AKIS and advisory services in *Germany*

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

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Executive summary

The German AKIS (Agricultural Knowledge and Innovation System) report is one of the AKIS country reports produced in 2021 within the frame of the i2connect project. With the next CAP reform ahead that envisages a strategic strengthening of member states' AKIS, such reports will provide useful and timely information about the various AKIS stakeholders operating in the sector in the respective countries. 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.

This report aims to provide an overview of the Agricultural Knowledge and Innovation System (AKIS) as well as the Forestry Knowledge and Innovation System (FKIS) in Germany. In doing so, the report takes stock of the relevant actors in the German agriculture and forestry actors and provides particular insights on advisory service providers. The report's main sections include characteristics of AKIS actors, policy framework, funding mechanisms, and advisory services. While the report builds on the earlier AKIS report for Germany conducted by the PRO AKIS project in 2014, it also brings in a renewed assessment of the agricultural and forestry advisory and innovation services and describes actors' linkages and knowledge flows in the sector.

The German agriculture sector exhibits a general trend towards a decrease in the number of farm holdings and an increase in the average farm size per holding. Also, the distinction in farm size between the former Eastern and the Western German States is visible. Concerning the forestry sub-sector, Germany remains in the front line for timber production compared to other European countries. The Utilised Agriculture Area for forestry remains stable so far, where 52% of the forest area belongs to the public sector.

Diverse actors from all organisational categories: public authorities, research and education, private sector, farmer-based organisations and third sector non-governmental organisations characterise the German AKIS. Moreover, the heterogeneous and decentralised governance structure where the Federal Government and the 16 states (Länder) take an active role provides a unique

perspective to the AKIS in the country. While the various coordination structures and policy frameworks in place make the German AKIS a strong one, the decentralised system and actors' heterogeneity make it partly fragmented.

For the German agriculture advisory services, the trend in heterogeneous service provision continues. Nowadays, a more pluralistic mode of advisory delivery, where the public, private and third sector organisations offer different service is prominent. According to the survey results, in general, advisors in the service organisations have many years of professional experience and good educational backgrounds; further advisory certifications such as CECRA courses as additional qualifications are considered essential for advisors. The clients of advisory service providers range from small or medium and to large scale farmers, with no particular target group recognised per type of service provider. In contrast, targeted services for specific interest groups such as farmworkers, new entrants, or other advisors seem rare. Advice offered includes cross-cutting topics such as entrepreneurship and farm management, support with the grant application and agri-environmental stewardship measures and nature protection as well as the conventional topics such as crop production, livestock production, farm machinery and building construction. The survey results showed that advisors spend 43% of their time in targeted consultation service and divide the remaining in other advisory activities. While the link between research and practice still requires more work, the strong cooperation and linkage with public authorities, FBOs and private companies affirm the important role these actors have in knowledge sharing, service provision, and connecting actors in the overall AKIS.

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Abbreviations

ABL	Arbeitsgemeinschaft bäuerliche Landwirtschaft
ÄELF	Ämter für Ernährung, Landwirtschaft und Forsten
AKIS	Agricultural Knowledge and Innovation System
AWG	Bayerisches Amts für Waldgenetik
AWU	Annual Work Unit
BaySF	Bayerische Staatsforsten
BLE	Bundesanstalt für Landwirtschaft und Ernährung
BMEL	Bundesministerium für Ernährung und Landwirtschaft
BÖLW	Bund Ökologische Lebensmittelwirtschaft
BZL	Bundesinformationszentrum Landwirtschaft
CAP	Common Agricultural Policy
CECRA	Certificate for European Consultants in Rural Areas
DAF	Dachverband Agrarforschung wissenschaftlicher Gesellschaften der Agrar-, Forst-, Ernährungs-, Veterinär- und Umweltforschung e.V
DAFA	Deutsche Agrarforschungsallianz
DBV	DeutscherBauernverband
DIP	Deutsche Innovationspartnerschaft
DLG	Deutsche Landwirtschaftsgesellschaft
DLV	Deutscher Landfrauenverband
DRV	Deutscher Raiffeisenverband
DVS	Deutsche Vernetzungsstelle Ländliche Räume
DWD-ZAMF	Deutscher Wetterdienst- Zentrum für Agrarmeteorologische Forschung Braunschweig
EAFRD	European Agricultural Fund for Rural Development
EIP-Agri	European Innovation Partnership for Agricultural productivity and Sustainability
EU	European Union
FAS	Farm Advisory System
FBO	Farmer Based Organisation
FKIS	Forest Knowledge and Innovation System
FLI	Friedrich Loeffler Institute

FNR	Fachagentur Nachwachsende Rohstoffe
FZuS	Forstwirtschaftliche Zusammenschlüsse
GAK	Gemeinschaftsaufgabe Agrarstruktur und Küstenschutz
GDP	Gross Domestic product
GDR	German Democratic Republic
IALB	Internationale Akademie für ländliche Beratung
JKI	Julius Kühn Institute
KWF	Kuratorium für Waldarbeit und Forsttechnik
LSU	Livestock Unit
LWF	Bayerische Landesanstalt für Wald und Forstwirtschaft
MRI	Max Rubner Institute
NGO	Non-Government Organisation
SO	Standard Output
StMELF	Bayerisches Staatsministerium für Ernährung, Landwirtschaft und Forsten
TI	Johann Heinrich von Thünen Institute
UAA	Utilised Agriculture Area
vlf	Bundesverband Landwirtschaftlicher Fachbildung
VLK	Verband der Landwirtschaftskammern

1. Main structural characteristics of the agricultural and forestry sector

This section provides a brief overview of the structural characteristics of the German agriculture and forestry sector. The information provided is based on the review of policy documents, and information from the national and European level databases such as DESTATIS and EUROSTAT.

With its 83.01 million inhabitants, the federal republic of Germany has the largest population of all the EU member states (EUROSTAT, 2020d [demo_pjan]). Situated in central Europe, it expands from the Baltic Sea in the North to the Alps in the South. It is a federal republic comprising 16 states, so-called Länder, of which 13 are considered territorial states and 3 are city-states (Berlin, Hamburg and Bremen). About 51% of Germany's land is used for agriculture (33% arable land and 13% permanent grassland) and another 30% for forestry (Statistisches Bundesamt [Destatis], 2020e)

1.1. Agricultural and forestry structures and holdings

Germany's total territory amounts to 35.7 million hectares, and almost half (16.7 million hectares) of it goes to the Utilised Area for Agriculture (UAA), which comprises arable land and permanent grassland (Destatis, 2019). The UAA in Germany, one of the highest in the EU, has remained relatively stable over the past twenty years. In contrast, the number of holdings decreased from 299,310 in 2010 to 266 700 in 2018 (EUROSTAT, 2020b; Destatis, 2020a). This means more than thirty thousand holdings ceased their agriculture activity in just a few years. While the absolute number of farms has decreased, the average farm size of those existing holdings has increased over the years. In 2018, the average farm size was 60,5 hectares compared to 55,8 hectares in 2010 (BMEL, 2019a, p. 108).

The agricultural structure reveals a typical dichotomy in terms of the number of farm holdings and farm sizes in the German states. Of the total 266,700 farm holdings, 91% are situated in the old states (Länder) and manage farms with mostly less than 50 hectares. The remaining 9.3% are in the five eastern states of the former German Democratic Republic (GDR), managing farms of mostly more

than 100 hectares (Destatis, 2019). The former GDR states have a larger proportion (59%) of the total UAA in Germany.

Over the past ten years, organic farming has gained importance in German agriculture. Land allocated for organic farming has expanded by 470,000 hectares since 2014 (BMEL, 2019a, p. 81), raising the total area of organically farmed land to 1.52 million hectares, which corresponds to 9,1 % of the UAA (BMEL, 2019a).

Same as the UAA, the land used for forestry remains stable in Germany. The forest area amounts to 11.4 million hectares, of which 10.9 million hectares is for timber. Germany's timber stocks account for 3.7 billion m^3, putting the country in the front line for timber production compared to other European Union countries (EUROSTAT, 2019, p. 88).

Forest ownership is mainly public (52%) - where the states own 29%, communities and associations own 19%, and the federal government owns 4%. The remaining 48% of forest land is privately owned. The number of communal and private forest owners in Germany is estimated at two million (BMEL, 2014). The private forests are predominantly small, where 50% comprise less than 20 hectares and only 13% are more than 1,000 hectares. Some forest owners have also agriculture land as well. The proportion of forest area and the ownership structure developed differently over history and among the states (BMEL, 2019a, pp. 95–96). Regarding types of wood, German forests are characterised by about 90 billion old and young spruces, pines, beeches, oaks and other tree species (BMEL, 2014).

1.2. Contribution of agriculture to the German economy and income

Germany's gross domestic product (GDP) per capita has witnessed a consistent increase in the past three years from €39,259 in 2017, to €40, 339 and €41,346 in years 2018 and 2019 respectively (Destatis, 2020f). In contrast, there was a slight decrease in agriculture's contribution to the Gross Domestic Product with 0.5% in 2018 (EUROSTAT, 2019, p. 155) compared to 0.7% in 2017 (BMEL, 2019a, p. 51). Regardless, Germany's agricultural gross domestic product is among the four largest sectoral products in the European Union.

The total standard output (SO) of all German farm holdings has shown a steady increase, where it was €46.252m, €49.242m and €65.662m in years 2013, 2016

and 2017/18 respectively (EUROSTAT, 2020b[ef_m_farmleg]); BMEL, 2019a). When classifying the agricultural holdings into standard output classes, 24% of the holdings produce between €50,000 and €100,000; 38.4% of the holdings produce between €100,000 and €250,000 and 36.9% of the holdings produce more than €250,000 (BMEL, 2019a, p. 62).

In Germany, over a quarter of the arable land is used for wheat production. In 2019, the top agricultural products in terms of harvested production were sugar beet (29.7 million tons) and wheat (23 million tons)(Destatis, 2020c). Fruits and vegetables with the highest harvest were apples (973,400 t), asparagus (104,400 t) and strawberries (99,000t) (Destatis, 2020d). The domestic farming sector meets about a third of Germany's demand for vegetables and a fifth for fruit. The remaining amount are imported from other European countries and international (BMEL, 2019b).

In terms of livestock population, there are 11.4 million cattle, 25.5 million pigs, and 41 million hens (Destatis, 2020b). Germany is the largest milk producer in the EU and, after France, the second-largest producer of beef and veal. Pig farming is the mainstay of the domestic farming sector, where pork holds the first rank as a source of meat in Germany (BMEL, 2019b). Regardless, the total Livestock Unit (LSU) in Germany featured a slight decrease from 18.4million in 2013 to 18.1 million in 2016 (EUROSTAT, 2020c[ef_lsk_main]). Also, a 7% decline in the number of farm holdings with livestock has been observed between 2013 and 2016 (BMEL, 2019a, p. 110).

1.3. Contribution to employment and demographic structure

The agriculture sector in Germany has a 1.3% share of the country's total employment(EUROSTAT, 2019, p. 155). In 2018, the annual work unit (AWU) - full time equivalent employment - for Agriculture was 474.00, which showed a decline from 477.60 in 2017 and 480.00 in 2016 (EUROSTAT, 2020a[aact_ali01]). Farms with more than 50% regular labour from family members represent 94% of the total share of all farm holdings. A closer look at the age structure of farm managers in Germany reveals that only 14.7% of farms are managed by farmers who are 40 years old or younger. Female farmers represent 9.6% of farmers in Germany (EUROSTAT, 2019, p. 137). The small representation of young and female farmers shows the challenge the agriculture sector faces to adapt to the new generation.

Concerning the forestry sub-sector, the forest and timber industry, including processing and paper and printing and publishing, accounted for nearly 1.3 million jobs with an annual turnover of about 170 billion (BMEL, 2014). Specifically, for forestry and logging, the AWU in 2017 was 48.01, which showed a small decline from 48.9 in 2016 and 50.21 in 2015 (EUROSTAT, 2020b[for_emp_lfs]).

2. Characteristics of AKIS and FKIS

2.1. AKIS and FKIS description

As already described by Paul et al. (2014) in the PRO AKIS report, the German AKIS is characterised by a heterogeneous and decentralised governance structure where the Federal Government and the 16 states (Länder) take an active role. Therefore, the multifaceted organisational setting at the national level has only a limited impact on the state level (Knierim et al., 2015). In this section, we present the German AKIS from a national perspective. In addition, to illustrate the institutional diversity among the federal states, we present two examples of state-level AKIS: Bavaria and Schleswig Holstein. Furthermore, as the forestry sub-sector is unique, we describe Germany's forest knowledge and innovation system as a separate sub-section.

2.1.1. AKIS actors and knowledge flows at the national level

The public sector of the German AKIS includes the Federal Ministry of Food and Agriculture (BMEL[1]) and its subordinate agencies. The BMEL is responsible for all higher-level matters in the agricultural sector, however, it does not play a big role in the advisory services, which is predominantly the states' responsibility. As an authority subordinate to the BMEL, the Federal Agency for Agriculture and Food (BLE[2]) is responsible for information service provision at the federal level and acts as a project management agency of the BMEL. The Federal Information Centre for Agriculture (BZL[3]), and the German Agency for the Networking of Rural Areas (DVS[4]) are based in the BLE with the mission to disseminate information and coordinate the cooperation and exchange among various actors. BZL, as a knowledge-based information service provider for agriculture and all related subjects, collects and analyses data and information for wider dissemination. The DVS was set up to support cooperation and exchange between administrative and

[1] *Bundesministerium für Ernährung und Landwirtschaft*
[2] *Bundesanstalt für Landwirtschaft und Ernährung*
[3] *Bundesinformationszentrum Landwirtschaft*
[4] *Deutsche Vernetzungsstelle Ländliche Räume*

scientific actors and practitioners in agriculture and rural areas, e.g. via thematic networking events, a topical newsletter as well as a regular journal. According to the expert interviewees, the DVS plays a key role in supporting the European Innovation Partnership (EIP) Operational Groups, which have a limited outreach to AKIS actors in Germany. The experts also emphasised the need to scale up the experiences from the EIP operational groups to the broader German AKIS. Another important task in BLE is coordinating relevant EU research affairs and participating conceptually in EU bodies, representing the position of the BMEL. Via this task, the BLE advises the BMEL and German research institutions in the agricultural and food sector on cross-border cooperation under the EU Research Framework Programmes. However, according to the interviews, the linkage of the EU research affairs with the rest of the German AKIS actors for knowledge exchange is minimal.

The BMEL finances **four federal agricultural research institutions**: The Thünen Research Institute for Rural areas, forestry, agriculture and fisheries (TI); Julius Kühn Research Institute for Cultivated Plants (JKI); Friedrich Loeffler Research Institute for Animal Health (FLI); and Max Rubner Research Institute for Nutrition and Food (MRI)(BMEL, 2020a). The institutes primarily work on scientific guidance in decision-making for the BMEL. **Six Leibniz institutes** are also co-funded by the BMEL and the federal states in which their headquarters are located. These institutes conduct application-oriented basic research in the green sector and complement the federal research institutes (BMEL, 2020a). At the regional level, the states are responsible for conducting research and demonstration projects in the **state level research institutes** that carry out practical tests or adaptive research for their respective states and across Germany. These bodies sit in the state ministries of agriculture or in the chambers of agriculture. The so-called *Arbeitsgemeinschaft der Ressortforschungseinrichtungen,* a working group that brings together more than 40 federal research institutions for knowledge exchange, quality assurance of scientific work and cooperation with the state/departmental research institutes. The federal ministries are responsible for coordinating the *Ressortforschung* working group.

