occupation,
- where advisory service is not a product on its own, but part of the sales strategy when selling input goods (upstreams) or securing quality assurance (downstreams), and
- free advisory services where all of the advisory service is paid by the public.

For a long time, the Rural Economy and Agricultural Societies was the only agricultural service supplier, but with the establishment of the public advisory services from the County administration in the sixties, and the private agricultural service in the 80s, the suppliers of advisory services have become quite diverse with public, private and farmers' owned organisations (Yngwe 2014).

There are some leading national suppliers of commercial agricultural advisory service:

- The Rural Economy and Agricultural Societies, which is a farmer-based member organisation for farmers and it has a diverse service supply of e.g. advisory service, field trials, education;
- Växa, which is farmer owned and stems from the animal husbandry and breed organisations and focuses on animal production, and finally
- Ludvig & Co (previously LRF Konsult), which is partly owned by LRF (Swedish Federation of Farmers, holds 25%) and mainly focuses on economy and bookkeeping for both agricultural and non-agricultural businesses.

These three organisations can be found in local and/or regional offices all over Sweden, and have a total of 700, 500 and 1,500 employees respectively. In

addition there are about 60-70 private/farmer owned suppliers of agricultural advice, many of these are local actors with less than 10 employees (Yngwe 2014).

There are quite a few actors that could be defined as 'value chain' advisory services, as they sell input goods to the farmers and acts as advisers in these discussions but do not sell advisory services on their own. The market leader is Lantmännen with approximately 13,000 employees all over the world, but Svenska Foder and Gullviks are other large national players. There are some smaller, local retailers of input goods, many of which are members of the Danish DLA-group, and there are also food companies like Nordic Sugar and Findus that have advisers for their contractors, in order for the contracted farmer to produce as high quality products as possible (Yngwe 2014).

In some regions the County Administrative Board still offers free advisory services. Producer organisations like LRF used to give free advisory services to their members in the past. As profitability has gone down, the structures of Swedish cooperatives have changed, as some have been sold and others have merged, it has become very rare for these producer organisations to offer free advisory services, unless it is part of a specific project (Yngwe 2014).

4.2. Result from the online survey about AKIS

The i2connect online survey was carried out in November 2020 and a total of 15 respondents were collected; 12 of them represented an organisation with an advisory component and 3 of them represented an advisory organisation. Of the 15 respondents, 10 organisations were government or ministry based advisory organisations, 4 were non-governmental organisations (NGO) and 1 was a farmer-based organisation. The organisations work on the scale of regional (67%), sub-regional (13%), national (13%) and international (7%) according to the survey. The primary source(s) of funding for the advisory organisation are mostly national/regional government funds (public funds) and EU CAP projects and funds, but cost-recovery from farmers (fee for service financing), contribution (membership fee), foundation funding and levy (payment for a certain share) also occur according to the respondents.

How many employees the organisations had in 2020 differ significantly, from 0 employees (lowest) to 950 (highest). Around 73 percent of the respondents have

answered that the amount of advisors are the same as it has been in the past five years. In the survey, 9 of the respondents (60%) answered that one need additional qualifications, as experience and organic competence for organic advisory, to serve as an advisor in their organisations. 13 of 15 (87%) respondents answered that advisors in their organisation do not have advisory certifications. 12 of 15 respondents (80%) say that their organisations have a staff development strategy/plan. The majority of the advisory organisations (73%) do not have some form of mechanisms to reward good performance and incentivize skill developments for advisors.

Respondents' perception of how much of the total time average advisors in the organisation allocate for the following activities. Only 9 of 15 respondents answered the question. Proportion of time in percent (%).

	Teaching and training activities	Innovation support activities (facilitation, networking, brokerage)	Targeted consultation services (business plans, credit/subsidy application, etc.)	Information dissemination (face to face, via digital tools)	Further development of one's knowledge and skills (participating in training programs)	Others
<i>Respondents</i>						
1	10	0	0	10	2	78
2	15	2	0	5	1	77
3	60	10			30	
4	30	10		40	20	
5	20	20	20	20	20	20
6	50	45			5	
7	25	10	50	5	10	
8	30	10			2	30
9		90		10		

Figure 2: Table over advisors' time based on the i2connect online survey.

The advisory activities of the respondents' organisations are many according to the online survey, such as creating awareness and facilitating exchange of knowledge, networking, enhancing access to resources, training and capacity building etc. The client groups of the organisations are many; small to large farms, agricultural advisors, young and part-time farmers, producer groups etc. Not all respondents replied on how many client contacts their organisations service per year, but the responses received range from 30 (lowest) to 6000 (highest). What the clients ask for differ according to the survey, but questions concerning entrepreneurship and farm management, production technologies and support with grant application are some examples. The majority of the respondent

organisations (87%) outsource to external consultants for certain advisory topics. What these advisory topics are differ, but issues concerning production, environment and different kind of development occur in the answers.

Respondents' rate on the degree of cooperation in advisory service delivery with the following actors.

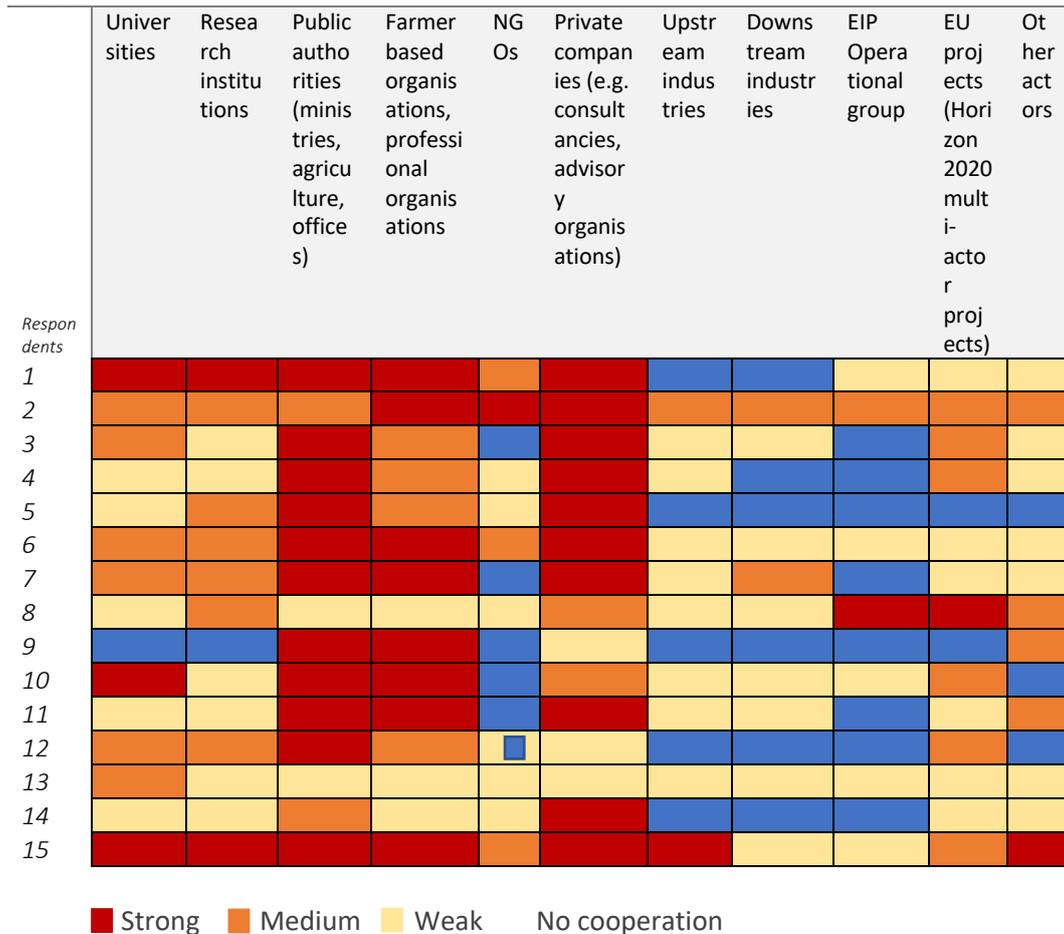


Figure 3: Table over advisors' perception over the degree of cooperation between different actors in advisory service.

The advisory organisations work in different ways, as illustrated in figure 3. The level of cooperation between different actors is perceived differently and this creates a mosaic of understandings. The figure shows that the work of advisory organisations is heterogeneous and how they gather information depends on the organisation. As the amount of respondents in the online survey was 15, it is hard to verify an overall picture of how all advisory organisations work in Sweden.

All respondents (100%) say that there have been changes in the advisory methods due to the COVID-19 pandemic. The changes differ depending on organisations, but digital meetings, cancelled meetings and smaller groups are some examples.

4.3. Public policy, funding schemes, financing mechanisms, advisory service providers

In the interviews, it becomes apparent that it is a necessity for advisory organisations to be in continuous contact with authorities, for example Näringsdepartementet (Ministry of Enterprise and Innovation) and Jordbruksverket (Swedish Board of Agriculture), to be updated on politics that will affect the advisory organisations and their customers. One expert argues that agriculture in Sweden is formed by politics to a large extent, which affects the narrative of agriculture as well. The expert gives example on how the Swedish policy has high standards for animal welfare, which every farmer need to comply regardless if it is profitable or not. Different laws within EU makes it difficult for Swedish farmers as there is a contradiction that it is illegal to produce some goods, but not illegal to buy them. This complicate the situation for Swedish farmers to compete with farmers within EU and on the global market as the market and politics in Sweden are not always synchronised.

