AKIS and advisory services in Sweden

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INTERACTIVE INNOVATION

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Abbreviations

AKIS	Agricultural Knowledge and Innovation Systems
CAP	Common Agricultural Policy
CAP-network	The Swedish national CAP-network
EU	The European Union
GDP	Gross Domestic Product
LRF	The Federation of Swedish Farmers, Lantbrukarnas Riksförbund
OECD	The Organisation for Economic Co-operation and Development
SBA	The Swedish Board of Agriculture, Jordbruksverket
SGO	Swedish Government Offices
SLU	The Swedish University of Agricultural Science

Executive summary

The aim of this report is to provide an update of the AKIS report for Sweden, describing the national AKIS and advisory organisations. The methods followed the guidelines provided by the i2connect project, a review of existing literature and documentation. The forestry sector is not included in this report, as it is a large industry sector with its own extensive knowledge and innovation system.

The findings illustrate that the main structural characteristic of Swedish agriculture is the regional differences in the natural and climate conditions for primary production. The main production area is located in southern and central Sweden, with cereals, dairy, beef and horticulture as important subsectors. The major characteristic of Sweden's AKIS is a diversified and fragmented system; many actors acknowledge the need to strengthen the link between basic research, applied research, advisory services, farmers, argi-food firms and rural entrepreneurs. The regional differences make policy coordination vital between authorities and in the innovation support system, as well as between national, regional and local level policies and efforts.

What is distinctive about Sweden's agricultural advisory system, in a European context, is that it rests greatly on market actors. The low density and long distances in rural areas poses challenges for the advisory system. Advisory services aimed at environment and climate issues are largely funded with public funds, while production and business advice generally take place on market terms.

Based on the AKIS and advisory system described in this report, the question of whether the CAP strategic plan and the current national policy interventions are sufficient to adequately address the perceived deficiencies is relevant. As the linear view of innovation still partly prevails, new approaches are needed which foster system views and cooperation, and sets the needs of the target groups at the centre.

1. The main structural characteristics of the agricultural sector in Sweden

The total population in Sweden is approximately 10.5 million people as of April of 2024 (Statistics Sweden, 2024a). The GDP per capita was 559,000 SEK in 2022 (Statistics Sweden, 2024b), which, according to current exchange rates, equals approximately €50,000. The agricultural sector comprises 1.1 percent of the total GDP (World Bank, 2016). Around 2 percent of the economically active population in Sweden is involved in agriculture, although this is steadily decreasing. The average age of farmers in Sweden is high; 74 percent of the farmers are older than 50 years. 1.86 percent of the total work force is occupied within primary agriculture, forestry and fishing, with around 1.07 percent of those working in agriculture (SBA, 2020).

The total land area of Sweden is 41 million hectares. In 2023, the total area of agricultural land (arable land and pastures) was less than 3 million hectares, corresponding to 7 percent of the total land area (see figure 1) (Statistics Sweden, 2024c). The forestry sector is not included in this report, as it is a large industry sector with its own extensive knowledge and innovation system. With forests covering 68 percent of the land (figure 1), Sweden is one of the most heavily forested countries in Europe.