As can be observed from above, the BMEL interacts with a large pool of public research institutions to shape Germany's agricultural research direction and to set new trends and opportunities for excellent research and innovation transfer. Nevertheless, the interviewees affirmed the system's inefficiency in transferring

or disseminating research results to other AKIS actors in Germany and expressed the need to strengthen the linkages.

The German Agricultural Research Alliance (DAFA[5]) congregates the publicly funded agricultural research institutions in Germany. DAFA primary aims to support the BMEL in setting strategic agendas for agricultural research and future trends in specific topics by coordinating various publicly funded research institutions. Members of DAFA include units at universities, non-university research facilities, federal and state research institutes, independent research institutes, and agriculture chambers with a research component. Since the last ten years, DAFA actively supported the research agenda, particularly in livestock, legumes, grassland, bees in agriculture, organic agriculture and aquaculture. Another integrative agricultural research association is the umbrella organisation of Agriculture research (DAF[6]). DAF, a multidisciplinary association of leading scientific societies in the sectors of agriculture, forestry, food, veterinary and environmental research, was founded in 1973 to replace the former 'Research Council's tasks in Germany (FISA, 2020).

The agriculture education system in Germany involves various actors and responsibilities at different levels: (i) basic professional training (*Berufsausbildung*), (ii) advanced training (*Fortbildung*), (iii) University education (Studium) and (iv) further education (*Weiterbildung*).

(i) The basic professional training, regulated by the Vocational Training Act (BBiG[7]) at the federal level, takes place in the dual system frame. In this context, vocational schools (*Berufsschule*) and (agricultural) company or enterprises conduct the training. Additionally, Agro-Technical-Schools, Animal-Husbandry-Schools or Forestry Schools linked to research institutions engage in inter-company training. Highly qualified and pedagogically well-trained professional masters (*Meister*) or instructors (*Ausbilder*) on the farms and in the enterprises, together with the schools form the backbone of a practice-oriented transfer of knowledge and know-how to the next generation of agricultural workers and forestry personnel.

[5] *Deutsche Agrarforschungsallianz*

[6] *Dachverband wissenschaftlicher Gesellschaften der Agrar-, Forst-, Ernährungs-, Veterinär- und Umweltforschung e.V.*

[7] Berufsbildungsgesetz

Vocational training schools continue to develop the capacity of many young professionals in the German agriculture sector. For instance, in the year 2019, a total of 32,331 young people studied the 14 agricultural professions offered in the(BMEL, 2020c, p. 27). Our interviewees affirmed that vocational schools are crucial actors in the German AKIS. Furthermore, some interviewees stressed the importance of explicitly including topics, communication, public relation and personal competence in the vocational school curriculum.

(ii) Secondary technical schools (*Fachschule*) and higher agricultural schools (*Höhere Landbauschule*) offer advanced training opportunities for those who completed basic professional training from the dual system. In particular, agricultural professionals who aspire to have a full-time agricultural occupation use advanced training opportunities. The secondary schools offer farmers qualifications that allow them to train apprentices on their farms, gardening or forestry enterprises or labs. According to BLE (2020), the number of secondary technical schools that provide advanced training in the federal states amount to 353

(iii) Universities of applied sciences and agricultural science universities train theoretical and practical education in agriculture. Throughout the country, a total of **ten universities and 13 universities of applied sciences are dedicated to agricultural study programs** (VDL, 2020). The so-called old states, host majority of those universities. Universities of Applied Sciences focus particularly on applied research questions and include a higher amount of practice and internships in practical farms than science universities. Consequently, the applied universities cooperate more with practitioners, companies, associations and organisations at the local level.

(iv) Various universities and technical schools offer further education (W*eiterbildung*) courses on diverse topics and duration for all agricultural professionals who want to acquire knowledge and skills to meet new challenges in their profession. For example, publicly financed organisations such as the federal **teaching and research institutes** (*Lehr- und Versuchsanstalten*) provide possibilities for conducting specific experimentations for those from vocational schools as well as for other individuals interested in specific topics. Privately financed organisations such as the German Agricultural Society's **DLG Academy** and the **Andreas-Hermes Academy** of the German Farmers Association also provide further education courses. There are also numerous associations with more

specific educational functions for agricultural and rural actors and **interest groups** with an (agro-) ecological working focus.

State agriculture offices in the states of Bavaria, Baden-Württemberg, Hessen and Rhineland-Palatine provide holistic agricultural economic advice (Knierim, Thomas, & Schmitt, 2017b). However, their mode of service delivery evolved in the past years. For instance, in Baden-Württemberg, the state office provides free advice to farmers only on general questions. It leaves advice on specific issues such as production technologies and farm entrepreneurship or confidential questions to private advisors. Private advisors are admitted and supported for providing modularised, content-wise targeted services in a two-stage concession process. Farmers contract private advisors and contribute financially to the service provision.

Meanwhile, agriculture offices at a state and district level are more engaged in holistic advisory services such as agriculture investment promotion, rural development and following up on regulatory issues related to the use of EU EAFRD funds. On the other hand, private advisors offer advisory modules on specialised topics such as business management, plant and animal production, organic farming, income combinations, environment, and energy. Similarly, Bavaria introduced a two-tier system in 2006, that allows the state agriculture offices and non-governmental advisory organisations to offer service in complementarity (Knierim et al., 2017b).

Chambers of agriculture are described as self-governing bodies of the farmers and the state governments, thus acting as a kind of hybrid organisation between the public sector and Farmer Based Organisations (FBOs). In Germany, chambers of agriculture exist in seven states. Administrative and regulatory duties of the chambers are similar to those of the state agriculture offices. The chambers are responsible for education and training tasks and provide advisory services to farmers. According to the expert interviewees, chambers have a strong linkage with vocational education providers and many farmer-based organisations and third sector organisations in the German AKIS. Unfortunately, the continuous reduction of public funding for the chambers in recent years has resulted in a decline in the number of advisors and a change to a fee-based advisory service.

Private advisory services can be accessed by any farmer at any time and in all states of Germany. Therefore, numerous private companies - ranging from

individual freelancers to larger companies with a wide range of clients - provide advisory services to farmers. In principle, private advisory companies provide similar tasks and services as that of chambers and states but only on a commercial basis. Agricultural advisory companies play a key role in the eastern German states, where advisory service is mainly privatised. Also, in the other states with public services or chambers, the number of private advisors contracted by farmers' own finances is rising. According to our interviewees, private companies, particularly those in eastern Germany, cooperate with other AKIS actors such as state research institutes, chambers, vocational schools and the industry in manifold issues and ways. Our interviewees also highlighted that private advisory services are limited to the services that farmers are willing to pay. Therefore, private companies cannot offer advice on important and relevant topics such as nitrogen balancing.

Upstream and downstream companies, e.g. companies providing agricultural inputs or processing agricultural products, also engage in agricultural knowledge exchange. For example, our interviewees expressed the key role that the German Raiffeisen Association (DRV[8]), a private company, plays in agricultural knowledge exchange. The DRV represents the interests of the cooperative-oriented companies in the German agricultural and food industry. There are 1,984 DRV member companies in the production, trading and processing of plant and animal products. Members of the DRV include farmers, gardeners and winemakers (DRV, 2020). The DRV is known to work directly with farmers and deliver advisory services.

There is a broad range of actors who belong to **farmer-based organisations** (**FBOs**), as with the private sector; to give an overview of all FBOs in Germany is therefore impossible. Also, the boundaries between private organisations and FBOs are often fluid, which makes it hard to separate one from another. For example, an advisory circle may work as a non-profit farmer association or as a partly or fully commercialised advisory company.

The German farmers' association (DBV[9]) is one example of FBOs at the national level, with the major aim of representing farmers' interests in the society, but also

[8] *Deutscher Raiffeisenverband*

[9] *Deutscher Bauernverband*

actively involved in providing advisory and knowledge exchange services. The DBV represents the most dominant lobby group of farmers in Germany. It has traditionally played a key role in the agricultural sector and is well connected with other lobby organisations and the public sector. The DBV's organisational structure can be observed at three governance levels: at the local (district) level, the farmers' association provides a forum for exchange, opinion building and mutual support. It also serves for representation of farmers' interest towards regional administrative bodies. The second level is the state farmers' association that provides information, advice and services for all local level groups, individual advice for farmers on selected topics and maintains linkages with the state level actors such as chambers of agriculture, ministries etc. At the national level, the DBV operates as a professional interest organisation with a broad range of activities and services and manifold links to national and international, in particular, EU political fora.

Also, the DBV has a close link with the German Rural Women's Association (DLV[10]). The DLV represents women who live in the countryside and their families. Roughly half a million rural women are members of DLV (DLV, 2020). Given that female farmers make up only about a third of DLV-members, DLV can be regarded more broadly as a lobby group of rural female actors, rather than solely farmer-based. The DLV recognises itself as an important educational actor for rural women.

Besides DBV, farmers, particularly those engaged in smallholder and ecologically oriented farming, are represented by other associations, for instance, the 'working group for smallholder farming' (ABL[11]). The ABL is an association which represents smallholder and organic farming interests and engages in knowledge exchange on ecological, agro-policy and development related topics. Most ABL members are concentrated in the "old" Länder. The ABL has supported smallholder and organic farmers' interests since the 1970s.

The **association of agricultural chambers (VLK**[12]) primarily acts as an overarching association representing the interests of the seven agricultural chambers' in Germany. Also, VLK provides a nationwide networking platform for experts from the agriculture chambers, state agricultural administrations, farmers' associations

[10] *Deutscher Landfrauenverband*
[11] *Arbeitsgemeinschaft bäuerliche Landwirtschaft*
[12] *Verband der Landwirtschaftskammern*

and professional advisory service providers to exchange on agricultural knowledge. The VLK has a cooperation agreement with the state ministries for agriculture advisory activities. Through its working group for agriculture advisory services, the VLK coordinates and moderates around 40 committee meetings per year with experts from all agriculture areas.

The federal association of agricultural training (vlf[13]) is a farmer-driven organisation with 'continuous training for farmers' as their main focus and with about 200,000 farmers as members nationwide. The association is represented nationwide with 13 member associations in the respective states. Members of the association consist of farmers who graduated from one- or two-year technical schools, technical colleges and universities in the agricultural sector as well as actors from other associations such as DBV. According to our interviewees, the vlf plays a central role in shaping the policy in agricultural vocational education and training in Germany and works closely with the state ministries and chambers of agriculture to supervise and monitor vocational education quality.

There are many **interest groups** and **NGOs** that represent agricultural interests at national, state and local levels in Germany. Such groups and NGOs represent their members' interest in order to influence public opinion and or policy. In this report, we only mention some interest groups in the agriculture sector that act as lobby groups and knowledge exchange platforms.

- **The association of agricultural producers, processors and retailers of organic foods in Germany (BÖLW[14])** is an umbrella association that unites 14 member associations along the entire value chain in the field of organic agriculture. Associations such as Bioland, Demeter and Naturland are BÖLW's members. The members interact with actors in various spheres of the agriculture sector, which includes advisory service to farmers, product certification, policy discussions and bridging research and practice. BÖLW's main objective is to create a favourable framework for the further development of the organic food industry in Germany by serving as a

[13] *Bundesverband Landwirtschaftlicher Fachbildung*
[14] *Bund Ökologische Lebensmittelwirtschaft*

platform for open communication and knowledge exchange and joint decisions among its members.

- **The International Academy for Rural Advisory Services (IALB[15])** plays an important role in the further training of advisors. Originally founded by German-speaking advisors (from Germany, Austria, South Tyrol and Switzerland), it offers services for around 700 individual members from 18 different European countries and 15 corporate members (IALB, 2012). In Germany, IALB members consist of public agricultural advisory organisations, private advisory companies and individual advisors. The association engages in the advancement and support of rural and agricultural advisory services by organising and conducting professional training for advisors. IALB developed the program Certificate for European Consultants in Rural Areas (CECRA) to organise and standardise the various qualification approaches of the federal states under one umbrella. In 2015, the EUFRAS(European Forum for Agricultural and Rural Advisory Services) started cooperating with IALB to extend the CECRA courses to non-German speaking European countries and improve the qualification of rural advisors (EUFRAS, 2015). In addition, through its well-established annual conferences on topical advisory issues, IALB offers its members an important networking platform and acts as a source of knowledge.

- **The German Agricultural Society (DLG[16])** is another powerful actor with more than 27,000 members (DLG, 2020). Of those members, roughly two-thirds are farmers, while the rest comprises of upstream and downstream companies, agricultural advisors and scientists. The DLG regards itself as an open network and the professional voice of agriculture, agribusiness and the food sector. The network aims to advance technological and scientific progress in crop production, farm machinery, and animal husbandry (mainly on a commercial base). The testing centres, the exhibition departments, and the DLG academy are particularly noteworthy activities of the society. DLG produces and disseminates knowledge within the organisation and beyond, e.g. in the form of printed and online-published bulletins, trade fairs and exhibitions. Farmers, advisors and other

[15] *Internationale Akademie für ländliche Beratung*
[16] *Deutsche Landwirtschaftsgesellschaft*

agricultural actors pay membership fees to participate in professional events that function as sources of knowledge exchange and networking platforms for farmers, advisors, scientists and up-and-downstream enterprises. Although DLG is a powerful actor in German agriculture, it represents only the top 10% of Germany's farmers (interview communication).

Knowledge flows among AKIS Actors

According to our interviewees, in the German AKIS, the state level knowledge flows between associations and farm enterprises is reportedly strong. Similarly, the knowledge flows between chambers and farm enterprises as well as between research and DBV is perceived as strong. In contrast, direct knowledge flows from research to practice is perceived as weak. Notably, the varying administrative structures in the German states were raised as challenging situations for smoother knowledge flows among the states. The EIP operational groups or similar initiatives are perceived as solutions to strengthen the knowledge flows between research and practice and among the states, according to our interviewees.

The AKIS diagram (see Figure 1) represents the main organisational types and some examples of agriculture organisations of national importance. An earlier version of the diagram was used as a discussion tool for the semi-structured interviews to visualise interviewees' perspectives on the German AKIS, linkages and knowledge flows among the various AKIS actors. Based on the inputs from the interviewees, the diagram was adapted to its current version.