In Sweden, the most common form of advisory service provision is the paid advisory services according to the expert interviews. This has created a system where advisors know what is required of them as farmers only pay for the services they need. One expert means that there are no gaps in the knowledge flow between farmers and advisory organisations as long as the farmer search for services and can pay for it. As the farmers pay for almost every advice, the advisory organisations need to be updated with new knowledge. Another expert says that there are subsidised advisory services in Sweden, but that they are provided by the public authorities and not always in line with what the farmers need. The expert also argues that if the goals, as higher production and greater competitiveness, in the national food strategy of Sweden are going to be fulfilled, farmer enterprises in Sweden need to be more profitable. This is connected with a strong and capable advisory service.

From the political perspective, development in the knowledge chain is prioritised in Sweden. However, advisory organisations rarely have resources enough to put time and effort in their own capacity building or have conversations with policy makers. Dialogue with authorities are of great importance for advisory organisations, because if the political decisions do not become 'right', it will be harder to implement them in the advisory organisations. The political decisions need to be clear and useful to facilitate the work of advisors.

4.4. Human resources and methods of service provision

To be able to offer good service provision, advisors need further education occasionally. Skills development for advisors do not look the same as it did before when conferences were the most common method to gather knowledge. Today, the skills development is more continuous with activities such as digital seminars for example. A variety of courses is good, and in a general sense the experts find that universities and authorities provide good education. The advisory organisations often work together over the whole country to be able to provide knowledge to the farmer when the demand of knowledge is broad. The experts mean that it is a challenge to organise and deliver knowledge to customers, but even local advisory organisations try to work over the whole country to keep advisors updated within the areas that are needed. Many advisory organisations is financed through selling services, hence it is a necessity to be updated on the latest news within the green sector.

Advisory organisations need to be updated to meet demands of farmers, but advisory organisations do not always have resources to gather the knowledge that is needed. One expert means that it is up to the individual advisor to gather knowledge, which creates an inefficient system as every advisor need do it themselves. The time it takes to gather knowledge is non-debitable time, i.e. cannot be invoiced.

Many of the advisors mention 'best practise' as an important source of knowledge. A farmer who has made good results can become a good example to other farmers. By letting farmers present their results and solutions, other farmers can be inspired. One expert says that when actors speak the same language, they

understand each other to a greater extent henceforth it could be useful to have best practise as a coaching method.

4.5. Clients and topics

The experts mean that advisory services should be based on scientific facts. As the knowledge system has become more intangible and information sources such as social media has become more common, it is of great importance that advisory organisations are aware of new knowledge. One expert means that it is good to clarify where all new information comes from, as the advisory organisations need to validated information. To what extent farmers use social media as a knowledge source depend on the individual, but rumours one social media can complicate the work of an advisor. The need for the advisor to have answers that are based on facts is more important today than ever before.

The experts mean that farmers ask different questions today comparing to ten years ago; the questions have changed from being about production and biology, to become more about technical and digital tools, bureaucracy, business management and environment. The scope of the questions are bigger than before as a consequence of the fact that agriculture has become a subject of discussion in the society at large. Previously advisory service was often between one advisor and one farmer but now when the need of advisory services is broader, the advisors need to connect different types of expertise, and thus need a broader understanding of the farming as a whole.

The demand of advisory service has changed through the years, and today farmers often need services such as management when the farmer enterprises are getting bigger according to one of the experts. The expert says that the advisory service about management has been support through CAP for example, but the demand from farmers has been low. The expert means that is hard to know why that is, but it could be explained by the non-tradition of advisory services of such issues.

4.6. Linkages with other AKIS actors/knowledge flows

There are gaps in the knowledge flow between actors in the Swedish AKIS system. The flow from and to research is described as poor in the expert interviews. The

Swedish University of Agricultural Science, SLU, is the only university of agricultural science in Sweden and has been an important knowledge sources historically. In the expert interviews, SLU is criticised for not conducting relevant and practically applicable research. Experts mean that the research at SLU has changed focus from practical farming to other issues such as sustainability for example. This creates problems, as the advisory organisations need scientific results to base their advice on. SLU's new focus has led to other universities stepping forward and doing research within the green sector to fill the gap.

The adapted research within agriculture is missing in Sweden and one expert means that some advisory organisations need to do research on their own, mainly through field trials. The expert means that adapted research is a must if Sweden is going to be able to be at the forefront in the future. Another expert means that advisory organisations should be able to provide questions that researcher should take into consideration. This would make research more adapted to the needs of the farmers as the advisory organisations have a good view of what research is needed.

One of the expert means that the subject-oriented research is bigger than the practical in Sweden. The research focus on SLU covers 'bigger' issues according to the expert, who gives example on how research is more about sustainability rather than animal feed for example. When SLU changed focus, other universities in Sweden which have not been linked with agriculture before have stepped forward. Another expert says that there is no actor taking responsibility to synthesise knowledge about agriculture in Sweden, and gives suggestion on creating a platform where farmers, researcher, advisors and other actors could meet. The platform could also be way for farmers and advisors to give suggestions on research subjects that they need help with.

The researchers who are not out in the practice are not trusted by farmers according to one of the expert. When a researcher has not been out in the field, they do not understand issues that farmers face nor do they speak the same language. The expert also means that there is a gap between researcher and advisory organisations, a gap that could be filled by a new type of actor. The role of this actor could be to gather knowledge and research, synthesise it, package it and then spread it. This would facilitate the work for many advisory organisations according to the expert who means that the Swedish Government should bear the

cost for this actor. The expert says that Swedish Board of Agriculture has been commissioned to investigate this.

4.7. Programming and planning of advisory work

The experts mean that the AKIS system of today is influenced by the surroundings as the world is shrinking as a result of globalisation. Since Internet and social media have become fully integrated in our lives, the knowledge flow has become faster as well as much easier to access. As with all information on social media, it is hard to validate the information when fake news occurs everywhere. This creates some difficulties for advisors according to experts, as the advisors must know what is true and what is not, and still be able to answer quickly on the farmers' questions. One expert says that the advisors of today need to be confident in saying that they do not know all the answers, as the advisory organisations have a role of validating information. Farmers should be confident that advisory organisations know what they are talking about and that their advice is based on research. The new role of advisory organisations is to provide help to the individual farmer to find, sort and value information according to one of the experts.

4.8. Advisory organisations forming the FAS and evaluation of their FAS implementation

According to the i2connect online survey that was carried out in November 2020, 10 of the total 15 respondents that were collected (67%) answered that their organisation advise farmers to adapt their farms to the cross-compliance requirements by EU-FAS. This kind of work is embedded in the other advisory activities that the organisations do.

5. Summary and conclusions

5.1. Summary and conclusions on sections 1 – 3

In Sweden, 7 percent of the land is agricultural land and 69 percent of the land is forest. The country is long and has different conditions depending on region. The majority of the population, around 87 percent, live in urban areas. The forestry sector in Sweden stands for 9-12 percent of the total employment in Swedish industry. Around 2 percent of the economical active population in Sweden is involved in agriculture, but the amount is decreasing steadily. The average age of farmers in Sweden are high; 74 percent of the farmers are older than 50 years. There were 62 937 holdings within agriculture in 2016 and the average size of an agricultural holding was 41,0 hectares the same year. In Sweden, the milk sector has the highest productive value compared to other branches as it stands for around one sixth of the total value of the Swedish agriculture.

How AKIS works within the forestry sector in Sweden has not been explicitly studied for this report. AKIS actors within agriculture in Sweden are mainly divided in areas of farming, advisory and research. The advisory system in Sweden can be divided in three categorises; the commercial advisory service, the upstream and downstream service and the free advisory service. Advisory service in Sweden has a long history; the first advisory organisation, the Swedish Rural Economy and Agricultural Societies (Hushållningssällskapet), formed a regional society in 1791. The advisory services have changed through time; from focusing on intense production, to economy and environmentally friendly production. Today, for example, the focus is on entrepreneurship and management.

The knowledge flow in AKIS in Sweden has also changed; today we see a system that is less hierarchical, where knowledge is created between actors at different levels and through new sources. The universities still have an important role to play in validating knowledge through research, but they are not the only knowledge sources as they have been historically.

5.2. Summary and conclusions on sections 4

The i2connect online survey had a total of 15 answers where 12 of them represented an organisation with an advisory component and 3 of them represented an advisory organisation. The survey showed that the advisory

organisations that answered the survey work on the scale of regional (67%), sub-regional (13%), national (13%) and international (7%). They are funded by national/regional government funds (public funds) and EU CAP projects and funds above all, but also by cost-recovery from farmers (fee for service financing), contribution (membership fee), foundation funding and levy (payment for a certain share). This contradicts to the answer of experts, who say that the most common form of advisory service provision in Sweden is the paid advisory services. They mean that this has created a system where advisors know what is required of them; farmers only pay for the services that they need.

All respondents (100%) in the online survey answered that there have been changes in the advisory methods due to the COVID-19 pandemic. These changes differ depending on organisations, but digital meetings, cancelled physical meetings and smaller groups are some examples.

Some linkages between actors in the Swedish AKIS system have gaps in the knowledge flow according to the expert interviews. The knowledge flow to and from research is describe as bad as research of practical issues are missing. This creates problems, as the advisory organisations need scientific results to base their advice on. The focus of research has changed from practical to broader issues such as sustainability, the research that is produced today is rarely used by farmers directly. The experts also mean that other universities than the Swedish University of Agricultural Science (SLU), that has a history of being the prime university in agricultural science, have begun to find interest in issues concerning agriculture. The lack of practical research has led to advisory organisations looking after research results abroad according to experts.