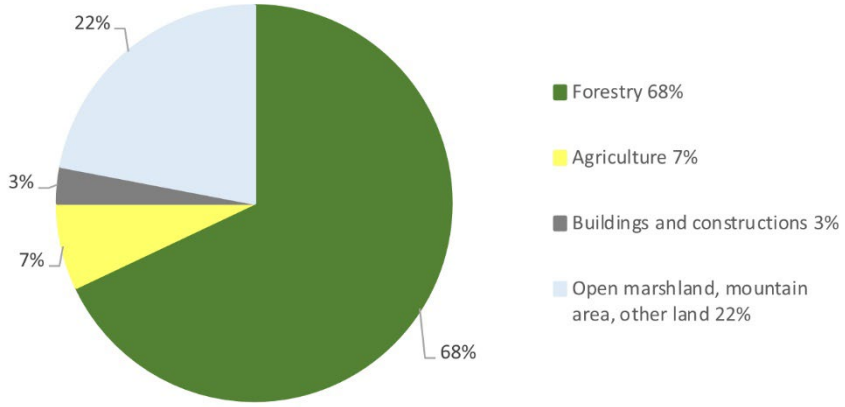
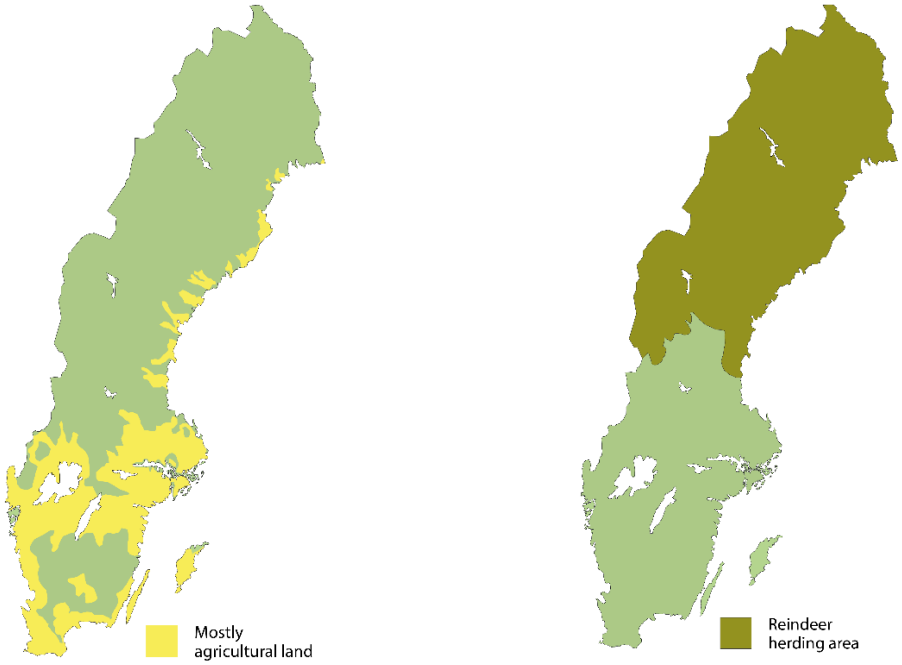


Figure 1. Land use in Sweden in 2020 (Statistics Sweden, 2024c).

The agricultural land is unevenly distributed, and the regional differences are large due to geographic and climate conditions. In the southern county of Skåne, almost half of the land is agricultural land, while in the northern county of Norrbotten, only 0.4 percent is agricultural land (see figure 2a). On the other hand, northern counties have a large area for reindeer herding (see figure 2b). Hence, the regional

differences in the conditions for primary production are a major characteristic of Sweden.



Figures 2a - 2b. Country maps highlighting: a) agricultural land and b) area of reindeer herding. Graphics: Anni Hoffrén, SLU.

Reindeer herding is reserved for the Sámi people based on ancient traditions, according to the Swedish constitution. All reindeer herding is based on free natural grazing, as reindeer are migratory animals. Reindeer grazing rights prevail on approximately half of Sweden's land area (see figure 2b). There are roughly 5,000 reindeer owners, of which around 1,000 are professional reindeer herders.

Since 1983, the arable land has decreased from 2.94 million hectares to 2.53 million hectares in 2023 (see figure 3) (SBA, 2024a). The total pasture, included in the arable land, has decreased from 0.49 million hectares in 2003 (no older data was found) to 0.45 million hectares in 2023. The area organic production reached a high in 2019 at 20.4%, but has fallen back to 18.4% in 2023 (SBA, 2024b).