Schematic diagram of the main actors and knowledge flows in the German AKIS

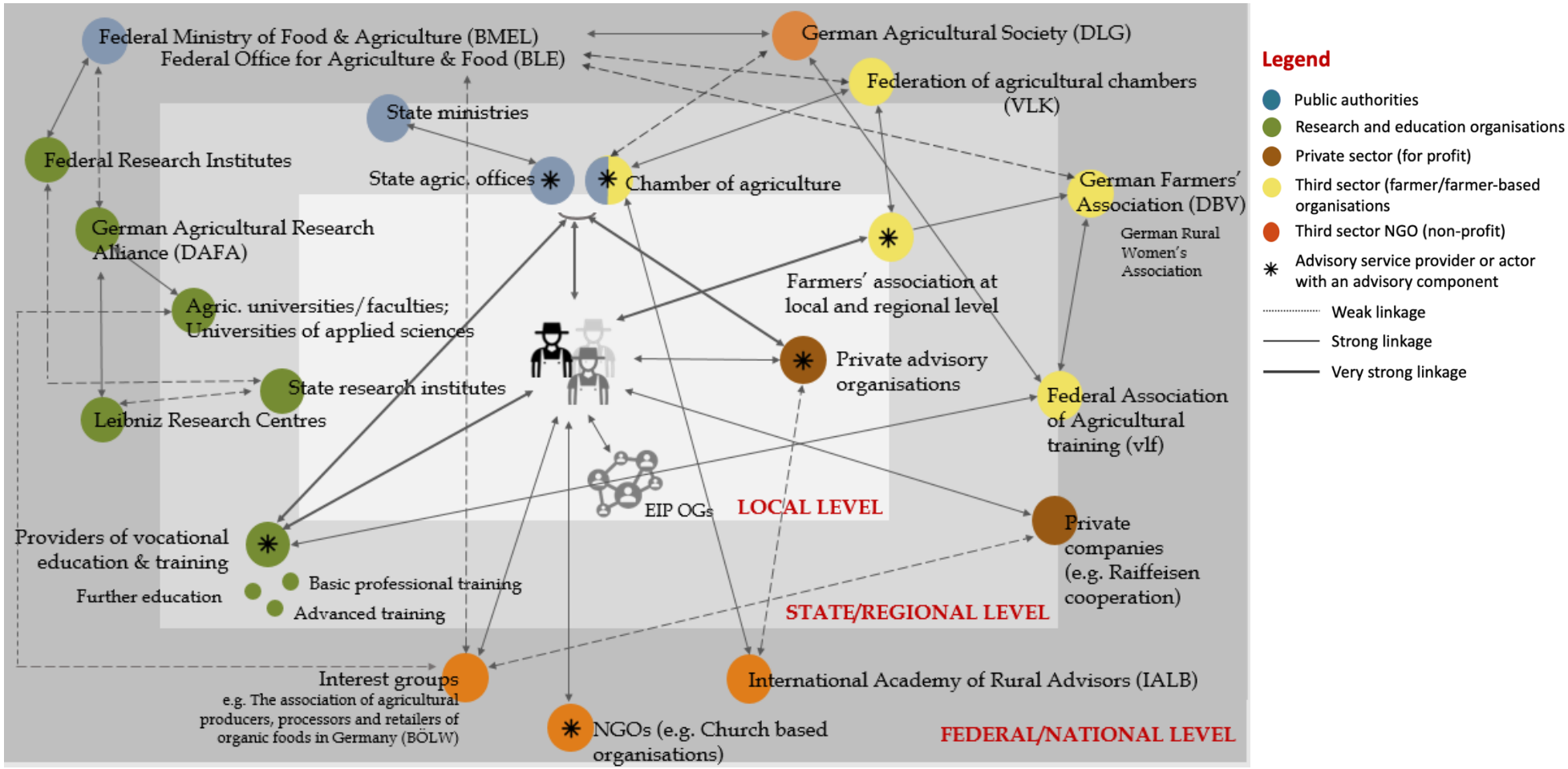

Figure 1 The German AKIS at the national level

2.1.2. Examples of state-levels AKIS in Germany

To showcase the heterogeneity and diversity of the German AKIS among the various states, we present two examples of state level AKISs: one of Schleswig Holstein and the other of Bavaria.

Schleswig-Holstein

Schleswig-Holstein is a relatively small state in the North with shipyards, pharmacy and tourism as main sectors. The relative importance of agriculture for the GDP is slightly higher than the German average. There are ca. 15.000 farms, half of which are full-time farms with an average size of 100 hectares. The strength of the sector is reflected in well-developed and diversified AKIS actors. In the last ten years, the campus Osterrönfeld, Rendsburg, related to the agriculture department of the Kiel University of Applied Science, has become a focal point of the agricultural economy in Schleswig-Holstein and the seat of many institutions and associations. The Chamber of Agriculture moved from Kiel to Rendsburg into a new building ten years ago. Together with multiple associations and institutions, which were already there or followed, Rendsburg became a central agricultural hub. Here, the agricultural school, technical college, DEULA, chamber of agriculture, farmers' association, further producer and interest groups, as well as various advisory rings and agricultural advisory companies, are found in one building or in close proximity. Figure 2 below shows the main AKIS actors in Schleswig-Holstein and the knowledge flows among them.

In the small federal state of Schleswig-Holstein, where distances are short, many actors in the agricultural, food and forestry industries know each other well, and some even personally, for instance, as alumni from their times as apprentices or students. In the past decades, good structures that promote close cooperation, which are helpful for networking, knowledge exchange and creating innovations, have been created.

The Chamber of Agriculture plays a key role in the state by maintaining close links with all important actors and offering a platform to state level associations and advisory organisations. Farmers in Schleswig-Holstein are highly educated and a large percentage of young farm managers have graduated from an agricultural

university, or a university of applied sciences, or a technical college. Also, farmers have good linkages with research and training institutions in the state.

Since 2014, the European Innovation Partnership (EIP-AGRI) initiative has made it possible for actors from key organisations in agriculture and nature conservation to collaborate in 30 innovation projects. By working together in such projects, the linkages among farmers, advisors and researchers are strengthened through repeated communication and cooperation. As a result, trust has developed and close thematic working groups have been established. Nevertheless, there is still a need to strengthen contacts for stable and reliable networks to intensify innovation. Moreover, start-up initiatives in the agriculture, food and forestry sector, which is still low in Schleswig-Holstein compared to, e.g. the neighbouring Lower Saxony, need to be promoted.

Schematic diagram of the main actors and knowledge flows in the Schleswig-Holstein AKIS

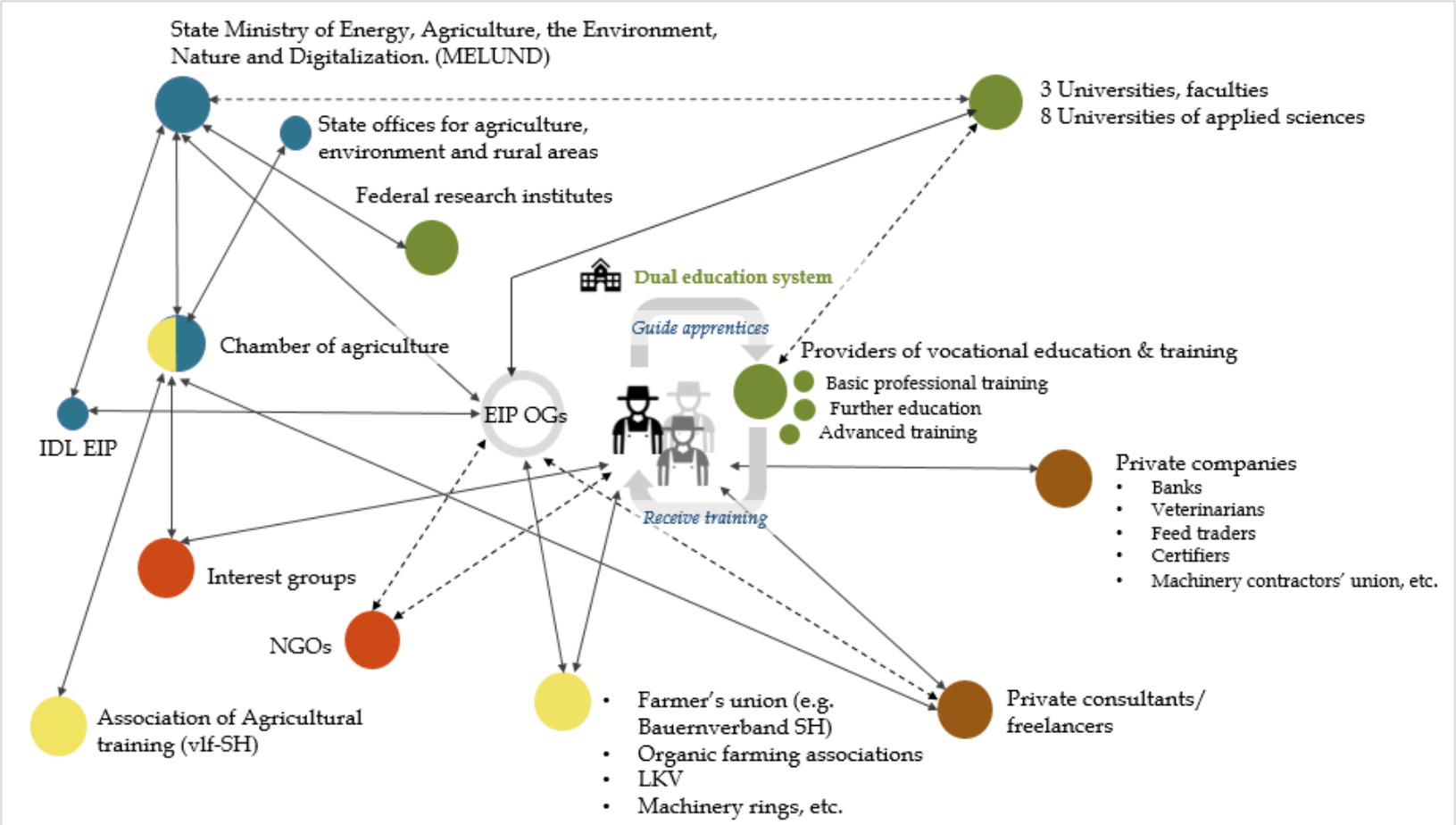

Figure 2 The Schleswig-Holstein AKIS

Bavaria

The AKIS in Bavaria, characterised by a dense infrastructure comprised of a high number of public actors and various professional organisations and associations, gives an overview of the agricultural actors involved in innovation and knowledge transfer. This structural performance corresponds to the important role that agriculture plays for the rural areas in Bavaria: with roughly 90,000 farms, the state hosts almost one third of all German agricultural enterprises (Brechmannn et al. 2015).

Similar to Schleswig-Holstein, Bavaria has a long tradition of agricultural production. In Bavaria, agricultural education and training and applied research are mainly under the responsibility of the State Ministry of Food, Agriculture and Forestry (StMELF). The Offices for Food, Agriculture and Forestry (ÄELF), which coordinate advisory services as well as advanced and further training, play a key role in knowledge transfer. In the case of supra-regional issues or highly specialised topics, various bodies of the state institutes and technical colleges collaborate. Concerning vocational education in Bavaria, young professionals in agriculture and home economics gain their knowledge via the dual system, or the Farmer's Training Programme (BiLa), or the master craftsman qualification. Prominent agricultural education institutions in Bavaria are the agricultural and home economics technical colleges or higher agricultural and technical colleges such as the Weihenstephan-Triesdorf University of Applied Sciences and the Technical University of Munich.

State agricultural advisory organisations coordinate advisory service provision in Bavaria. The state offices coordinate collaboration with farmer based organisations, non-governmental advisory organisations and private organisations via the collaboration scheme ('*Verbundberatung*'). The *Verbundberatung* regulates cooperation between the state and accredited advisory service providers from the above mentioned institutions. For areas where the collaboration scheme does not reach, networks and state level associations such as the Bavarian farmers' association (BBV) and the association of agriculture training (vlf Bayern) cover the gap. Also, actors from business and industry offer advisory services to farmers. Figure 3 below illustrates the AKIS actors and the knowledge flows in Bavaria.

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INTERACTIVE INNOVATION

Schematic diagram of the main actors and knowledge flows in the Bavarian AKIS

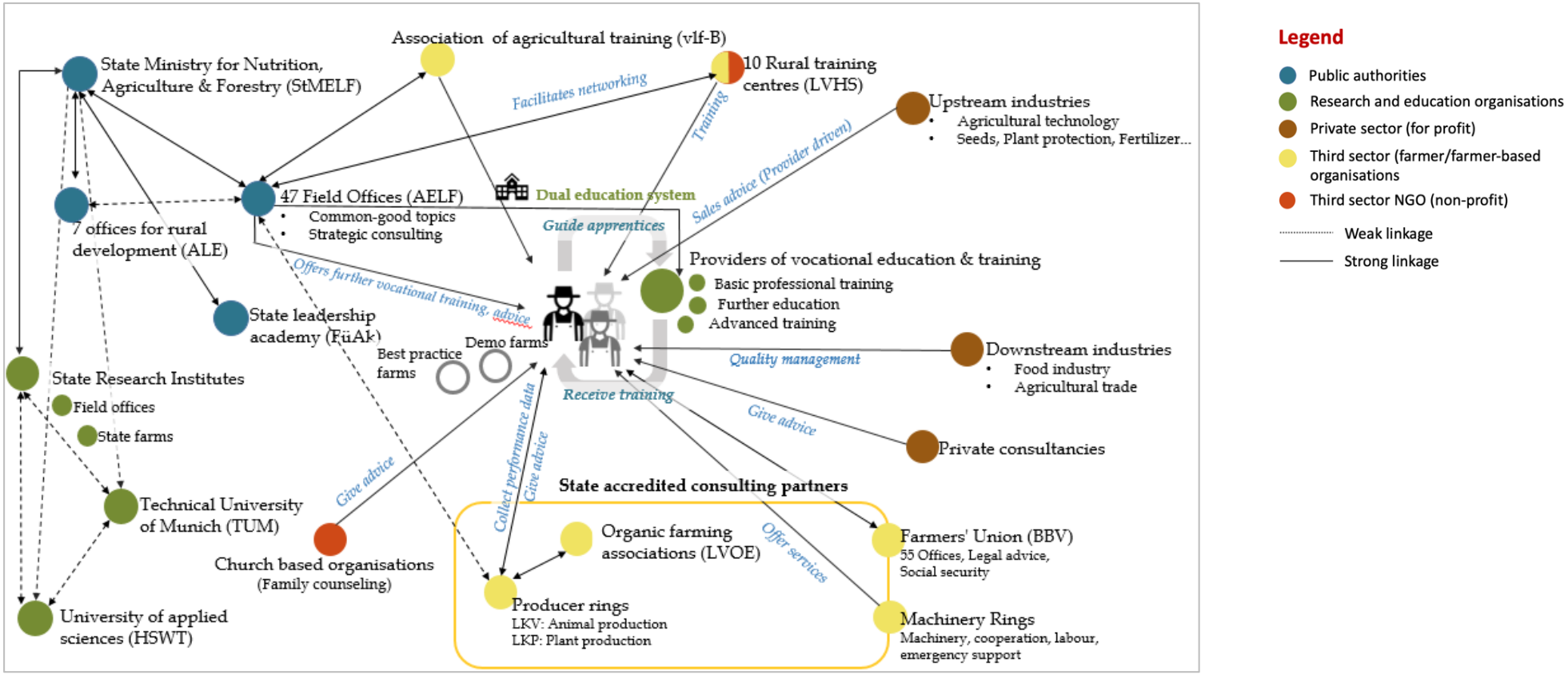

Figure 3 The Bavarian AKIS

2.1.3. Forestry Knowledge and Innovation System (FKIS) in Germany

The forest knowledge and innovation system (FKIS) is equally complex and heterogeneous in Germany as the AKIS. Forest governance lies within the mandate of the individual federal states, with the federal government only taking on the role of coordinating the activities of the states and setting the legal framework for sustainable forest management through the Federal Forest Act (Bundeswaldgesetz). The diversity of the forest structures and the relative importance of forestry in each state also means that different policies exist in the individual federal states (Haußmann and Köhl 2018).