One of the experts means that there is a gap between research and advisory services, a gap that could be filled by a new type of actor. The role of this actor could be to gather knowledge and research, package it and spread it. Another expert gives suggestion to create a platform where farmers, researcher, advisors and other actors could meet. The platform could also be a way for farmers and advisors to give suggestions on research subjects that they need help with.

All advisory services are based on scientific facts according to one of the experts. As the knowledge system has become more flexible and information sources such as social media have become more common, it is of great importance that advisory organisations are aware of all new knowledge that is produced. Social

media gives information fast, but it is rarely validated and therefore fake news can occur. The new role of advisory organisations is to provide help to the individual farmer to find, sort and value information.

Many advisory organisations live on selling services and they need be able to offer good service provision which requires that advisors have further education every so often. One expert means that it is up to the individual advisor to gather knowledge, which creates an ineffective system when every advisor need do it themselves. The time it takes to gathering knowledge is also non-debitable time according to one expert. A platform would facilitate this. Many advisors talk about the concept of 'best practise', which means that farmers who have made good results can act as good examples to other farmers, as a coaching method. Farmers speak the same language hence it could be instructive.

An expert states that farmers ask different questions today comparing to ten years ago; the questions have changed from being about production and biology, to become more about technical and digital tools, bureaucracy, business management and environment. The expert means that the "brush strokes" are bigger than before as an extension of the agriculture's role has become a subject of discussion in the main society. In the expert interviews, it appears that the relation with policy makers is important for advisory organisations as their work is affected by political decisions. Unfortunately, advisory organisations rarely have resources enough to put time and effort in conversations with policy makers.

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Appendices

Guideline questions for the semi-structured interviews

Overview of service suppliers

1. What is your perception/impression regarding the current agricultural knowledge and innovation systems in your country?
2. Please comment on and complement the AKIS diagram sketch: Does it reflect your point of view, and where do you deviate? Which organisations are missing or redundant in the diagram?

Networks, knowledge flows, linkages with other AKIS actors

3. Where is knowledge in this system created, processed/ transformed, applied, etc.?
4. How are the organisations linked? Specify which linkages are strong, weak, and do not exist.
5. How do you assess the capability of advisory services to bridge research and knowledge needs of farmers? Where in the diagram can bridges be found, where are gaps?
6. How do you perceive the ability of knowledge networks in enhancing innovations?

Public policy, funding schemes, financing mechanisms

7. Please comment on the policy framework (national level) with regard to a functioning AKIS: e.g.
 - How does the policy framework support on setting strategic goals for agriculture and rural development?
 - How does the policy framework support innovations in agriculture?
8. Which national agreements exist on knowledge exchange; what governance and coordination structures today and in the future in this regard? Are there particular financial instruments?

Challenges, knowledge gaps

9. What are key challenges for the agricultural sector? Consequently, what are key concerns of the current AKIS in your country?
10. Which (future) trends do you observe within AKIS / advisory services in your country?
11. Which knowledge needs do you perceive:
 - for farmers?
 - with regard to the new CAP period?
12. Are you aware of topical literature about relations and knowledge flows between advisors and farmers?

AKIS and advisory services in *Switzerland*

Report for the AKIS inventory (Task 1.2) of the i2connect project

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Executive summary

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1. Main structural characteristics of the agricultural and forestry sector

1.1. The main structural characteristics of the agricultural sector

Agrarian structure and holdings (Bfs, 2020)

The number of Swiss farms is growing. The number of farms fell from 111'302 in 1975 to 50'038 in 2019. While the number of conventionally producing farms shrank, organic farming gained strongly in importance in the 1990s. The number of organic farms increased from 900 in 1990 to 7284 in 2019. In 2019, a farm managed an average of 21 hectares of agricultural land, which is more than twice as much as in 1975, and the number of farms with more than 50 hectares of farmland increased. These 2900 large farms (6% of all farms) farm almost 205'000 ha of agricultural land (20% of the total area).

Economy and income situation

The total output of Swiss agriculture in 2018 was CHF 10.7 billion. 48% of this came from animal production. Milk production alone accounted for 20% of total production (CHF 2.2 billion). Agricultural services and non-agricultural secondary activities contribute significantly more to the production value than in 1985. Agricultural income per farm in 2018 averaged CHF 70'600. Non-agricultural income accounted for about one third of household income. Household income was on average 20% and 29% lower in the hill and mountain regions respectively than in the valley region.

The earnings of family workers in agriculture are generally lower than those of employees: In the valley, hill and mountain regions, 67%, 53% and 48% respectively of the reference wage.

Employment and age structure

In 2018, 152 442 people were employed in agriculture. Between 2000 and 2018, the total number of people employed in agriculture fell by over 50 000. In absolute terms, the number of family workers fell by around 48 200 and the number of non-family workers by around 3200. Since 2000, the number of female farm managers among the family labour force has increased.

The average age of farm managers increased by three years between 2000 and 2018, from 47 to 50 years (Zorn, 2020). The median (50 % percentile) shows a similar trend, increasing from 47 to 51 years. This means that half of the farm managers are 51 years and older. There is a clearly decreasing share of young farm managers under 35 years of age. At the same time the proportion of farm managers who will exceed the age limit of 65 years for receiving direct payments in the next ten years is growing: from 21 % in 2000 to around 30 % of all farm managers in 2018. This could stimulate structural change in the coming years.

Use of chemicals in soil improvement

The nitrogen balance remains in surplus. In 2017, food in Switzerland will account for 24% of the greenhouse gas emissions of the entire economy, of which agricultural production will account for 14%. In the 1990s, there was a nitrogen surplus on agricultural land of over 80 kg/ha and year. Since then, it has been declining and in 2017 it was around 66 kg/ha.

In 2018 a total of 2050 tonnes of plant protection products were sold, which is about 10% less than in 2013.

Conclusions

- The number of large farms with at least 30 ha of agricultural land is increasing, while the number of smaller farms is decreasing.
- Structural change is proceeding more slowly in Switzerland than in neighbouring countries.
- Specialisation in agriculture is increasing. Fewer and fewer farms keep dairy cows (< 20,000) and pigs. In crop production, the cultivation of root crops and vegetables is concentrated on fewer and fewer farms.
- In the next ten years 30% of farm managers will reach the age limit for receiving direct payments (65 years). This will lead to a generation change which will have an impact on structural change, in particular on the growth of the remaining farms.

1.2. The main structural characteristics of the forestry sector

General (WaldSchweiz)

- One third of the country's surface is covered by forest.
- This amounts to around 1.28 million hectares of forest or just under 1,520 m² per inhabitant.
- The forest area is increasing - annually by about the same amount as the Lake of Thun.
- The total stock of timber in Swiss forests is about 427 million m³.
- Every year, 10 million m³ of wood grow again in Switzerland.
- Without overexploiting the forest, 7 to 8 million m³ of wood could be harvested annually.
- Switzerland's annual wood consumption, including imported wood, is almost 11 million m³.

Working in the forest

- More than 700 forestry companies manage the forest. In addition, about 850 mobile, flexible forestry companies work on behalf of the forest owners. Thousands of private individuals (mainly farmers) use and maintain their forest.
- The forestry sector employs 6,200 people, and the raw wood processing industry employs around 7,500.
- The forestry and timber industry provides more than 100,000 jobs.
- Forestry work is dangerous, with almost 1,500 accidents every year.
- Around 4.5 million m³ of wood worth over CHF 380 million is harvested annually. Approximately two thirds of this is coniferous wood and one third hardwood.
- Gross value added in the forestry and timber industry CHF 4.5 billion/year
- The good access with approx. 30,500 km of forest roads enables forest maintenance and management.

Organization of the forestry sector

Codoc is a specialist unit of the Federal Office for the Environment FOEN (CODOC, 2020), which was founded in 1989 and operates throughout Switzerland. It is an information hub, teaching aid centre and innovator. Codoc is an important contact

and information point for the entire forest industry. In collaboration with its partners - the Confederation, cantons, associations, training centres and schools - it promotes and supports the implementation, quality and further development of education and training in the forest. www.codoc.ch

Association of Swiss Forest Owners, WaldSchweiz: The network comprises the national association of forest owners, with its 22 cantonal associations. All forest owners in Switzerland and the Principality of Liechtenstein can join a regional and/or cantonal association. It represents the interests of some 250,000 private and public forest owners:

- political representation in parliament and cooperation with federal offices, universities, research institutes, associations, etc.
- professional training and further education of forest experts
- Support of forestry enterprises through consulting and software products
- Supporting forest owners in marketing timber products and other forest services
- Information for the industry, including the publication "WALD & HOLZ"

Based on the national forest legislation, each canton has its own forest law and a forest ordinance. These govern various aspects of forest management, forest maintenance, forest preservation and many other issues. This gives rise to most of the rights and obligations of forest owners.

The Swiss forest belongs to around 250,000 different owners. Of these, 244,000 are private and almost 3,500 public forest owners. Public-law owners include municipalities, cantons and the Confederation, but also civic communities and corporations.