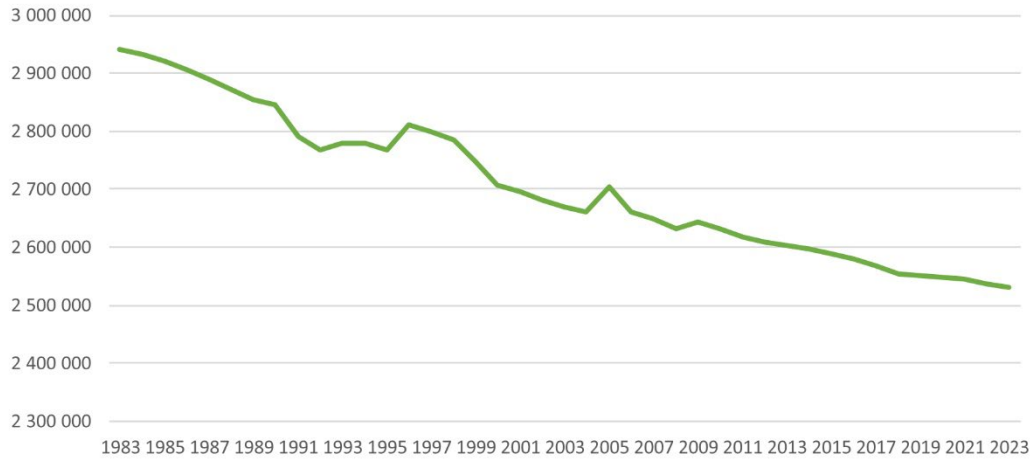


Figure 3. The development of arable land in Sweden 1983 - 2023 in hectares (SBA, 2024a).

The number of agricultural holdings has decreased from around 72,000 in 2007 to around 56,000 in 2023. In the same period, the average arable land per holding has increased from 36 to 45 hectares (see figure 4) (SBA 2024c).

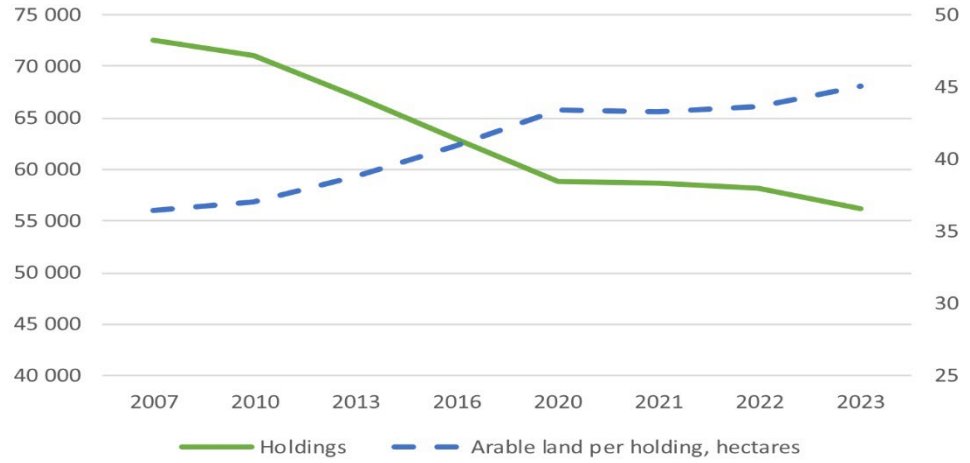


Figure 4. The development of the number of holdings and amount of arable land in hectares per holding from 2007 to 2023 (SBA, 2024c).

The distribution of the agricultural holdings in relation to farm size, as measured in hectares, shows that small farms with up to 10 hectares comprise almost half of all agricultural holdings (see figure 5) (SBA, 2023a).