The illustration of forestry actors at the national and the state level using the FKIS concept is relatively new for the sector. This was affirmed by our interviewees who mentioned that the German FKIS is independent of the AKIS and little is known about the linkages and cooperation of the diverse actors operating in the forest sector. To this end, the BMEL is in favour of setting up a coordination unit, similar to DAFA for the forest sector. One already existing structure is the FNR (Fachagentur Nachwachsende Rohstoffe) that is responsible for the forestry and renewable energy topics at the federal level.

In terms of main actors, forestry schools and forestry training centres run by the federal states play an important role in the FKIS. The forestry schools provide standard, advanced and further training courses for foresters, master foresters, and forest owners. The forestry schools and forestry training centres are run by the respective forest administration offices or state forest enterprises. At the national level, the Lohr State Technical School offers training for foresters, master foresters and forest owners.

The Federal Research Institute for rural areas, forestry and fisheries is dedicated to forestry research in Germany. Another key actor in research is the Board of Trustees for Forest Work and Forest Technology (KWF[17]). KWF addresses forestry technology topics, particularly those within the supra-regional context. The KWF

[17] *Kuratorium für Waldarbeit und Forsttechnik*

has been operating for more than 50 years in Germany with 2500 members from practice, science, administration and industry. The KWF is institutionally supported by the BMEL and the ministries of the federal states. Additionally, state forestry research institutes in the respective federal states conduct forestry research.

While state research institutions and universities conduct research to produce knowledge and innovation in forestry, disseminating the results is a role of the state forest offices or forest chambers or private advisors. Moreover, the state forest offices are responsible for organising on-site advisory services and training activities for forest owners in the respective states. The internet-based information platform "Waldwissen.net", managed in collaboration with four forest research institutes in Germany, Switzerland and Austria plays a key role in disseminating findings from forest research institutions to forest owners and the public. Mitigating the massive effects of climate change on forests is one of the primary topics receiving attention by forest actors in Germany.

Concerning third sector actors in the German FKIS, the association of German Forest Owners (AGDW[18]) is an umbrella association covering 13 federal associations. AGDW represents the common interests of private forests owners as well as municipal and corporate forests. Figure 4 below illustrates the FKIS actors and the knowledge flows in Germany.

[18] *Arbeitsgemeinschaft Deutscher Waldbesitzerverbände*

Schematic diagram of the main actors and knowledge flows in German FKIS

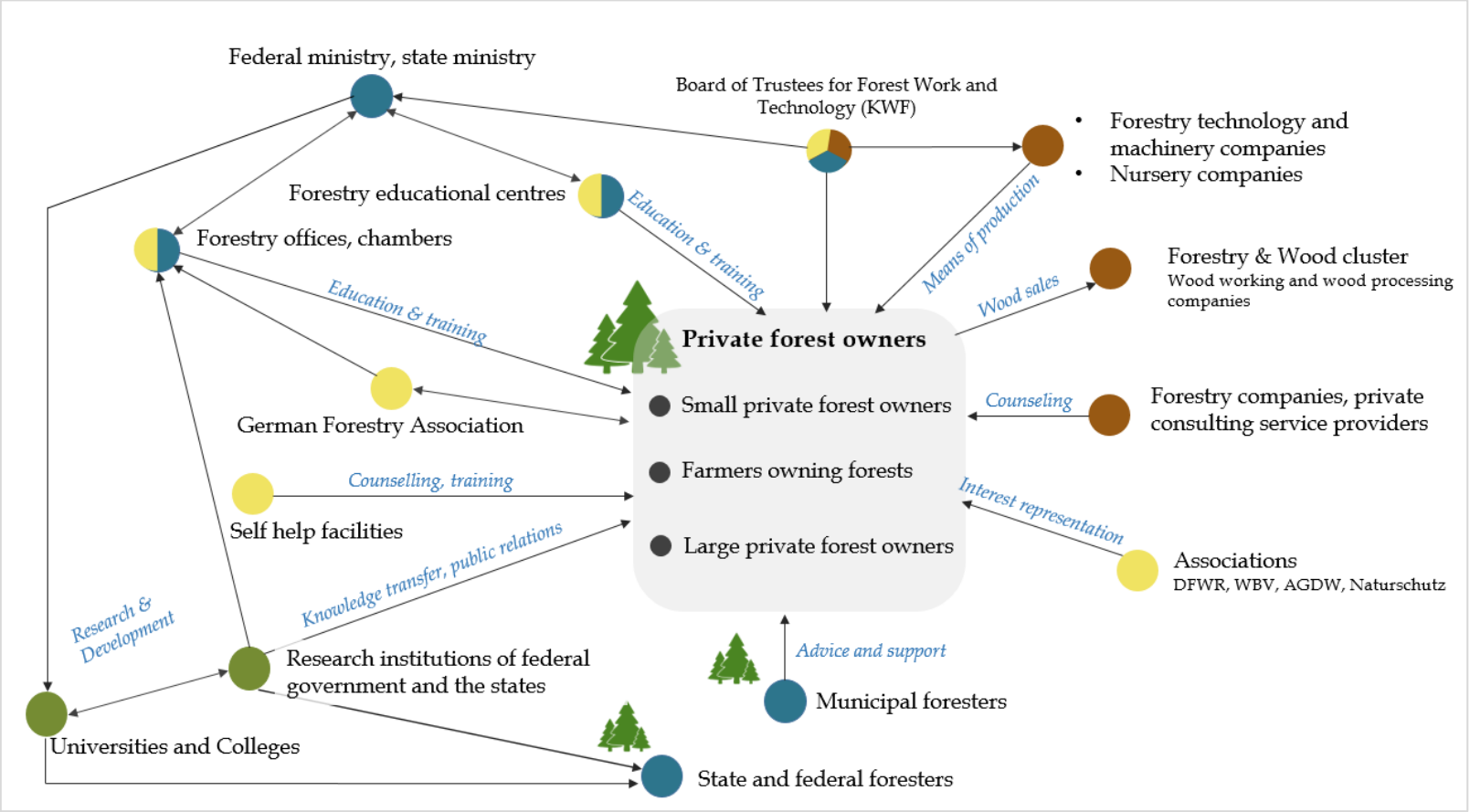

Figure 4 The German FKIS

2.1.4. Example of state level FKIS in Germany

In the state of Bavaria, the State Ministry of Food, Agriculture and Forestry (StMELF) and its subordinate bodies are responsible for coordinating and overseeing the vocational education, advisory service and applied research on forestry. The Forestry College Lohr and the Lohr State Technical College provide standard and advanced vocational training. Courses take place at the School of Silviculture and at the training centres of the Bavarian state forestry company (BaySF).

Applied research is conducted by the Bavarian State Institute for Forestry and Silviculture (LWF) and the Office of Forest Genetics (AWG). Also, universities collaborate with the institute through projects. One such example is the Centre of Forestry Weihenstephan (ZWFH) which is a unique competence centre for forests in Europe. ZWFH brings together three institutes: the LWF, the Technical University of Munich and the Weihenstephan University of Applied Sciences to cooperate in the generation of forestry related knowledge and innovation. ZWFH combines basic research, applied research, education and consultancy for the entire forest sector and acts as an interface between science and practice (ZWFH 2020)

In Bavaria, advice to forest owners and on-site training activities are primarily the responsibility of the Forestry Division at the Offices for Food, Agriculture and Forestry (ÄELF). These offices cooperate with the private forestry associations (FZuS) as self-help institutions for private forest owners. Advice is free of charge for forest owners with an area of less than 200 hectares. Dissemination of knowledge from research institutions and universities is taken up by the advisors at the state authorities as well as teachers, forest owners and the public. Figure 5 below illustrates the FKIS actors and the knowledge flows in Bavaria.

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Schematic diagram of the main actors and knowledge flows in the Bavarian FKIS

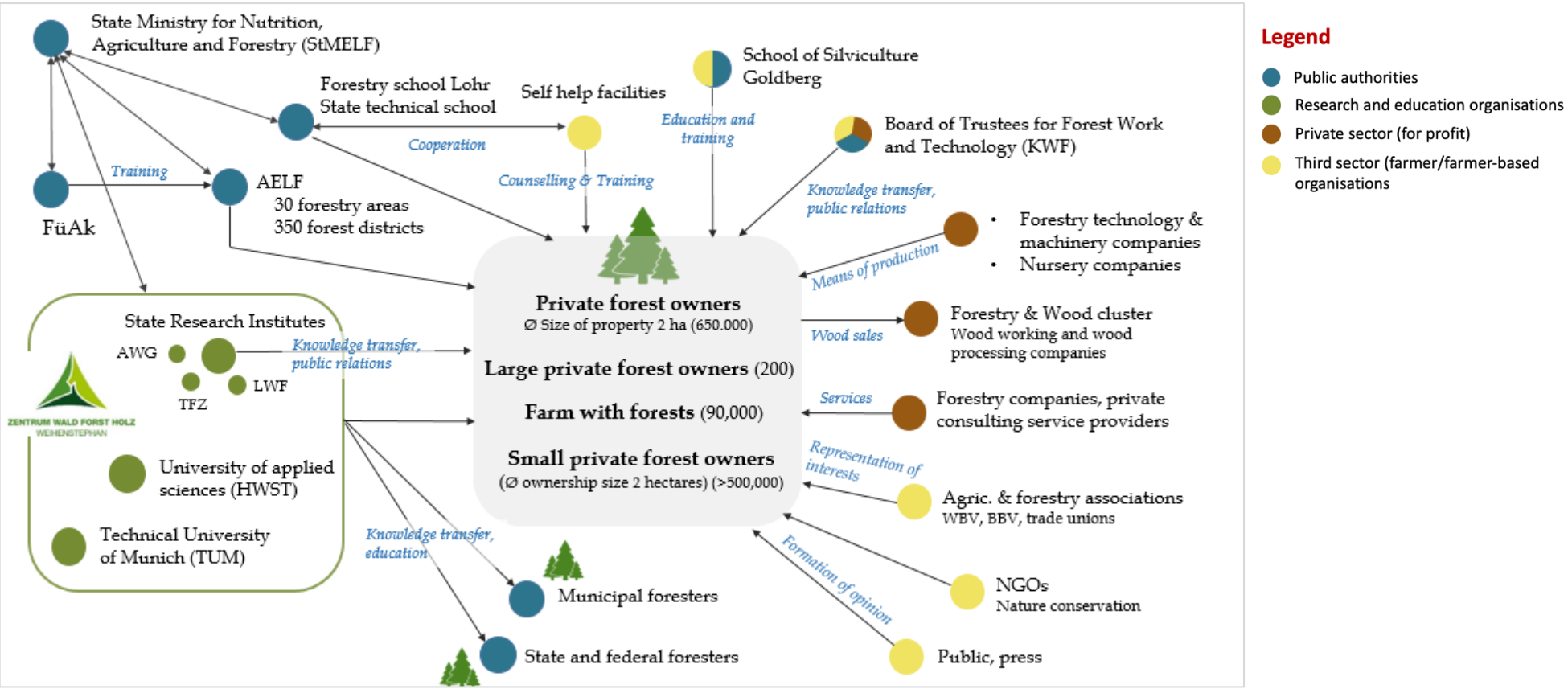

Figure 5 The Bavarian FKIS

2.2. Policy framework at national level

The federal ministry of food and agriculture (BMEL) is responsible for providing the framework and guiding principles for the agricultural sector, e.g. by setting policies and incentives through funding programs. Several national policies set the frame and guide the German agricultural sector's overall direction and rural areas' development. One big policy programme is the Joint Task for the Improvement of Agricultural Structures and Coastal Protection (GAK[19]). The GAK, ongoing since 1973, is the most important national funding instrument to support agriculture and forestry, the development of rural areas and to improve coastal and flood protection. Together with the states' funds, the total budget of the GAK amounts to around 1.9 billion euros per year (BMEL, 2020b). BMEL finances 60%, while state governments cover 40% of the GAK budget. According to our interviewees, financing shares between the federal government and the states are sometimes adjusted upon negotiations.

Moreover, the BMEL initiates specific programs that are purely implemented by BLE without the states' engagement. These programs aim to support research projects and promote innovation and knowledge exchange. Some of such programs are:

- **The programme for the promotion of innovation** that aims to support the competitiveness of the German agricultural and food industry. Through this programme, collaborations between small and medium-sized companies and research institutions are promoted to efficiently tap into innovative ideas;
- **The Federal programme for Organic Farming and Other Forms of Sustainable Agriculture Programme (BÖLN[20])** that aims to promote organic farming as a pioneering form of agricultural use. The BÖLN implements the exchange of knowledge at an early stage of research funding. BMEL puts about 30 million euros for BÖLN;

[19] *Gemeinschaftsaufgabe Agrarstruktur und Küstenschutz*

[20] *Bundesprogramm Ökologischer Landbau und andere Formen nachhaltiger Landwirtschaft*

- **The support program for renewable raw materials (FNR)** that aims to further develop a sustainable bioeconomy and open up new perspectives for Germany as an industrial location and develop the rural areas.
- **The German Agricultural Innovation Partnership (DIP[21])** that aims to strengthen agricultural innovations by providing funding for research and development projects with high practical relevance. The funding is aimed at commercial companies eligible to apply alone or in association with other industry or science partners. Member organisations of DIP include public authorities, third sector associations and research organisations. The members meet regularly to propose projects for funding and discuss the eligibility of funding.
- **The Future Program of digital agriculture policy** that aims to support projects that use digital technology to improve living and working in rural areas. Through this program, the BMEL is planning a comprehensive data platform for farmers.

Moreover, policy programs that directly target federal states, such as European Agricultural Fund for Rural Development (EAFRD) and the European Innovation Partnership for Agricultural Productivity and Sustainability (EIP AGRI) are worthy to note. EAFRD is a funding instrument of the CAP that supports rural development strategies and projects in the EU. In Germany, the money from EAFRD goes directly to the states' rural development programmes and the state ministries are responsible for managing the funds (BMEL, 2019). The other policy program, EIP-AGRI, supports collaboration and knowledge exchange among farmers, scientists, consultants and associations to implement innovative projects via the operational groups (OG).

According to our expert interviewees, although the policy and the programmes are all in place, only a small number of advisors and other relevant AKIS actors are addressed. Possible reasons highlighted were budget constraints and the limited capacity of policy support staff to deal with the many actors in the AKIS.