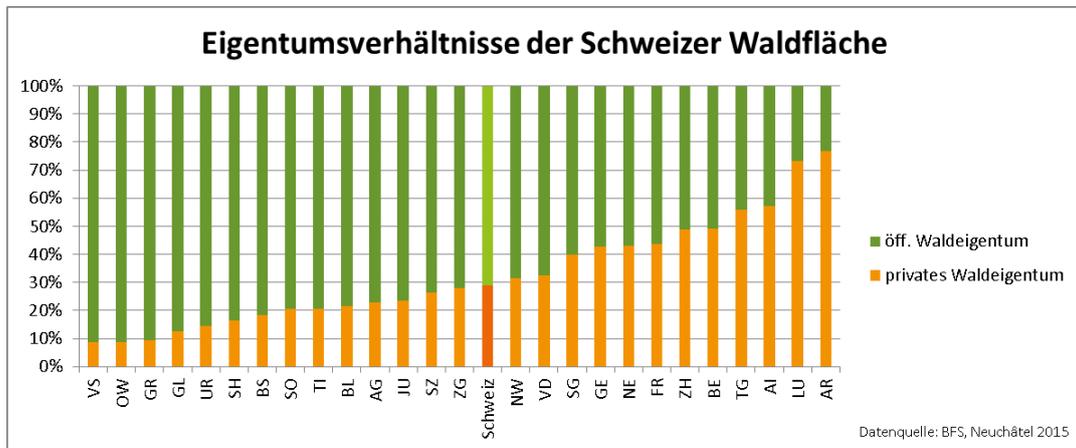


Figure 1: Ownership structure of Swiss forest land by canton

The ownership structure of forest areas varies considerably. In the canton of Valais, less than 10% is privately owned, while in the canton of Lucerne it is over 70%. On average in Switzerland, around 28% of forest areas are owned by private owners, 72% by the public sector.

2. Characteristics of AKIS

2.1. The Swiss AKIS diagram

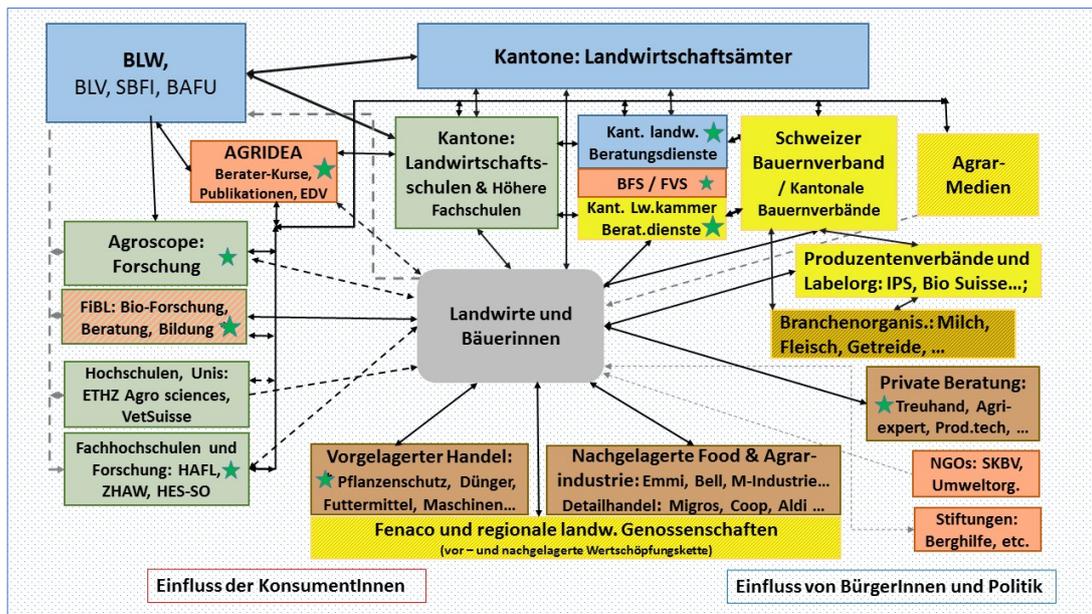


Figure 2: The Swiss AKIS diagram

- ★ Advisory organisations and organisations with an advisory component or other advisory support were marked with a green star in the AKIS diagram.

2.2. AKIS description

2.2.1. AKIS actors and knowledge flows

The AKIS diagram of Switzerland was structured using the colour code provided by the i2connect project. The focus of the presentation is on the interactive transfer of knowledge between research, advisory services and practical farms. Advisory organisations and organisations with an advisory component or other advisory support were marked with a green star in the AKIS diagram.

The following public institutions (blue) are responsible for agriculture at national level: the Federal Office for Agriculture FOAG, the Federal Office for Food Safety and Veterinary Affairs BLV, the State Secretariat for Education, Research and Innovation SBFI and the Federal Office for the Environment FOEN, which is also

responsible for the forests. Vocational education and training is subordinate to the SBFI. Agricultural research, however, is directly subordinate to the FOAG.

In the 26 cantons, the agriculture directors with their agricultural offices are responsible for agricultural matters, supplemented by the cantonal veterinarians, the cantonal food control authorities and others. The cantonal agricultural offices implement the agricultural policy with production requirements, direct payments etc.

Agricultural research and education (green) is funded by the federal government (Agroscope, ETH) on the one hand, and by the cantons on the other. The FOAG finances the agricultural research institute Agroscope and, with a performance mandate, partly also the Research Institute of Organic Agriculture, FiBL. However, FiBL is privately funded and also receives private funding.

The cantons are responsible for the universities (including VetSuisse) and the universities of applied sciences (HAFL, ZHAW, HES-SO, etc.). Both are active in the fields of education (training of agricultural, forestry, food and environmental engineers) and research. ETH Zurich (Agro sciences) is funded by the federal government and trains agricultural, food and environmental engineers at university level. The cantons finance the agricultural schools (agricultural education and extension centres) and higher agricultural training courses.

Since 2008, the cantons' public agricultural advisory services have been financed exclusively by the cantons. The cantons of Neuchâtel, Vaud, Geneva, Jura and Bern, as well as Zurich, award advisory mandates in whole or in part to the cantonal chambers of agriculture (the cantonal farmers' associations), which then operate cantonal advisory services.

Private sector (brown) and non-profit organisations (orange) also play a role in extension services. AGRDEA, for example, is run by an association (orange), on whose board the cantons have a majority since 2019 and determine the strategic issues. The services of the two AGRIDEA advisory centres are financed by a mandate from the FOAG. AGRIDEA provides the cantonal advisory services with further training courses, publications, IT solutions and other services, while for farmers it mainly provides publications and IT solutions.

Among the private or farmer-based advisory services (brown and/or yellow), the agricultural fiduciary services play an important role in the areas of accounting, business and tax advice. The Swiss Farmers' Association also runs a private consultancy centre 'Agriexpert' on topics such as fiduciary services, legal issues, farm transfers, etc.

The farmers' organisations (yellow) under the national umbrella of the Swiss Farmers' Union play a very important role in the AKIS. Among other things, they are also responsible for the vocational training of farmers: The Vocational Training Organisation (OdA AgriAliForm) brings together 10 member organisations from the agricultural and equestrian sectors which are involved in vocational education and training. In this way it fulfils the objective "Vocational education and training is a joint task between the Confederation, the cantons and professional organisations". The organisation is the point of contact for questions relating to basic vocational education and training and higher vocational education and training in agriculture and the equestrian sector in Switzerland.

In addition to providing technical support to farmers, the farmers' organisations focus on representing their interests in politics, government offices, institutions and the public.

Farmers' organisations also include the national producer associations (milk, meat, cereals, potatoes, fruit, vegetables, etc.) and their cantonal sections. Important national label organisations such as Bio Suisse or IP-Suisse also are farmer-based and have cantonal sections.

Also important are the sectoral organisations (Interprofession milk, Proviande, Swissgranum, Swisspatat, etc.), which involve the players along the entire value chain from production to processing and marketing and play a major role in industry standards, market issues, representation of interests and sales promotion, among other things. In the sector organisations, farmers are only one of the groups of actors. These organisations are therefore not purely agricultural. The agricultural media play an important role in the transfer of knowledge between the AKIS actors and farmers. Among other things, they report on new products, practical application of innovations, practical examples, practical needs, important research results and important technical or agricultural policy topics. The most important ones are BauernZeitung (farmer-owned), Schweizer Bauer (private), Agri (farmer-owned, French-speaking Switzerland). Other publications include agricultural research (Agroscope), cantonal farmers' association newspapers, newsletters, etc.

In the AKIS there are a number of thematic platforms and networks (national and regional) which play a major role in the exchange of knowledge, experience, networking and solving current problems. The platforms bring together mainly experts, researchers, decision-makers, multipliers and also farmers. AGRIDEA alone, for example, is involved in over 150 thematic platforms every year.

Looking at the entire agricultural and food value chain, the upstream and downstream value-added partners play a central role for agricultural enterprises. Upstream are the suppliers of plant protection products, fertilisers, animal feed, machinery, equipment and services who provide the inputs necessary for agriculture. Upstream suppliers are important intermediaries of innovation (progress) on farms.

Downstream is the whole agri-food industry as demander of agricultural products. A significant market position in the upstream and downstream value chains is held by the Fenaco agricultural co-operative association and its affiliated regional agricultural co-operatives. The agricultural cooperatives are run by farmers. Fenaco is an important supplier to the farms and the food industry with high market shares.

The consumers are also among the actors in the value chain, at the end of the chain, whose consumption behaviour generates market changes and trends. In today's climate and environmental discussion this is of great importance.

The AKIS of Switzerland is very much influenced by politics and agricultural policy. As about 50% of Swiss agriculture is financed by public funds, it is also highly politicised and risks becoming the plaything of politicians and NGOs. The current popular initiatives to ban pesticides, ban intensive livestock farming, etc. can illustrate this. Therefore, the whole AKIS diagram of Switzerland is underlaid with a grid "Influence of consumers" and "Influence of citizens and politics".