[21] *Deutsche Innovationspartnerschaft*

2.3. Coordination structures

There are multiple coordination structures in Germany, aiming to make knowledge exchange and innovation processes optimal. The first is the thematic working panel (*Bund-Länder Arbeitsgruppen*), which coordinates exchange between the national and state ministries. Paul, Knuth, Knierim, Ndah, and M. Klein (2014) described the thematic panels as important exchange platforms between the state and national level. Our expert interviewees also corroborated the important coordination role these thematic panels play in exchanging agricultural knowledge and innovation at the national level. They also pointed out the need to bridge the communication gaps among the states and cross-exchange with the different thematic panels.

The second important coordinating body at the national level is the German Federal Agency for Agriculture and Food (BLE). The BLE acts as the executive agency for the BMEL programs. Under the BLE is the German Networking Agency for Rural Areas (DVS), which is a coordination and networking body responsible for coordinating the knowledge exchange and dissemination among EIP-OGs programmes. The BLE initiated an online portal, "Research Information System for Agriculture and Nutrition (FISA)", in order to provide detailed information on publicly funded research projects in the fields of agriculture and nutrition (FISA, 2020). Furthermore, other coordination structures, such as the association of agriculture chambers, vocational training, and the DAFA continue to play a significant role in coordinating agricultural knowledge exchange and innovation.

According to the expert interviews, regardless of the coordination structures in place, the horizontal interplay among German AKIS actors in the various states and subsystems appears rather weak. Similarly, Paul et al. (2014) indicated a low level of cooperation among the state ministries in agricultural knowledge exchange and innovation processes.

3. History of advisory services in Germany

Germany has a long history of agricultural advisory services that dates back to the second half of the 19th century. However, an institutionalised form of advisory services provision was installed from the 1920s onwards (Hoffmann, Lamers, & Kidd, 2000). Before the unification of East and West Germany in 1990, the agricultural sector policies and strategies focused on higher production for farmers and low cost for consumers. Advisory service in the eastern part of Germany was an integral part of an overall system promoting socialist agricultural development under party and state officials' directions. In the western part of Germany, there were three organisational forms for agricultural advisory services: (i) chambers of agriculture, (ii) public agricultural offices, (iii) Advice circles and farmers' working groups (Paul et al., 2014).

After the reunification in 1990, there was strong support for a fourth organisational form in the eastern states: a private advisory system. Consequently, in the 1990s, German advisory services appeared as one of three types: Chambers of Agriculture in the northwest of Germany and in Saarland, private advisory service providers in the north-east German states and public/state advisory services in the Southern German states and in Saxony. In addition to the prominent service providers, associations, upstream and downstream industries continued to play a significant role in advisory services.

Since mid- 2000, advisory service provision in Germany has received more political focus and reforms have taken place at national and state levels (Knierim, Thomas, & Schmitt, 2017a). One significant transformation is the trend towards increased pluralistic advisory services. In the pluralistic system, the state's role in specialised and specific advisory services has been reduced. In contrast, the role of the private sector and third sector organisations in specialised topics have increased. Also, for the past ten years, advisory services are regarded as important players in the German AKIS.

The European Fund for Agriculture and Rural Development (EFARD), as part of the CAP 2014-2020, allocates funds for advisory services and knowledge transfer for each federal state. According to Knierim et al. (2017a), the co-financing from the EFARD funds has significantly contributed to the expanding advisory service offers in the German federal states.

4. Agriculture and forest advisory service providers

This section is based on the review of policy documents, published and grey literature, expert interviews, and the online survey results on the German advisory service providers. The survey is not representative of the advisory service providers in Germany. However, it gives structured situational insights by providing information about the type of advisory organisations, topics and methods of advice, and advisors' qualifications and experience of the participating advisory actors.

4.1. Overview of all service providers

The federal states are responsible for coordinating and providing agriculture and forestry advisory services in their respective states. While Berlin and Brandenburg states have a common advisory service structure, the other states possess independent advisory services. Based on the typologies of advisory service providers presented in the i2connect conceptual background report (Knierim et al., 2020), four types of advisory service providers that prevail in the German states are summarised in Figure 6. In reality, however, there is a pluralism of actors that offer services, and no single typology exists distinctively in any of the states. Also, various third sector organisations such as farmer associations and NGOs offer advisory services at the local level throughout the country, but only in a limited scale or a smaller geographical location.

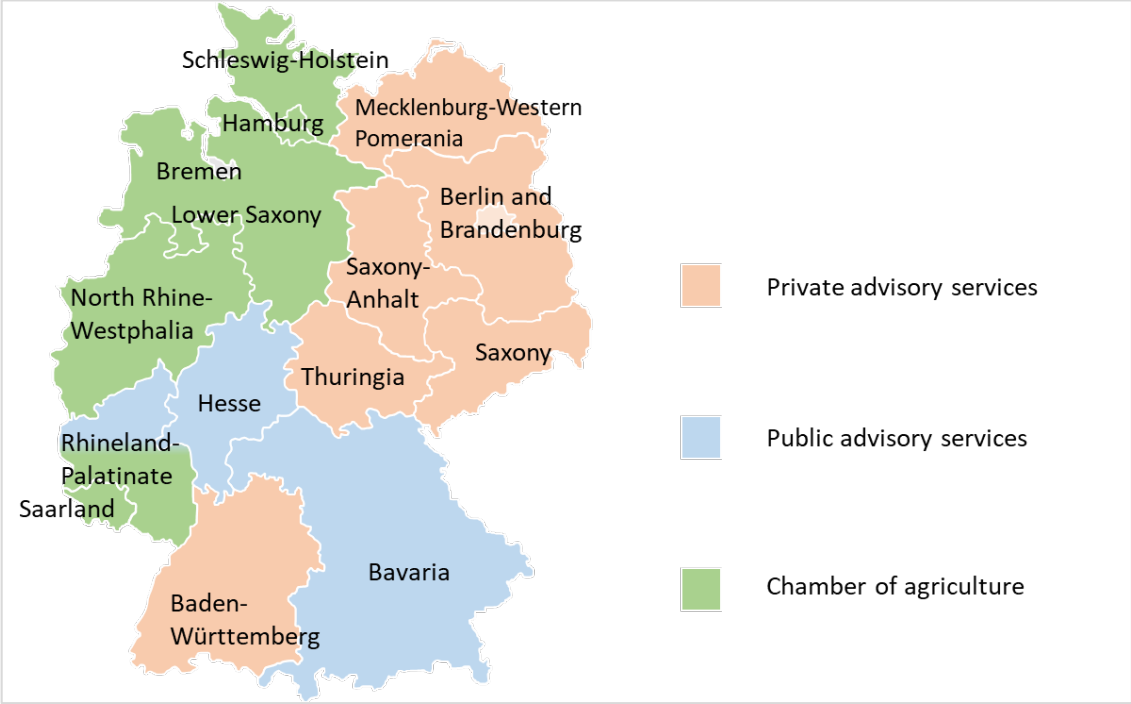

Figure 6: Dominant type of advisory service providers in the German states

To assess the advisory service landscape for agriculture and forestry enterprises, we conducted an online survey between October and November 2020. The questionnaire invitations were distributed to advisory organisations and individual freelance service providers via contact persons in all federal state ministries and chamber of agriculture offices. Additionally, the invitations were sent out to all IALB network members in Germany. A total of 50 complete questionnaires were received from individuals who identified themselves as representatives of advisory organisations (20) or organisations with advisory components (17) or as freelance advisors (13) (Figure 7). The majority of respondents (23 out of 50) were from two German states, Baden Württemberg and Bayern, and some states were represented by just one respondent.

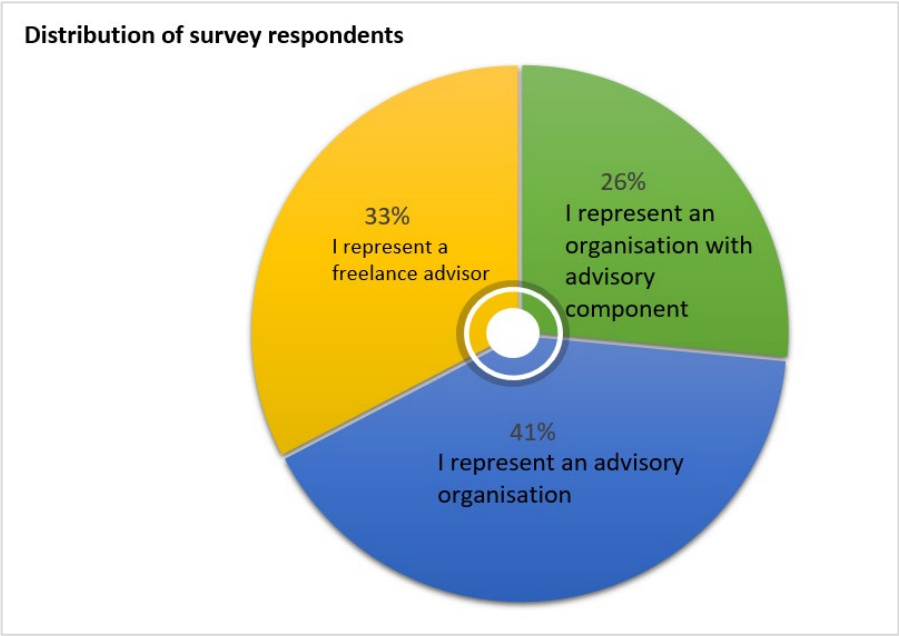

Figure 7: Distribution of survey respondents (n=50)

The respondents with an organisational affiliation identified themselves as representing a FBO, NGO, Government or ministry-based organisation, private/commercial advisory organisation or university (Figure 7). For simplicity of data analysis, freelancers were included into the category of private/commercial advisory organisations, thereby constituting private companies (10 out of 50) and freelancers (13 out of 50). The freelancers included those who provide advisory services full-time (10 out of 13) and part-time (3 out of 13). In addition, a few respondents (4 out of 37) identified their organisations as one with mixed affiliation.

Table 1: Category of orgnisations represented by the survey respondents

Category of organisations	Number of respondents from the organisation category
Farmer-based organisation (FBO)/Professional organisation	12
Government or ministry based advisory organisation	8
Mixed	4
Non-Governmental Organisation (NGO)	2
Private/Commercial advisory organisation*	23
University-based/Research-based advisory organisation	1
Total	50

*includes the 13 private freelance advisors who provide service full-time/part-time

Of the total survey respondents, 72% (36 out of 50), reported that their organisations offer advisory services at the regional (state/province) level. University and private organisations have a scale of operation at an international level, while FBOs, government organisations and NGOs predominantly operate at the state level.

Advisory organisations and freelancers were found to offer a diverse range of advisory services. The most frequently offered services include consultancy and backstopping, creating awareness and facilitating knowledge exchange, networking/facilitation, and brokerage (Figure 8). According to the results, private advisory organisations were found to offer more services in 'enhancing access to resources (input, finance)' compared with the other advisory service providers.

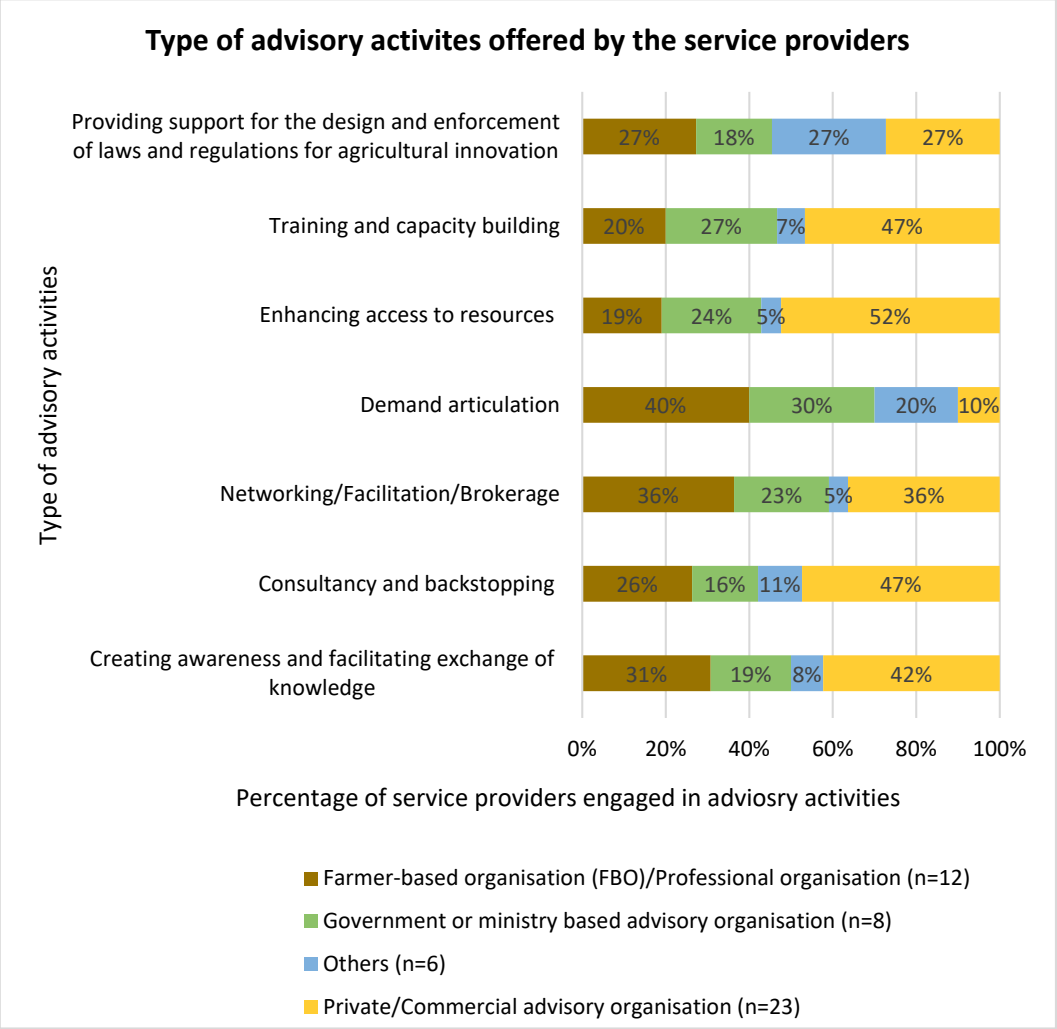

Figure 8: Main advisory activities in the organisations (Multiple answers possible, n= 36)

4.2. Public policy, funding schemes, financing mechanisms

In the survey, 65% (22 out of 34) of the advisory organisations reported more than one primary funding source. The other 35% (12 out of 34) reported a single funding source from national or regional governments (7 government organisations), levy (1 private organisation) and membership fee (4 FBOs). While the primary sources of funding are multiple, the proportion of national/regional government funding appears significant in all the organisations (Figure 9). Source of the national/regional government funds in Germany include funds from the federal

government and the EAFRD funds allocated for advisory service provision (Knierim et al., 2017a)

Changes in the annual budget for advisory services were observed in 29% (10 out of 34) organisations in the last three years. Some respondents mentioned that their organisation's budget increased due to more customers, higher personnel cost, increased staff number, more projects and higher grants from church organisations. Other respondents mentioned that their organisation's advisory service budget decreased due to the shift to EU CAP projects and a drop in clients/members.

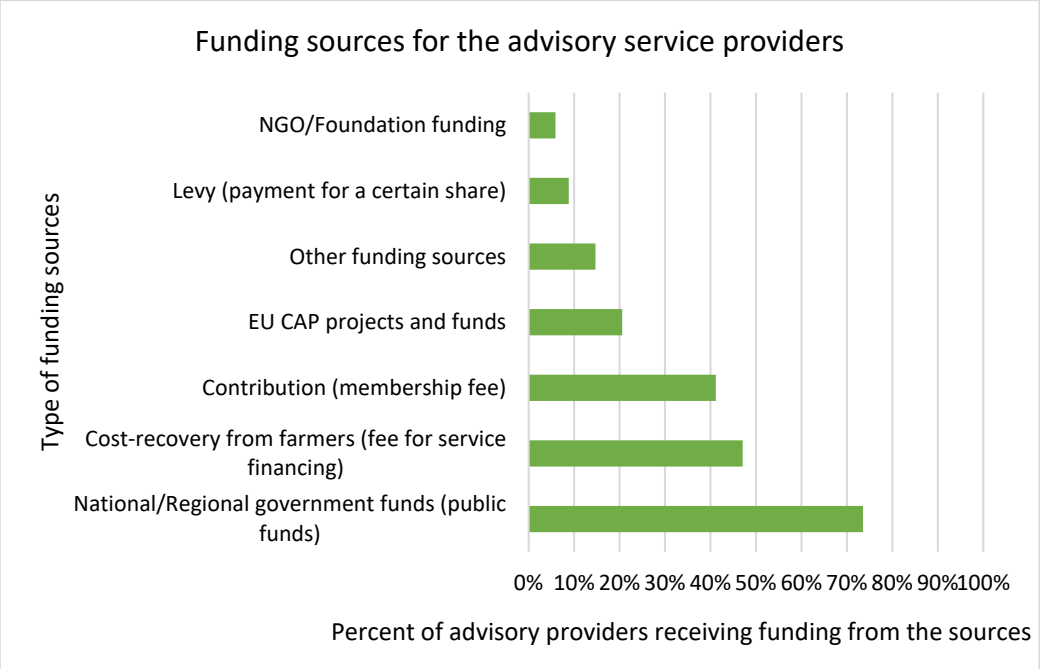

Figure 9: Primary sources of funding (Multiple answers possible)

4.3. Human resources and methods of service provision

The total number of employees and the share of women and advisors show a considerable variation among the organisations (see Figure *10*). In general, government organisations reported higher numbers of employees and advisors.

As shown in Figure *10*, advisors' share is highest in mixed organisations, followed by NGOs and private organisations. Government organisations and FBOs have

lower proportions of advisors, which could be due to the multiplicity of services offered by these organisations. In general, women advisors are well represented in the respective organisations. The percentage of women advisors in government organisations and private organisations is less than in NGOs and mixed organisations.

Advisors' number remained steady in 69% (25 out of 36) of the organisations and 22% (8 out of 36) organisations reported a significant increase. According to the respondents, the increase in advisor number is related to the growing number of organic farms that led to more demand for advisory services, the acquisition of more international projects, and the availability of a wider range of funding programs. In contrast, 8% (3 out of 36) reported a significant decrease due to the country's financial crisis, the decline in clients number, and the emergence of other operational tasks.

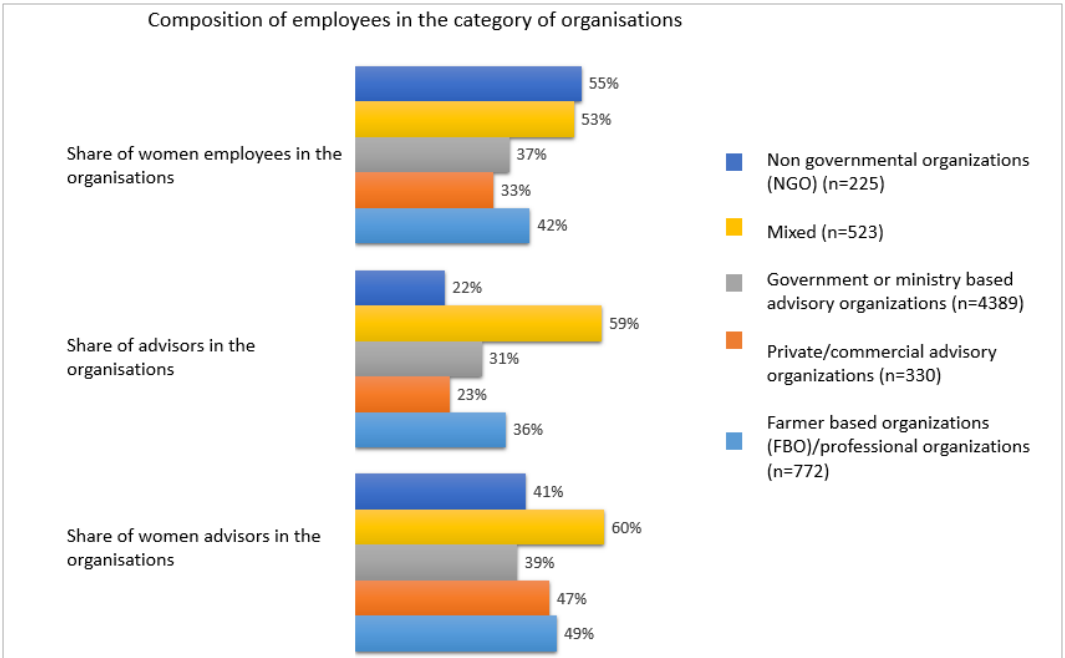

Figure 10 Composition of employees in the category of organisations

Regarding back-office activies, 67% (24 out of 36) specified the presence of an employee dedicated to back-office activities in their organisations. On average, every organisation has up to three employees dedicated to back-office activities.

In terms of education level, the survey distinguished five different ones. After controlling for an outlier that reported 400 engineers in a government

organisation, still, a clear majority of advisors (41%) (197 out of 482) holds an engineering degree (5 years), followed by 35% (169 out of 482) with a bachelors degree (3-4 years) and 14% (69 out of 482) with a masters degree (Figure 11). Vocational certification is reported by 4% (20 out of 482) of the respondents, mainly from FBOs and NGOs, as the highest education level.

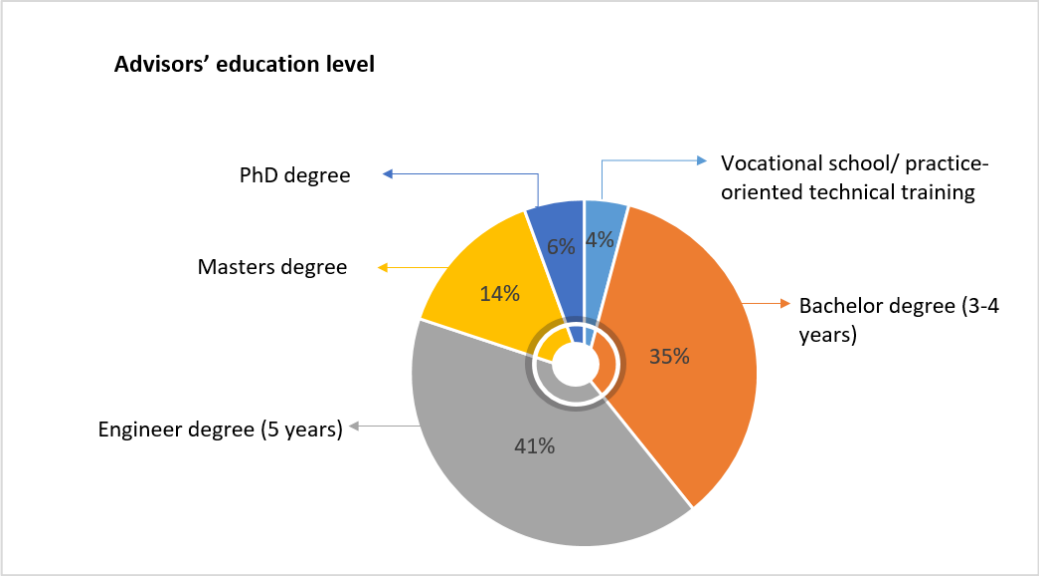

Figure 11: Percent of advisors' education level in all service providers (n=482)

When asked whether additional qualifications (other than education degrees) were required for an individual to serve as an advisor, 56% (20 out of 36) responded yes. The qualifications mentioned include one or two years of training on advisory methodologies (e.g. facilitation, mediation, communication), cross-compliance training, CECRA module certificates, work experiences in advisory service delivery and skills in practical topics such as fruit growing and forestry.

Advisors in 67% (20 out of 36) of the organisations possess advisory certifications in various topics such as cross-compliance, CECRA modules, organic farming, systematic coaching, state certification for consulting approval, ring leader and qualification certification for technical expertise such as plant protection, organic farming and energy advising.

When asked the aggregated years of advisors' professional experience, in the surveyed advisory organisations, 58% (1128 out of 1954) of the advisors have more than ten years of experience, while 30% (582 out of 1954) of the advisors

have 3-10 years of experience, and 12% (244 out of 1954) of the advisors have 0-3 years of professional experience. Similarly, a higher proportion of freelance advisors (85%) (11 out of 13) reported having more than ten years of professional advisory experience. The result indicates a trend in a smaller proportion of young professional advisors joining the sector.

Methods of service provision

According to the survey results, individual face-to-face advice is the most common method used in all 49 organisations. Concerning the relative proportion of use, 66% (32 out of 49) responded to use individual advisory methods in more than 80 percent of the time they provide advice. The three individual advisory methods most frequented are face-to-face advice on the farm/enterprise, advice via telephone and individual advice via digital apps (Figure 12).

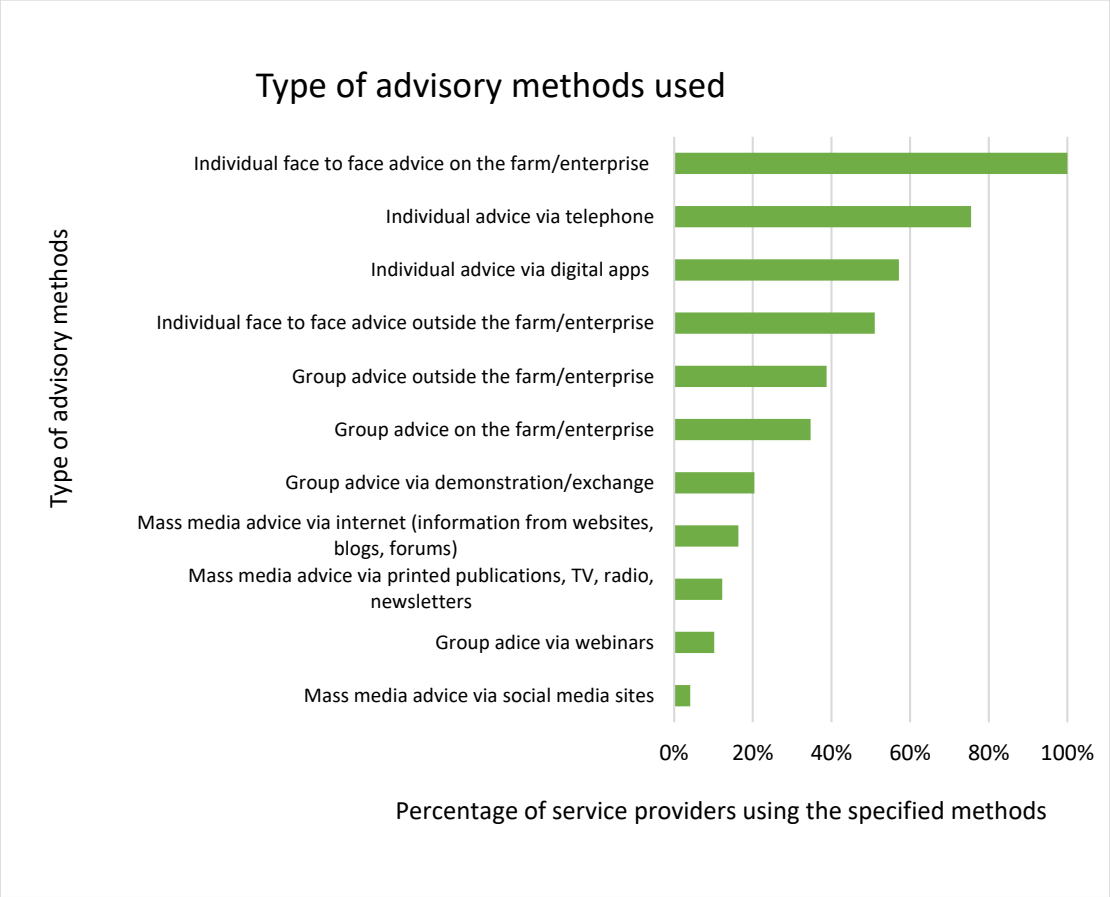

Figure 12: Advisory methods frequented by the advisory organisations (Multiple answers possible)

Changes in the advisory methods used have been reported by 59% (29 out of 49) of the respondents due to the Covid-19 pandemic. According to the respondents, individual face to face advice has been reduced or replaced by telephone or digital advisory methods. Similarly, group advice has been replaced by webinars or video-based consultation and training.

4.4. Clients, topics and content

Conventional advisory service to farmers with small/medium scale farms followed by farmers with large commercial farms appears more pronounced compared to targeted advice to farm workers or new entrants (Figure 13). Some FBOs, government-based advisory organisations, and private advisory organisations reported to also provide advisory services to full-time/part-time forest owners. In contrast, the freelance advisors who participated in the survey served clients exclusively from the agricultural sector.