International networking and the flow of knowledge thanks to the Internet (websites, applications, YouTube, social media, ...) represent a new dimension. These strong new developments will strongly accelerate and sustainably change the knowledge acquisition and knowledge exchange in AKIS at national and global level.

2.2.2. Knowledge flows

Knowledge is conveyed and exchanged in the AKIS through these channels.

Education:

- Apprenticeship, professional certificate
- Professional training/examination for farm management,
- Engineer education at university and college level

Agricultural media:

- Traditional and digital publications

Advisory services (public and private):

- Individual farm advice
- Publications, leaflets, apps
- Further training courses, working groups, etc.
- Projects
- Own further training of advisors: Advisor introduction, specialist courses, method courses, etc.

Research:

- Farmer days,
- Publications and resources
- Pilot and demonstration projects
- thematic platforms
- Stakeholder surveys on research needs

Private sector suppliers

- Farmer days, courses, visits
- Tools, IT-tools

National and global transfer and exchange of knowledge between all actors

- - Internet (websites, apps, YouTube, social media, ...)
- - Internet video telephony: Skype, zoom, etc.

Knowledge transfer and exchange in AKIS among decision makers, experts, researchers, trainers, multipliers, etc:

- - Over 150 thematic platforms
- - Conferences and further training courses
- - Communication tools of the institutions

2.2.3. Policy framework at national level

Agricultural policy from the perspective of the cantons (LDK, 2018)

The Federal Constitution lays down the model of a multifunctional, rural agriculture whose mission is primarily to serve the domestic market. Today's system of agricultural support therefore focuses on multifunctional, rural agriculture. The level of education and the willingness to produce are high in agriculture. The will to earn an income on the market dominates. There is a robust demand for quality products, which is met by professional and innovative farms through existing market channels or directly.

On the other hand, the economic viability of agricultural activity is weak on many farms, which limits the ability to invest. Less and less of the consumer franc goes to the producers. The margins of trade and processing are increasing. Some agricultural markets are not functioning satisfactorily. Upstream and downstream industries have a major impact.

A future agricultural policy must primarily improve the profitability of agricultural activity. At farm level this is the task of the individual farmer. At the level of the individual agricultural markets, their functioning must be brought closer to the ideal of perfect market competition.

Swiss agriculture is well anchored in the population and supported by it. The population is increasingly committed to its living environment and healthy food. These are good conditions for providing public services and producing Swiss agricultural products of high quality. Product differentiation via strong links to origin can be developed further. Swiss consumers are prepared to pay a Swissness surcharge. This willingness also exists in export markets which are capable of expansion.

Agricultural policy is largely a federal matter. The cantons have many implementation obligations, but little decision-making authority. At the political level, the cantons' voice is barely audible when it comes to agricultural policy. Moreover, the cantons are often at odds with each other.

Nevertheless, the cantons are not only involved in enforcement of the agricultural policy. The cantons provide agricultural vocational training and advisory services, thus ensuring that farming families can meet the challenges. Through numerous promotion and incentive programs, the cantons seek to improve compliance with conservation objectives, facilitate investment in soil and infrastructure and increase the value added from agricultural activity and viticulture.

For future agricultural policy, the cantons will continue to focus on education and extension, improving the profitability of agricultural activity, limiting the negative effects of the agricultural treadmill, on quality strategy, and promoting and expanding sales in the domestic market and selected export markets, while maintaining border protection.

Research and Extension

From the LDK's point of view, research (Agroscope) and consultancy (AGRIDEA), which is substantially funded by the Confederation, should be integrated into the AKIS and managed thematically by a committee (Confederation / cantons / sector) (LDK, 2018). The aim is to master the current challenges in production (including value creation at farm level) in a timely manner and to contribute to the processing of Swiss quality in agricultural production into marketable goods.

Opportunities

- Sharpen agricultural measures, focus on greater impact and competition, Promotion of innovation and value added, market and sales promotion;
- Targeted orientation towards the future challenges facing agriculture. e.g. profitability, resilience to climate change, better resource efficiency, less crop protection;
- Good infrastructure, functioning authorities, high purchasing power;
- Basic conditions for innovation are in place (education, promotion, money and freedom of trade);
- Strong, dynamic, innovative, market-oriented food chain/sector, which must continue to focus on quality
- Cooperation (horizontal, vertical);

Challenge

- The workload is high, but profitability is weak: increasing pressure on farming families;
- An often low level of capitalisation makes investment (innovation, conversions, farm abandonment) more difficult. The economic viability of agricultural activity must be improved.

- The functioning of agricultural markets must be brought closer to functioning competition, with fair distribution of margins;
- Orient agriculture and the food industry more consistently towards quality strategy, innovation and the expansion of market shares for Swiss food products.
- The transfer of knowledge from research to practice and the dissemination of new knowledge in practice is too slow or suboptimal;

3. History of the advisory system

Introduction

In the post-war period, the primary objective of agricultural policy in Switzerland was to produce the largest possible quantity of food in the most efficient way. Under this productivist paradigm, the aim was to feed a growing population. Technological innovations created the conditions for a rapid increase in productivity in the agricultural sector. Parallel to the one-sided orientation of post-war agricultural policy, until the 1990s an AKIS developed, which was strongly characterised by a linear approach to innovation: New knowledge was generated in research and passed on to farmers via advisory services and education.

At the end of the 20th century, the paradigm of "multifunctional" and "sustainable" agriculture moved into the focus of agricultural policy. Agriculture was no longer only to produce food efficiently, but was to perform multifunctional tasks. These objectives are emphasised in the new agricultural policy. The promotion of innovation was also explicitly mentioned.

The system of linear knowledge transfer was no longer adequate for the new multifunctional challenges. At the same time, the complexity of sustainable development made it more difficult for research, education and advisory services to recognise the new needs of farmers and to adequately meet the changed requirements (Home, 2013).

History of advisory services

The roots of agricultural advisory services in Switzerland date back to the 1950s. The Ordinance on Agricultural Education and Experimentation of 1955 states that the task of the advisory service is "to inform farmers about all technical questions and questions of business administration and to keep them constantly informed of new practical and scientific knowledge and thus contribute to the rationalisation of farms, the increase of productivity ... with the aim of improving the economic situation of agriculture". An OECD study (1953) described Switzerland's agricultural education system as exemplary, but the advisory service as underdeveloped.

Now the cantonal agricultural schools began to work with local farmers' advisory groups (mainly on farm surveys and feeding plans). Agricultural teachers were also increasingly involved in extension activities. This also created the need for a supporting organisation of central services for the benefit of agricultural advisors. In 1959 the Swiss Association for the Promotion of Farm Advisory Services in

Agriculture, SVBL, was founded. The SVBL now formed the responsible body for the 2 advisory centres: The "Service romand des vulgarisation agricole, SRVA" (French-speaking Switzerland) and the "SVBL-Zentralstelle Küssnacht" (German-speaking Switzerland), opened in 1958. The latter was established in CH-Lindau from 1976 and renamed Landwirtschaftliche Beratungszentrale Lindau, LBL (Mürset, 1993). Since 2006 the two advisory centres have been operating under the joint name AGRIDEA. In 2010 they were merged completely and placed under a common management.

Changes in the cantons

As the number of farms decreased, the "institutional landscape" (the AKIS) in the cantons changed from around 2000 onwards. The number of agricultural VET centres was greatly reduced and their services were concentrated at fewer locations. Basic VET was harmonised with the non-agricultural VET school sectors. Advisory services were either reduced or kept at the same level through higher advisory tariffs. In some cases, advisory services were organisationally separated from VET, as responsibilities changed in the canton. In special topics, supracantonal forms of cooperation were implemented.

As of 2008, the cantons no longer received financial support from the federal government (FOAG) for their agricultural advisory services. They had to finance their agricultural advisory services in the public interest on their own, but were relieved by the federal government in other areas (e.g. contributions to AGRIDEA). The FOAG took over the financing of AGRIDEA's advisory mandate on its own. This withdrawal of the Confederation from co-financing and the pressure to save in the cantons left their mark on the cantonal advisory services. The number of advisory staff tended to be reduced or their capacity reduced due to other administrative tasks. It became more difficult to provide a sufficiently diverse range of advisory offers that were tailored to needs. There was a lack of specialist skills and the advisory services were unable to develop important new services for farming families in time. The heads of the cantonal advisory services now had to combine the existing resources in the best possible way. In 2004 they therefore founded the Swiss Advisory Forum (BFS) / Forum La Vulg Suisse (FVS) as a common platform for the advisory services (Huber, 2005).

4. The agricultural advisory services

4.1. Overview of all service suppliers

Agricultural advisory services

As part of the Agricultural Innovation and Knowledge System AKIS, agricultural and rural-household advisory services in Switzerland are organised on two levels (Stöckli, 2020).

Stage 1: Direct advice for farming families is provided locally, primarily by the cantonal advisory services. The cantons are responsible for agricultural advisory services and their financing. The majority of the cantons have public agricultural advisory services. Several cantons award all or part of their extension mandates to the cantonal chambers of agriculture (the cantonal farmers' associations), which then manage the cantonal advisory services.

In some specific fields of knowledge, such as bees, poultry or alpine farming, advisory services are provided by agricultural organisations.

In some cantons, close cooperation between advisory services and education is facilitated by grouping them in so-called cantonal agricultural education and advisory centres (LBBZ) (Alfred Buess, 2011).

Stage 2: The AGRIDEA (agricultural advisory centre), with its main sites in Lindau and Lausanne, supports the agricultural and rural home economics advisory services in the cantons and organisations. As a centre of excellence for the exchange of knowledge and experience between practitioners and researchers, AGRIDEA networks players in agriculture and rural areas. It offers the cantonal advisors services such as further training courses, introductory courses for advisors, publications, IT solutions, etc. For farmers, it offers mainly publications and IT solutions.

Other players are active to varying degrees in providing advice and exchanging information: Agroscope, universities of applied sciences, FiBL (Research institute of organic agriculture), associations, media and the private sector (Stöckli, 2020). The international networking and the flow of knowledge thanks to the Internet (websites, applications, YouTube, social media, ...) are strong new developments that greatly accelerate and change the acquisition and exchange of knowledge at national and global level.

The importance of advisory services

The importance of agricultural advisory services co-financed by the public is recognised both at federal and cantonal level (Huber, 2005). The main strengths of the system are:

- Practical relevance
- A relationship of trust with the customers,
- holistic consulting approach
- Flexibility
- Professional and methodological competence, personal skills

The weaknesses are seen:

- In sometimes small structures
- In limited resources
- Partly in the challenges posed by new activities
- The fact that supracantonal cooperation is hampered by different structures, financing, etc.

The Swiss Advisory Forum (BFS)

The Swiss Advisory Forum (BFS) / Forum La Vulg Suisse (FVS) was founded in 2004. It is the association of the agricultural advisory services of Switzerland and the Principality of Lichtenstein (BeratungsForum). Its members are mainly the cantonal advisory services which provide exclusively or partially extension services in accordance with the Agriculture Act and whose customers are mainly farms, rural households and farmers' organisations or institutions and bodies active in regional economics. The BFS represents its members and their concerns in the agricultural knowledge system and supports the further development of professional, customer-oriented agricultural extension services.

The BFS has promoted cooperation between the advisory services and created the conditions for making cooperation with AGRIDEA and agricultural research more binding. The existing knowledge and experience in advisory services could be used to make it available more quickly to farming families.

The BFS aims in particular to

- the promotion of advisory services and further training for sustainably managed farms and agricultural enterprises in rural areas, in production-related, business management, socio-economic and ecological challenges;
- to coordinate the activities of its members throughout Switzerland;

- to make optimum use of the strengths of the knowledge system of agriculture and rural areas, in close cooperation with AGRIDEA, research institutions and universities;
- promoting exchange of information and experience among its members;
- representing their interests in working groups and organisations.

Agroscope

Agroscope, the agricultural research institution, has several types of services in the field of advice: Conferences, field days, publications and tools, pilot and demonstration projects, thematic platforms and stakeholder surveys on research needs.

FiBL, organic advice

FiBL offers training and further training for organic advisors and has organic advisory mandates in various cantons, where advisory services are offered to organic farmers.

HAFL Training for advisors

HAFL offers the agricultural course 'Teaching and Advice' (teaching diploma in part-time work). This training course is a preparation for the role as a teacher or an advisor in the agricultural, forestry or food sector.

Upstream and downstream value-added partners

Looking at the entire agricultural and food value chain, the upstream and downstream value-added partners play a central role for agricultural enterprises. Upstream are the suppliers of plant protection products, fertilisers, animal feed, machinery, equipment and services who provide the inputs necessary for agriculture. They are suppliers of various specific advisory services.

Downstream is the entire agricultural and food industry as a demander of agricultural services. The Fenaco agricultural co-operative association and its regional agricultural co-operatives have a significant market position in the upstream and downstream value chains.

Private advisors

Among the private advisory services, the agricultural fiduciary services play an important role in the areas of accounting, business administration and tax

consultancy. Other topics of private advisors are special crops, e.g. vegetables; pig farming, construction,...

Swiss Farmers' Union

The Swiss Farmers' Association runs a private advice centre 'Agriexpert' on topics such as fiduciary services, legal issues, farm transfers, etc. In doing so, it regularly deals with legal issues that are of great importance to farmers.

4.2. Results of the online survey on agricultural extension

The i2connect online survey was carried out in October 2020 and a total of 12 institutions responded, including 6 organisations with an advisory component, 5 advisory services and one private advisory office. These 12 organisations can be divided into the following categories: 5 public advisory services, 5 advisory services from farmers' organisations, 3 private commercial advisory organisations and 2 organisations with NGO character. These organisations operate in the following geographical perimeters: 1 sub-regional, 5 regional, 4 national and 1 international. French-speaking Switzerland and Ticino are represented by one organisation each, German-speaking Switzerland by 8. One extension service operates internationally.

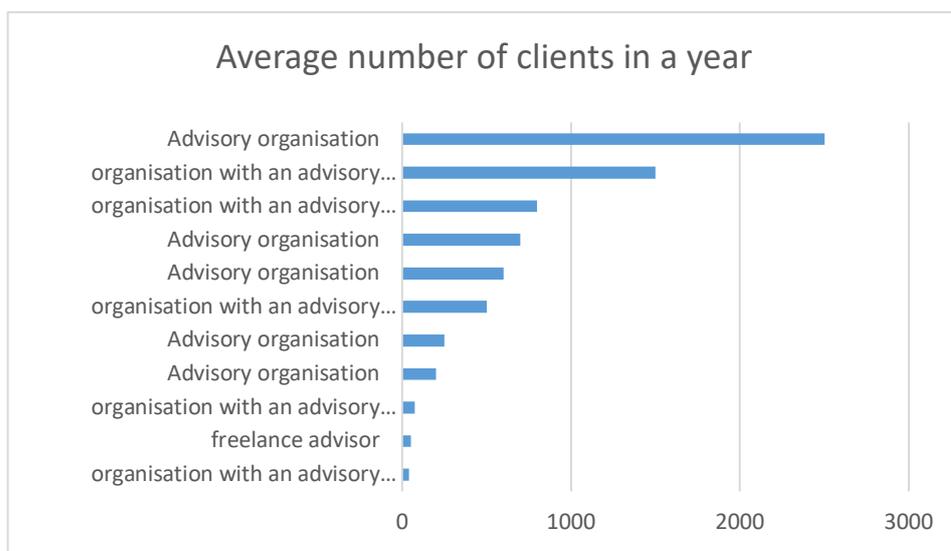


Figure 3 Average number of clients in a year

The advisory organization have about 850 contacts with clients a year, organization with an advisory component about 580.



Figure 4 Advisory organization's client groups

The most important client groups of advisory organizations are farmers with small/medium-scaled farms, part-time farmers, young farmers and women farmers.



Figure 5: Cross-cutting advisory topics most demanded by the clients

The most demanded topics by clients are entrepreneurship and farm management; rural development support and diversification; agri-environmental

stewardship measures and nature conservation; support with grant application and compliance with regulation and standards and tax and legal advice.

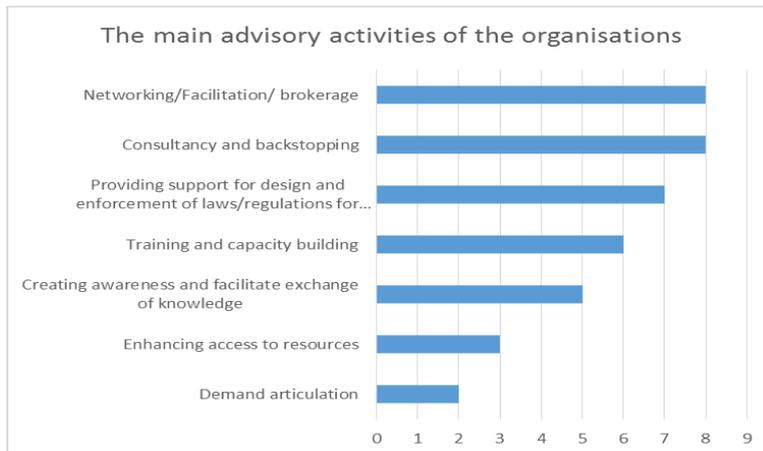


Figure 6: Main advisory activities

The main advisory activities are Networking/Facilitation/ Brokerage; Consultancy and backstopping; Support for design and enforcement of laws/regulations for agriculture (niche) innovation and Training and capacity building.

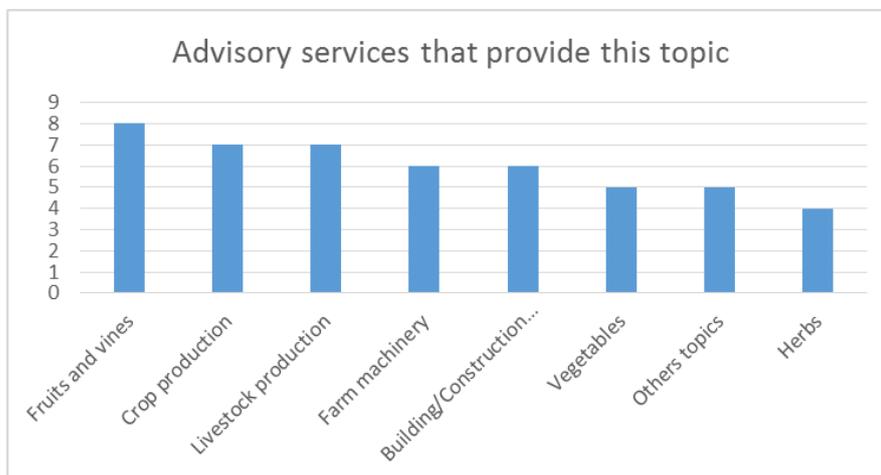


Figure 7: Advisory topics organizations provides

4.3. Public policy, funding schemes, financing mechanisms, advisory service providers

Federal financial resources for the advisory sector (Stöckli, 2020)

The Federal Government provides financial support to AGRIDEA and to some advisory services in specific fields of knowledge. It also supports preliminary studies for innovative projects. In addition, the FOAG can support projects which it puts out to tender. The cantonal advisory services are financed by cantonal contributions and the billing of services.