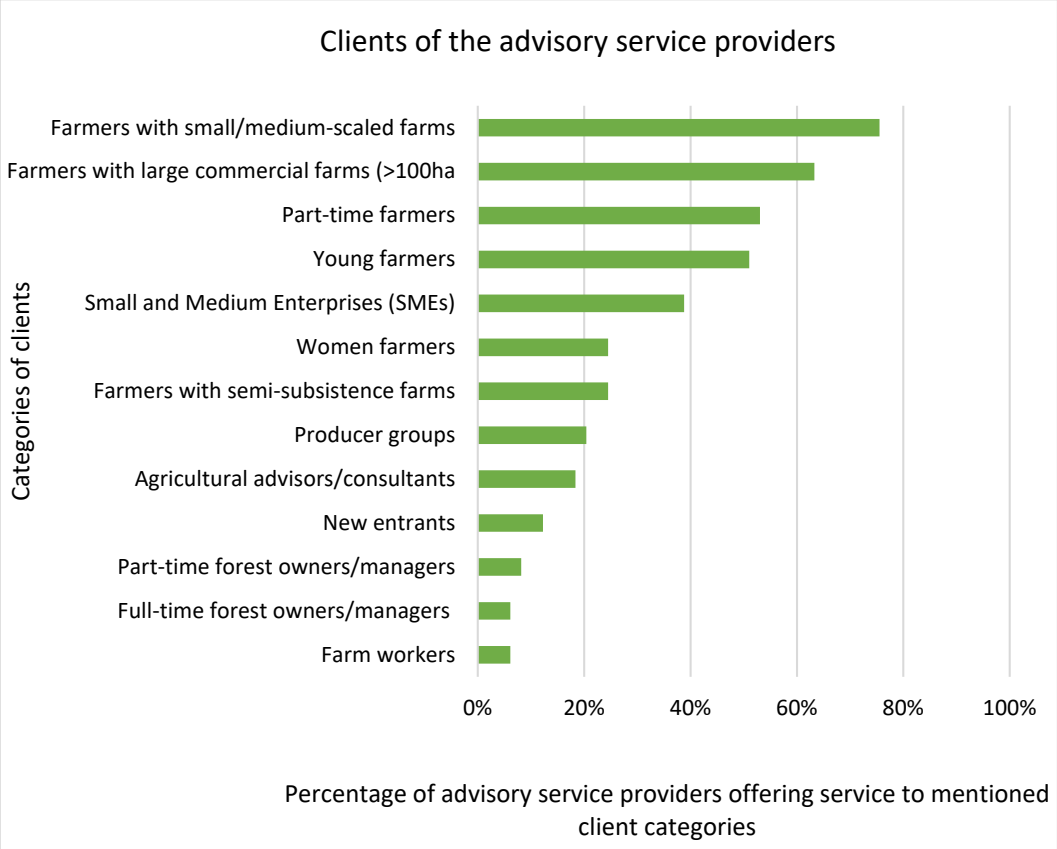

Figure 13: Clients of advisory service providers (Multiple answers possible)

According to the survey results, the public advisory organisations and the mixed organisations have the highest number of clients that contract their advisory service with some as high as 300,000 clients per year. In contrast, private organisations and freelance advisors have relatively fewer contracts with farm enterprises. This trend might be attributed to the organisations' capacity and history in service provision.

Cross-cutting and specific advisory topics

The advisory organisations offer a diversity of advisory topics to their clients. Cross-cutting topics such as entrepreneurship and farm management, support with the grant application and agri-environmental stewardship measures and nature protection are reported as the most frequently offered advisory topics (Figure *14*). Specific entrepreneurship topics offered by the organisations include business administration, organisational development, business start-ups, farm cafes, finance, investment promotion, and income diversification.

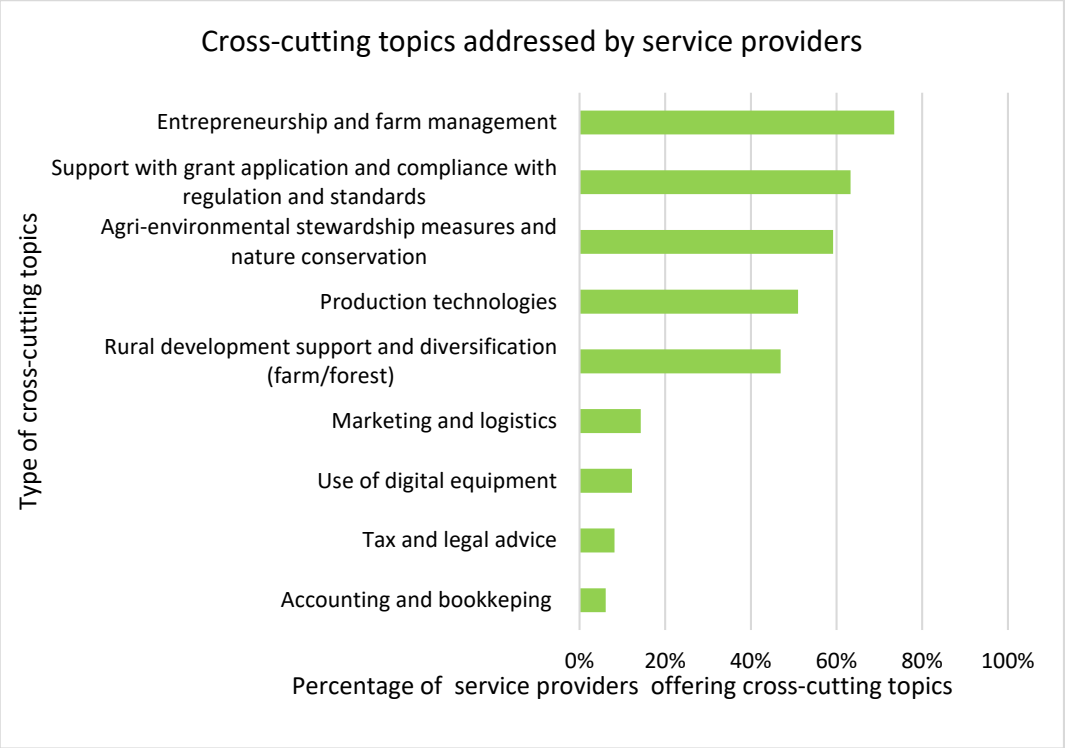

Figure 14: Cross-cutting topics addressed by service providers

Moreover, specific advisory topics such as crop production, livestock production, farm machinery and building constructions are frequently provided by the advisory organisations, predominantly by FBOs, government organisations and private organisations. Non-government organisations mainly focus on cross-cutting topics rather than specific advisory topics. Of the total 49 survey respondents, 41 reported providing advice on specific advisory topics, while eight reported their focus on only cross-cutting advisory topics. Figure 15 shows the relative proportion of specific advisory topics provided by all respondents.

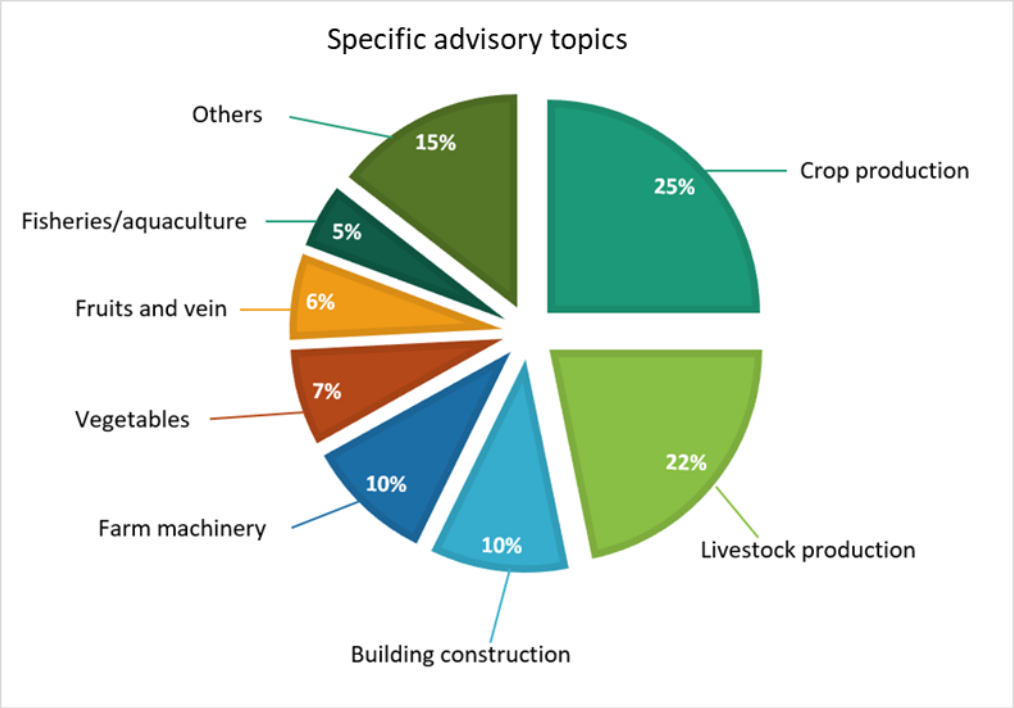

Figure 15:Specific advisory topics offered to clients (Total response n= 124)

Additionally, twelve organisations from 35, reported that they outsource cross-cutting and specific advisory topics. Topics outsourced vary from law and taxes, renewable energies, specific production technologies, marketing and logistics, to funding applications.

4.5. Linkages with other AKIS actors and knowledge flows

Participants were asked to rate the degree of cooperation in advisory service delivery with select types of actors on a scale from 'no', 'weak', 'medium' to

'strong' cooperation. Most participants rated the degree of cooperation with public authorities, FBOs, and private companies as medium or strong (Figure 16). In contrast, the degree of cooperation with universities, NGOs, upstream and downstream industries, EIP-operational groups, and EU-projects were mostly rated as of no or weak cooperation. Here, the no or weak cooperation rating with EIP-operational groups is in contrast to the expert interviews' content. This could be due to the small outreach of EIP-operational groups in Germany, and could have been the case that many of the organisations who took part in the survey were not part of EIP-operational groups. The degree of cooperation with research institutions seems stronger than cooperation with universities, which could be due to the theoretical focus of universities as compared to research institutes.

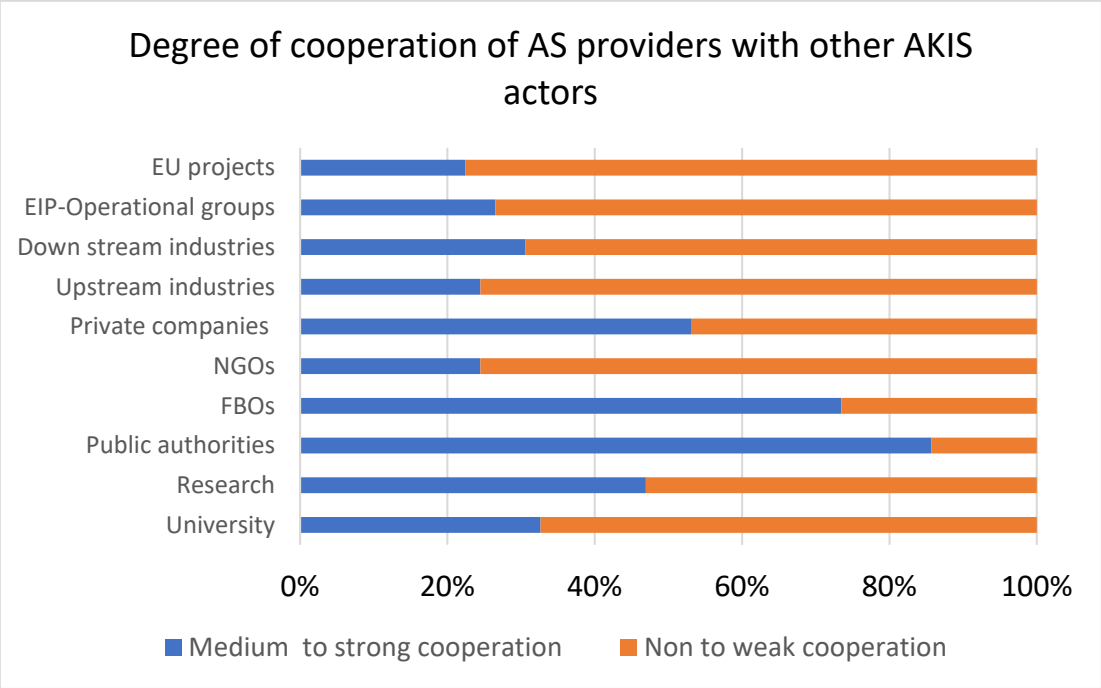

Figure 16: Degree of cooperation of advisory service providers with other AKIS actors

4.6. Programming and planning of advisory work

Concerning staff development plans in the advisory organisations, 51% (18 out of 35) reported having a yearly plan. Many affirmative responses came from government organisations followed by private organisations, mixed organisations and FBOs. For the organisations that claimed to have a staff capacity development

plan, the strategies listed include providing advanced training courses via internal or external seminars, obliging advisors to participate in at least two specialist training per year and organising a young talent promotion program.

When asked if the advisory organisations have a trainer or a training unit responsible for developing staff capacity, only 36% (12 out of 33) responded yes. The remaining 64% (21 out of 36) who did not have own trainers or training units, mentioned that they invite external trainers from other organisations to provide training in necessary topics advisors identify. Also, advisors are encouraged to participate in conferences and meetings organised by external organisations, as reported by some respondents. Regarding how often advisors receive training on advisory knowledge and skill, 79% of the organisations (26 out of 33) are reported to organize training for their advisors for half a day to 5 days every year. Also, 18% (6 out of 33) reported 6 to 10 days of training in a year, while one organisation reportedly organizes an exceptional 30 days of training for its advisors.

Rewarding advisors for good performance and incentivising skills development is practiced by 40% (n=35) of the advisory providers by offering performance-related remuneration either as a salary increase or bonus, giving opportunities to participate in conferences, fairs and training courses by covering costs.

Concerning time allocation for different advisory activities, the survey results show that advisors allocate up to 43% (n=27) of their time for targeted consultancy (Figure 17).

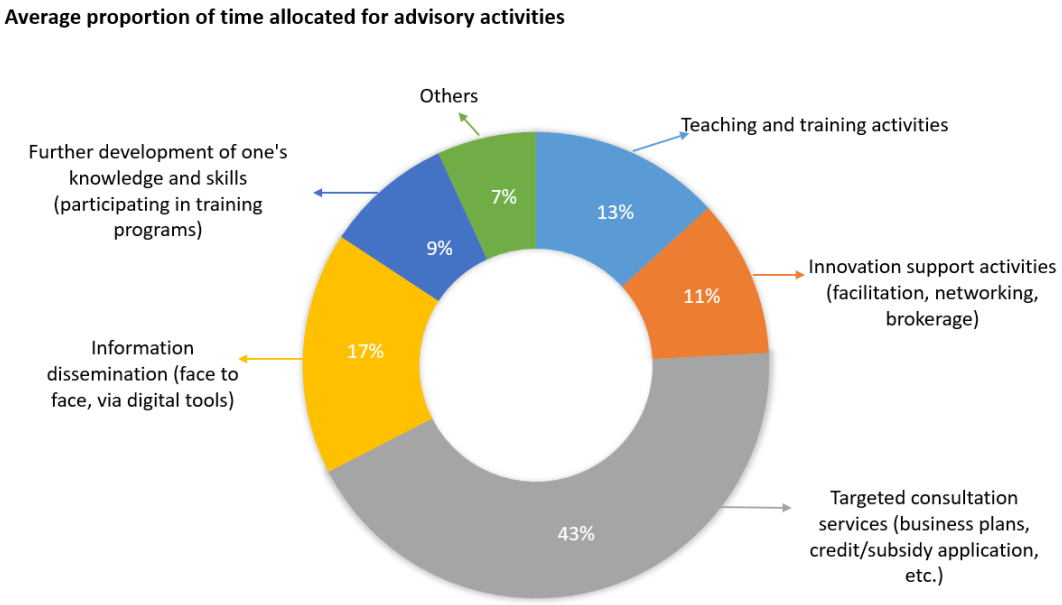

Figure 17: Average proportion of time allocated for various advisory activities

When asked about the technical and methodological knowledge and skills that advisors need in the organisations to meet the new CAP challenges, specific technological knowledge (e.g. farming practices and production technologies) was selected most frequently, followed by ecology and environment protection. Concerning the methodological skills needed, respondents from advisory organisations opted for digital skills and facilitation skills. On the other hand, freelance advisors indicated only the need for digital skills to meet the new CAP challenges. Similarly, the expert interviews results showed that advisors' interest for methodological skills development has increased in the recent years.