Federal expenditure on advisory services 2019

Empfänger	Mio. Fr.
Beratungszentrale (AGRIDEA)	7,9
Spezial-Beratungsdienste landwirtschaftlicher Organisationen	1,4
Vorabklärungen für innovative Projekte	0,2
Wettbewerbliche Vergabe von Beratungsprojekten: Ausschreibungen	0,3
Wettbewerbliche Vergabe von Beratungsprojekten: Beitragsgesuche	1,4
Total	11,1

Quelle: Staatsrechnung

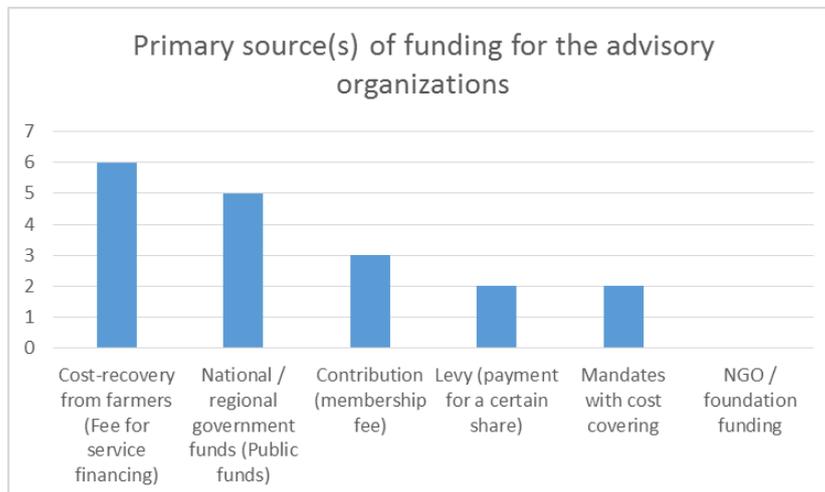


Figure 8: Primary source(s) of funding for the advisory organizations

Primary source(s) of funding for the 11 advisory organizations (multiple choice): 6 organizations enumerate cost-recovery form farmers, 5 are financed by national or regional government funds (public funds), 3 organizations enumerate contribution (membership fee), 2 enumerate a levy (payment for a certain share) and 2 are billing their mandates cost covering.

Funding of research and advice

The majority of the agricultural research and advice in Switzerland is publicly funded. About 80% of applied agricultural research is financed by the FOAG, the rest by public funds from other federal authorities. Agricultural extension is also 80% financed by public funds, only 20% by private funds (Home, 2013).

4.4. Human resources and methods of service provision

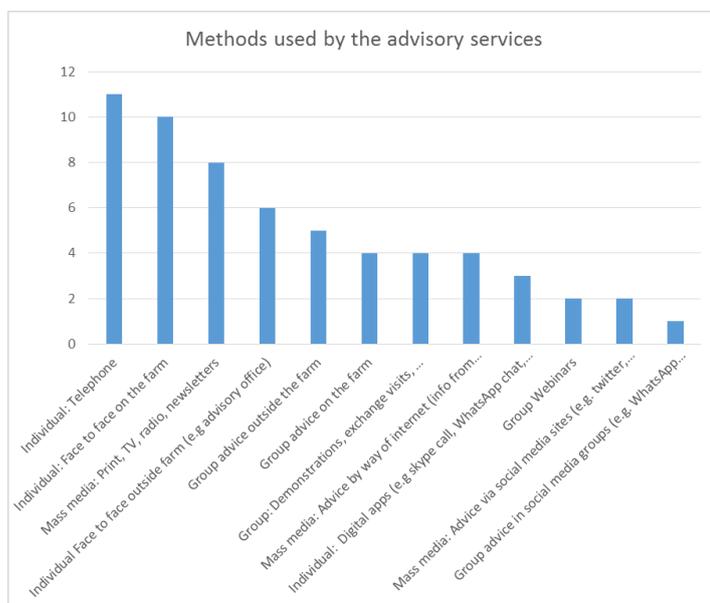
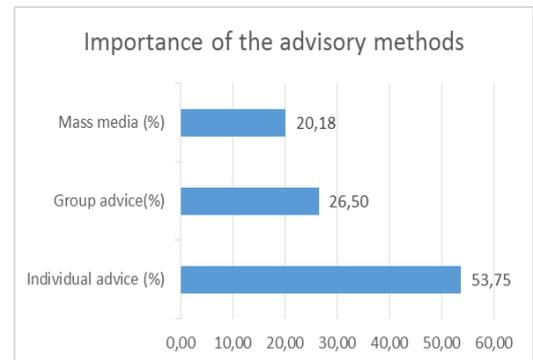
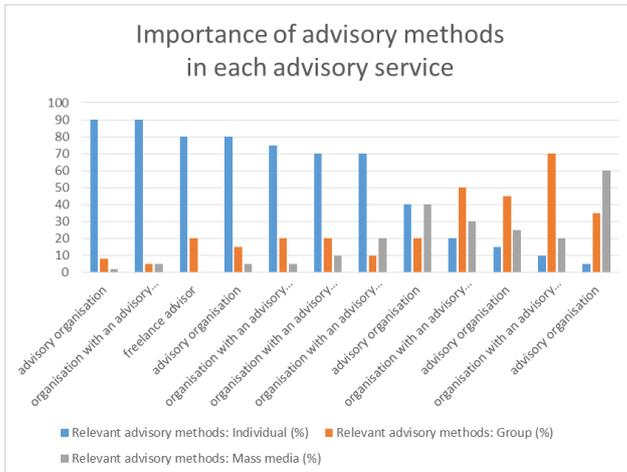


Figure 9: Methods used by the advisory services

The most often used methods of the advisory services are Telephone, Face to face on or outside the farm, Mass media and Group advice outside the farm.



Figures 10: Importance of advisory methods in advisory services

In 8 out of 12 advisory services individual advice is most important (Medium: 53,7 %). In 4 of 12 organizations Group advice is important (Medium: 26,5 %). The importance of Advice by Mass media is in medium 20,2 %.



Figure 11: Number of employees and advisors in each organization

The number of advisors in the organizations ranks between 4 and 35 (70). From those between 1 and 14 (35) are female advisors.

In 4 advisory organizations the number of advisors increased in the last 5 years due to new needs and topics. In 5 advisory organizations it was stable. In 2

advisory organizations the number decreased due to lower demand or financial restrictions.

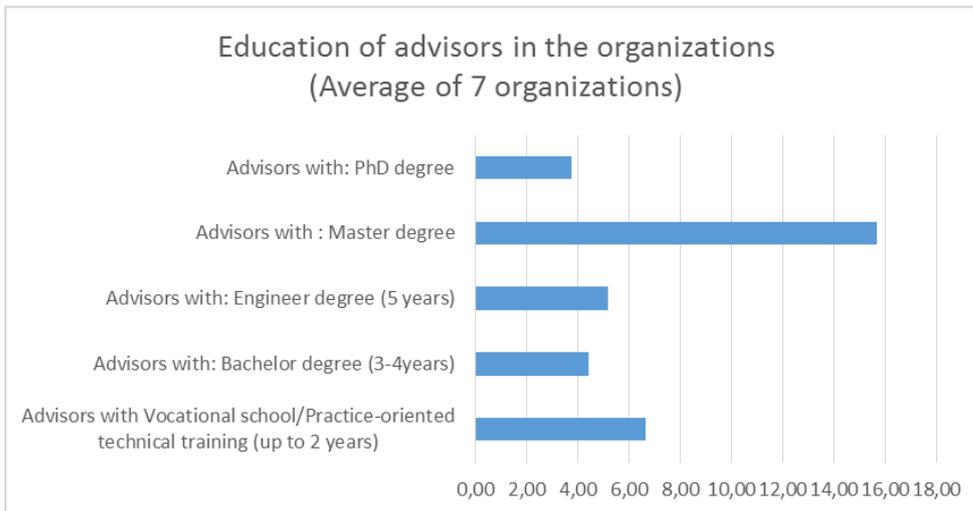


Figure 12: Education of advisors in the organizations

In the average of 7 advisory organizations this medium number of advisors have the following education: Master degree (15,7 advisors), Vocational school/Practice-oriented technical training (6,7); Engineer degree (5,2); Bachelor degree (4,4) and PhD degree (3,8).



Figure 13: Professional experience in advisory services (Average number)

The average of 9 advisory organizations shows the following professional experience of their advisors: 2.4 have 0 - 3 years, 5.6 have 3 - 10 years and 6.0 have more than 10 years of professional experience. So the fluctuation of employees seems to be quite stable.