4.7. Advisory organisations forming the EU-FAS

Countries in the European Union have a farm advisory system (FAS). The FAS aims at supporting farmers to better understand and meet the EU rules for environment, public and animal health, animal welfare and the good agricultural and environmental condition. When asked of their role in offering advice related to the EU-FAS topics, 79% of the organisations (n=33) reported that they advise farmers to adapt their farms to the cross-compliance requirements by embedding the service with other advisory activities (70%) or separately (9%). The results show that government organisations and FBOs are responsible for the larger proportion of EU-FAS advice (65%).

5. Summary and conclusions

5.1. Summary and conclusions on sections 1 – 3

Germany continues to be one of the leading European countries in agriculture production, specifically in cereals and cattle farming. Nevertheless, the overall contribution of agriculture to the country's GDP and employment is minimal. Furthermore, the trend towards a decrease in the number of farm holdings and an increase in the average farm size per holding continues. Aside from that, the increasing shift towards organic farming in response to consumer's demand shows the market potential for such agricultural produce in the country.

Given the multiplicity of actors in the German AKIS, it can be considered as a strong system, and with manifold contributions from public authorities, research and education, private companies and third sector organisations it represents a pluralistic AKIS. Similarly, the policy framework and multiple coordination structures illustrate well the political focus that the AKIS receives in Germany. The policy framework and the coordination structures at national level facilitate the vertical interplay between the central and federal states. In this respect, the national AKIS can be considered as strong. In contrast, structures for horizontal interplay among the states seem either weak or even missing. Hence, the overall picture is that of parallel work and fragmented cooperation rather than one of integration.

Some multi-level farmer-based organisations and private entrepreneurial associations fulfil a strong linking and integrating function at the national level, which contributes to the maintenance of an overarching AKIS and its vertical connection with other actors at the state and local level. In contrast, the linkage of universities, research, and ministries at the national and state levels with other AKIS actors appears weak. At the state level, actors such as vocational education institutions, chamber of agriculture and public advisory offices play an active role in establishing and maintaining knowledge flows among the AKIS actors. In general, the German AKIS can be regarded as strong but partly fragmented.

Regarding forests and the forest sector, Germany is one of the leading timber producers in Europe. About half of the total forest area is owned by the state while the rest belongs to private foresters. In this report, the FKIS is presented separately from the AKIS as it is considered an independent system. An overlap

with forest owning farmers is evident but has only a small share of the larger heterogeneous forest owners' group. Furthermore, the forestry sector will likely receive more attention in the near future due to the effects of climate change, such as the recurring drought observed in the past few years. This expected increased attention to forestry favours more insights into the shaping and functioning of Germany's forestry knowledge and innovation system.

5.2. Summary and conclusions on section 4

Germany's federal states are responsible for implementing advisory services for agriculture, forestry, and horticulture enterprises. This explains the diversity of advisory service providers and structures among the states. While either the chambers of agriculture or state authorities or private companies are predominant in the respective states, various associations and NGOs offer advisory services at the local, state and national levels throughout the country. In contrast, forest owners have fewer advisory service providers, namely state organisations and forest associations.

The low response rate and the limited geographical coverage of the survey results constrain the interpretation of advisory service provision for the whole of Germany. Nevertheless, the following insights on the topic are thought-provoking and worthwhile:

- From the survey results, it can be observed that the majority of the advisory organisations have mixed funding sources, and that the national or regional public funds dominate. This signals the prominent role that the public sector has for the provision of advisory services.
- One to one advisory services on the farm hold the upper part of advisory methods in contrast to group approaches or mass approaches offered by the advisory providers. This relates to the fact that farm enterprises are increasingly diverse resulting in situation- specific problems. Secondly, one to one advice as a preferred option in the context of the privatisation of advisory services, where farmers pay for specific advice.
- The clients of advisory services range from small to medium and to large scale farmers and no particular target group is recognised per type of service provider. In contrast, targeted services for specific groups such as farmworkers, new entrants, or other advisors are less common among the survey participants.

- In the organisations and among freelancers, most advisors are highly qualified with many years of professional experience and a higher education level supplemented by additional certifications. Thus, the result provides insights into the high-level competency of advisors in the German agriculture sector.
- The survey results show significant differences in the number of contract the advisory providers have. While, thousands of farmers contract the public advisory organisations and FBOs for advisory services in a yearly basis, private organisations, including freelancers have a much lesser amount but larger diversity ranging from five to 500 clients in a year. This situation could easily be attributed to the organisational capacities.
- The strong cooperation of advisory providers with other public advisory organisations, farmer-based organisations, and private companies affirms the important role these actors have in knowledge sharing, service provision, and connecting actors. Naturally, the gap between research and universities with practice is still prevalent; with the exception of strong linkages between applied universities and advisory service providers.
- Additional advisory certifications, particularly related to methodological skills such as those offered in the CECRA courses, tend to receive more attention and are considered necessary to raise the quality of advisory services provided.

6. Methodological reflection, acknowledgement, information sources and gaps

To compile the AKIS in Germany in the context of the i2connect project, we conducted a literature review on German agriculture and forestry, expert interviews with representatives from twelve organisations in the agriculture and forestry sectors and an online survey. The expert interviews gave an overview of the AKIS in Germany at the national level. They were instrumental in identifying AKIS actors and their linkages, the policy framework, funding mechanisms, challenges and knowledge needs. While organisations in the German AKIS are numerous, we selected only a few representative organisations that play an important role in the AKIS. Accordingly, we conducted interviews with representatives from the organisations listed in Table 2. We want to acknowledge all those who participated in the expert interviews and the online survey for sharing their knowledge and experience.

The survey questionnaire was sent to agriculture advisory service providers in each state of Germany via an online platform called EU-Survey. In addition, networks such as IALB were used to distribute the questionnaire to more than 200 independent advisors and 80 advisory organisations. Although the questionnaire was widely distributed, the response rate was relatively low. One reason for the low response rate was technical problems such as firewall and server updates, which challenged respondents to access the questionnaire. The results of the survey do not equally cover all German states. For example, 44% (23 out of 50) of the data came from only two southern states. Moreover, in a few states, no advisory organisations participated in the survey.

While interesting insights can be drawn from the results of the study, there are some limitations worthy of consideration,

- Due to the strict data protection law, the study team had limited access to advisory service providers and freelancers' contact addresses. Therefore, there is no clear overview of the delivery rate versus the response rate
- The report was intended to assess forestry advisory service providers; however, the low response rate on forest advisory provision gives a shallow overview of forest advisory service providers in Germany

- The survey targeted advisory organisations mainly in the five categories; therefore, upstream and downstream industries that offer advice to farm and forest enterprises were not included
- On methodological issues, the questionnaires refer to farmer-based organisations in the broader sense that includes chambers of agriculture, farmers' associations and other interest groups. Therefore, it was challenging to distinguish service provision between these closely related but unique organisations during the data analysis. Moreover, although it was recommended that someone who had a broader overview of the organisations fill in the questionnaire, we have observed that some respondents left out questions that required quantitative figures which might have been due to the fact that the respondents had a little overview about the organisational information requested.

Table 2: Institutional affiliation of expert interviewees

No.	Organisation (German)	Organisation (English)	Date of Interview
1	Bundesanstalt für Landwirtschaft und Ernährung (BLE)	Federal Agency for Agriculture and Food	29.07.2020
2	Bundesministerium für Ernährung und Landwirtschaft (BMEL)	Federal Ministry of Food and Agriculture	03.08.2020
3	EIP- Schleswig Holstein	EIP- Schleswig Holstein	07.08.2020
4	Verband der Landwirtschaftskammern (VLK)	Association of Agricultural Chambers	11.08.2020
5	Hochschule für nachhaltige Entwicklung Eberswalde	Eberswalde University of Sustainable development	13.08.2020
6	Deutsche Agrarforschungsallianz (DAFA)	German Agricultural Research Alliance	18.08.2020
7	Deutscher Bauernverband	German Farmers' Association (representative for vocational training	26.08.2020
8	Deutscher Bauernverband	German Farmers' Association	28.08.2020
9	Bund Ökologische Lebensmittelwirtschaft (BÖLW)	The association of agricultural producers, processors and retailers of organic foods in Germany	September 2020
10	LMS Agrarberatung GmbH	LMS agriculture consulting company	September 2020
11	BLE- B&B agrar	BLE- B&B agrar	09.09.2020
12	Waldbauernschule Kelheim, Goldberg (WBS)	Bavarian Forestry School	September 2020
13	Bayerischen Forstschule und Technikerschule für Waldwirtschaft Lohr am Main	Forestry and technical school for forest management	September 2020
14	Bayerischen Landesanstalt für Wald und Forstwirtschaft (LWF) in Freising	The Bavarian State Institute for Forests and Forestry	September 2020

References

BMEL (2014). *The Forests in Germany: Selected Results of the Third National Forest Inventory*. Retrieved from http://www.bmel.de/SharedDocs/Downloads/EN/Publications/ForestsInGermany-BWI.pdf?__blob=publicationFile (accessed on 09.10.2020)

BMEL (2019a). *Agricultural Policy Report of the Federal Government*. Retrieved from https://www.bmel.de/SharedDocs/Downloads/DE/Broschueren/Agrarbericht2019.pdf?__blob=publicationFile&v=4

BMEL (2019b). Understanding Farming in Germany: Facts and figures about German farming. Retrieved from https://www.bmel.de/SharedDocs/Downloads/EN/Publications/UnderstandingFarming.pdf;jsessionid=232358C6E188E92C528EADB150A29F2F.internet2831?__blob=publicationFile&v=5

BMEL (2020a). The BMEL's research institutions. Retrieved from https://www.bmel.de/EN/ministry/research/research-institutions.html

BMEL (2020b). Joint Task for the "Improvement of Agricultural Structures and Coastal Protection". Retrieved from https://www.bmel.de/EN/topics/rural-regions/rural-development-support/gak.html

BMEL (2020c). Statistik über die praktische Berufsbildung in der Landwirtschaft der Bundesrepublik Deutschland.

DLG (2020). DLG. Retrieved from https://www.dlg.org/en/

DLV (2020). DLV. Retrieved from https://www.landfrauen.info/verband

DRV (2020). DRV. Retrieved from https://www.raiffeisen.de/deutscher-raiffeisenverband-ev

EUFRAS (2015). *Cooperation and Usage agreement.*

EUROSTAT (2019). *Agriculture, forestry and fishery statistics: 2019 edition.*

EUROSTAT (2020a). Agricultural labour input statistics: absolute figures (1000 annual work units) [aact_ali01]. Retrieved from https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=aact_ali01&lang=en

EUROSTAT (2020b). Farm indicators by agricultural area, type of farm, standard output, legal form and NUTS 2 regions[ef_m_farmleg]. Retrieved from https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ef_m_farmleg&lang=en

EUROSTAT (2020c). Main livestock indicators by NUTs 2 regions -[ef_lsk_main]. Retrieved from https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ef_lsk_main&lang=en

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

FISA (2020). Retrieved from https://fisaonline.de/en/

Hoffmann, V., Lamers, J., & Kidd, A. D. (2000). *Reforming the organisation of agricultural extension in Germany: Lessons for other countries* - (AGREN Network paper No. 98). Retrieved from Overseas Development Institute website: https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/5128.pdf

IALB (2012). IALB Position Paper on the Implementation of the EU EAFRD Regulation and Horizontal Regulation 2014-20. Retrieved from https://www.ialb.org/files/Dokumente/Vernetzung/Position_Paper_IALB_EAFRD-Implementation_2014-2020_Final-EN.pdf

Knierim, A., Thomas, A., & Schmitt, S. (2017a). B&B Agrar 4-2017 Schwerpunktthema: Agrarkommunikation.

Knierim, A., Thomas, A., & Schmitt, S. (2017b). Beratungsangebote in den Bundesländern,.

Paul, C., Knuth, U., Knierim, A., Ndah, H., & and M. Klein (2014). *AKIS and advisory services in Germany: Report for the AKIS inventory (WP3) of the PRO AKIS project*. Retrieved from https://430a.uni-hohenheim.de/fileadmin/einrichtungen/430a/PRO_AKIS/Country_Reports/Country_Report_Germany_14_04_14.pdf

Statistisches Bundesamt (2019). *Statistisches Jahrbuch 2019: Kapitel 19 Land-und Forstwirtschaft*. Retrieved from https://www.destatis.de/DE/Themen/Querschnitt/Jahrbuch/jb-land-forstwirtschaft.pdf?__blob=publicationFile

Statistisches Bundesamt (2020a). Agricultural holdings and utilised agricultural area by size of the utilised agricultural area. Retrieved from https://www.destatis.de/EN/Themes/Economic-Sectors-Enterprises/Agriculture-Forestry-Fisheries/Agricultural-Holdings/Tables/agricultural-holdings-and-utilised-agricultural-areaby-size-of-the-utilised-agricultural-area.html

Statistisches Bundesamt (2020b). Agriculture and forestry, fisheries- Animals and animal production. Retrieved from https://www.destatis.de/EN/Themes/Economic-Sectors-Enterprises/Agriculture-Forestry-Fisheries/Animals-Animal-Production/_node.html

Statistisches Bundesamt (2020c). Field crops and grassland Harvest volume of selected crops in a time comparison. Retrieved from https://www.destatis.de/EN/Themes/Economic-Sectors-Enterprises/Agriculture-Forestry-Fisheries/Field-Crops-Grassland/Tables/3-harvest-volume-of-selected-crops-in-a-time-comparison.html?view=main[Print]

Statistisches Bundesamt (2020d). Fruit, vegetables, horticulture: Areas and quantities harvested (production for the market). Retrieved from https://www.destatis.de/EN/Themes/Economic-Sectors-Enterprises/Agriculture-Forestry-Fisheries/Fruit-Vegetables-Horticulture/_node.html

Statistisches Bundesamt (2020e). Land use: Floor area total according to types of use in Germany. Retrieved from https://www.destatis.de/EN/Themes/Economic-Sectors-Enterprises/Agriculture-Forestry-Fisheries/Land-Use/Tables/areas-new.html?view=main[Print]

Statistisches Bundesamt (2020f). National accounts, domestic product: Gross domestic product. Retrieved from https://www.destatis.de/EN/Themes/Economy/National-Accounts-Domestic-Product/Tables/gdp-bubbles.html

VDL (2020). Retrieved from https://www.agrarstudieren.de/universitaeten/