Figure 14: Professional experience in advisory services (number of advisors)

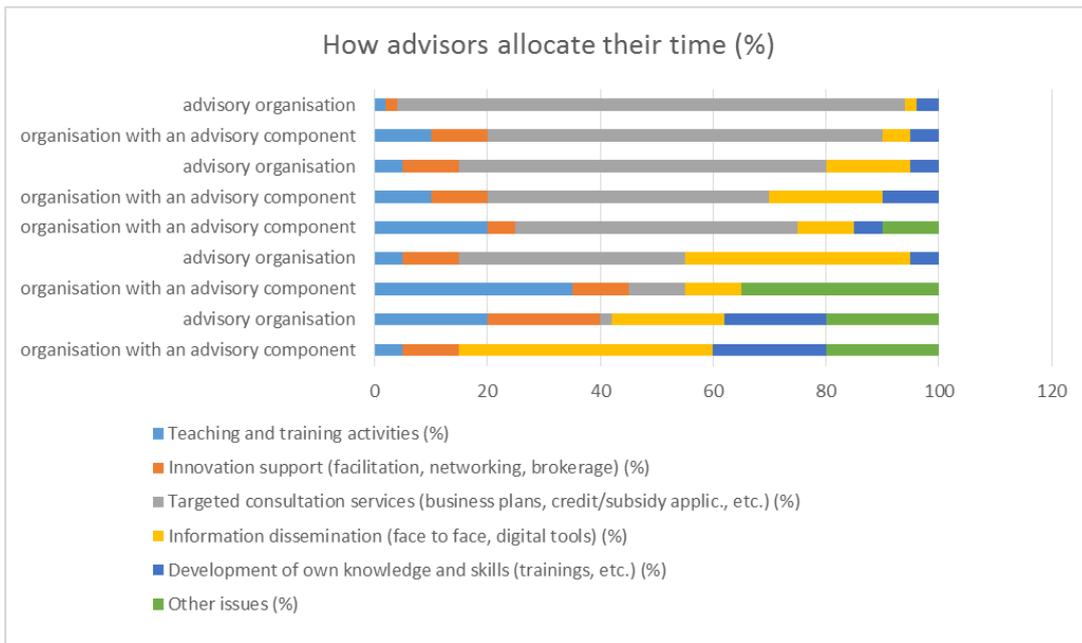


Figure 15: How advisors allocate their time (in %)

In the upper figure the time allocation of the different advisory organization is shown. The figure below shows the average of 9 organizations: Most important are Targeted consultation services; Other activities like articles, fact sheets, networking and coordination; Information dissemination and Teaching and

training activities. Innovation support (facilitation, networking, brokerage) comes only in 5th place (with 9,7 % of the time).

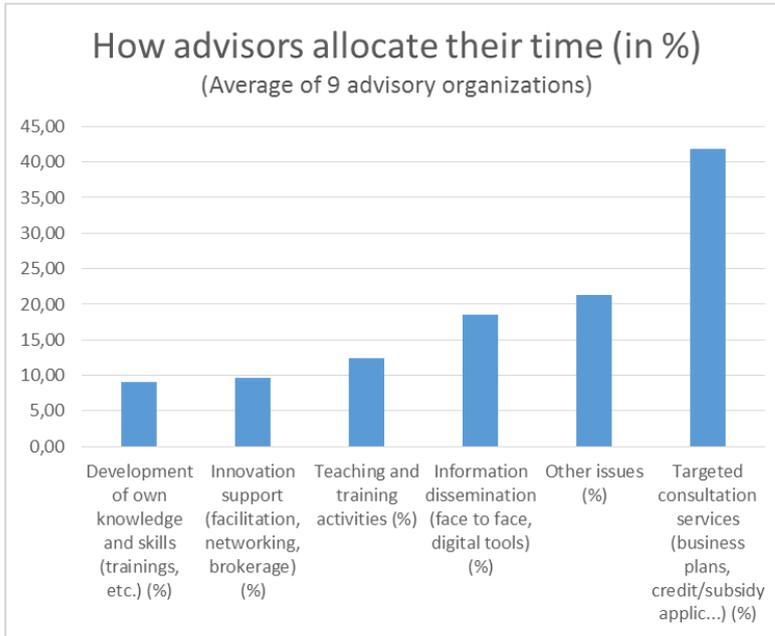


Figure 16: How advisors allocate their time (average in %)

4.5. Linkages with other AKIS actors/knowledge flows

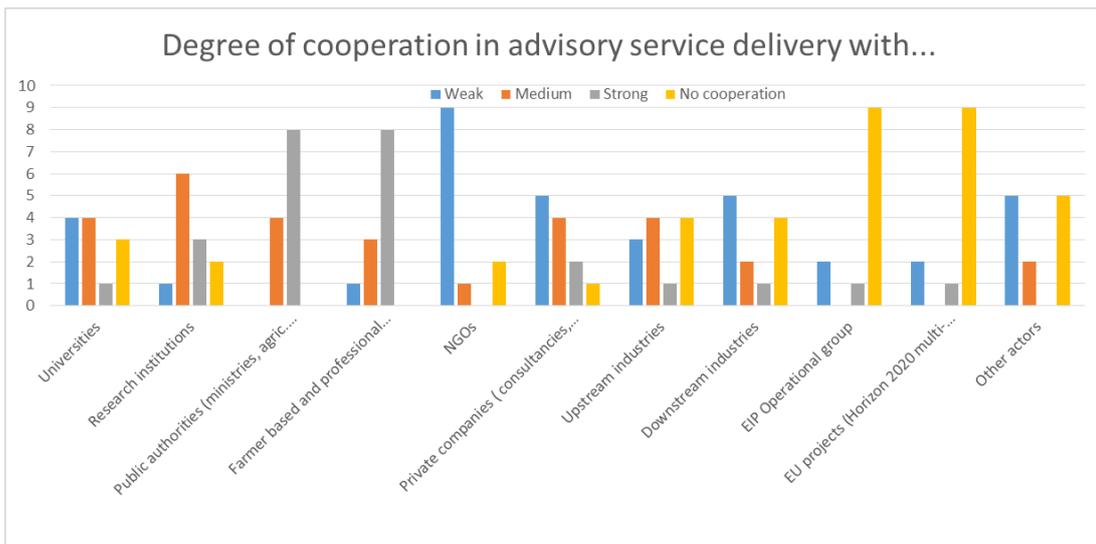


Figure 17: Degree of cooperation in advisory service delivery with

The cooperation with Universities is low, with research Institutions it's medium to strong, with Public authorities and farmer based or professional organizations it's strong to medium. Weak is the cooperation with NGOs and downstream industries, it's a little bit stronger with the upstream industries. As Switzerland is not an EU member, EIP and EU projects are usually not relevant for the advisory services.

In AKIS there is a multitude of thematic platforms and networks (national and regional) which play a major role in the exchange of knowledge, experience, networking and solving current problems. The platforms bring together above all experts, researchers, decision-makers, multipliers and also farmers. AGRIDEA alone, for example, is involved in over 150 thematic platforms every year. Platforms and networks make it possible to react quickly to new needs and bring interested people together. The platforms play an important role in the cooperation between AGRIDEA and Agroscope (AGRIDEA, 2019).

The exchange of information between institutions in the AKIS, which are responsible for the implementation of laws and regulations, takes place regularly and is highly formalised. The meetings serve to facilitate the flow of information between the cantonal level and the federal level, which is necessary since agricultural policy is made at federal level but implemented at cantonal level. The most important platforms and working groups each bring together the directorates, managers or representatives of the various relevant departments and divisions (e.g. Conference of Agricultural Offices, working groups at federal level on structural improvement, resource efficiency, direct payments, etc.). Representatives of the federal authorities are usually permanent guests in these groups.

The exchange of knowledge on technical issues (e.g. milk production or fodder production) takes place mainly in working groups, communication and cooperation platforms. These platforms primarily serve to exchange experience and discuss joint projects and technical developments in agriculture. More innovative projects are often supported by ad-hoc platforms and working groups and can be launched on the initiative of one or more AKIS institutions, cantons or individual actors (Home, 2013).

5. Summary and conclusions

5.1. Summary and conclusions on sections 1 – 3

- Swiss agriculture, which tends to be small-scale, is subject to continuous change. In the next 10 years, 30% of farm managers will reach retirement age and farms will tend to grow accordingly.
- Research, training, advice and further education are largely institutionally separate in forestry and agriculture.
- The Swiss AKIS shows the often historically grown structures and institutions which are common in many European countries, and which ensure the agricultural transfer of knowledge. It is regularly complained that this knowledge transfer between research and agricultural practice is progressing too slowly. Many factors influence this transfer and the reverse transfer of practical experience and needs back to advisors and research.
- The digitalisation of information flows via the Internet enables new, more direct and also global transfers. This leads to new offers, changing information needs and ultimately to changing expectations of the existing AKIS actors. This has been a challenge for agricultural research for some time, but it is increasingly becoming a challenge for all other AKIS actors.

5.2. Summary and conclusions on section 4

The online survey covers the advisory services in German-speaking Switzerland and, in some cases, the advisory services in French-speaking Switzerland and Ticino. Public advisory services, advisory services of farmers' organisations, private, commercial advisory organisations and organisations with NGO character took part. The survey provides a valuable insight into the situation of agricultural advisory services in Switzerland without claiming to be fully representative.

- Advisory organisation in medium have over 700 customer contacts per year. The most important clients are farmers of small and medium-sized farms, part-time farmers, young farmers and women farmers.
- The most important advisory topics are business and farm management, diversification, agro-ecological measures and financing issues.

- When asked how the advisory services are financed in the first place, they mention cost-recovery from farmers, financed by national or regional government funds (public funds) and contribution (membership fee). Public extension services are financed to a significant extent by the cantons. The FOAG finances the advisory mandate of AGRIDEA.
- The most often used methods of the advisory services are telephone, face to face on or outside the farm, mass media and group advice outside the farm. In advisory services the individual advice seems to be most important, followed by group advice.
- The advisory services have well trained staff, of which on average about 80% have more than 3 years of professional experience.
- As expected, cooperation with public authorities and farmer based or professional organisations is strong to medium, with research institutions it's medium to strong.

Agricultural extension services continue to enjoy good public support, especially in view of the current challenges, for example in the areas of nutrient and pesticide emissions, promotion of biodiversity and maintenance of income and value creation.

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