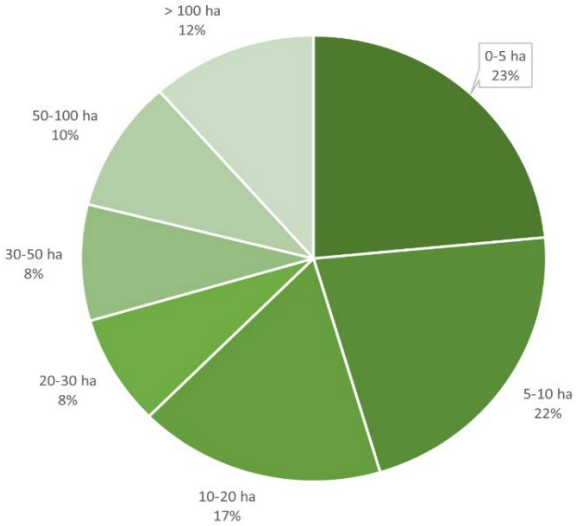


Figure 5. The distribution of the number of holdings in relation to farm size in hectares of arable land (SBA, 2023a).

The total production value of Swedish agriculture at the farm gate was 78.7 billion SEK (LRF, 2024), which, according to current exchange rates, would equal approximately €7 billion. The distribution between various subsectors is presented in figure 5, with cereals, dairy and horticulture as the top subsectors. Fisheries were not included in the data set.

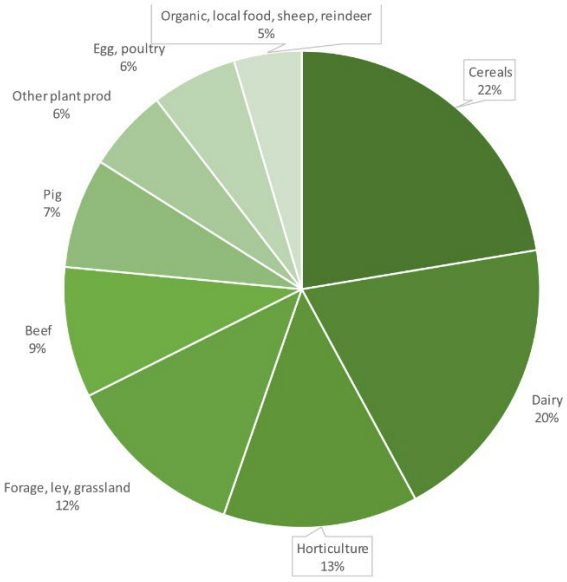


Figure 6. The production value of agricultural subsectors in 2022 (LRF, 2024; Sámi Parliament, pers. comm. 2024).

2. Characteristics of AKIS

The agricultural sector has changed greatly in Sweden since the beginning of the 1990s. Since joining the EU in 1995, Swedish agriculture has been exposed to increased competition on the international market, and increased competitiveness has therefore become a beacon. Farmers have expressed criticism of the system due to the hard-pressed market competition, while at the same time, strict regulations for Swedish production make it difficult to compete on the world market (Hajdu et al., 2020; OECD, 2018).

This was one of the reasons behind the new Swedish Food Strategy, adopted by the government in 2017 (SGO, 2017). The strategy's key areas are "Regulations and Conditions", "Consumer and Market", and "Knowledge and Innovation". OECD (2018) reported that while existing agricultural technology and production methods are performing well internationally in terms of sustainability, the ability to innovate in the primary production and the food industry is weaker than in other Swedish business sectors. Therefore, the need to invest in a well-functioning knowledge and innovation system has received increased focus in Sweden in recent years.

2.1. AKIS description

As noted in section 1, the regional differences in the natural conditions for primary production are a major characteristic of Sweden. This makes the coordination of various policies for rural development vital, as well as creating a need for coordination between national, regional and local level policies and efforts. However, the Swedish tradition of independent authorities with their own areas of responsibility and scope poses a challenge for coordination and cooperation (OECD, 2018).

Several analyses indicate that Sweden's AKIS is diversified and fragmented and that there is a lack of cooperation between the various actors in the knowledge and innovation system (cf. OECD, 2018; SBA, 2021; Johansson and Gidlund 2021; Blix Germundsson, 2021). Research is not well connected with the needs of the agriculture and food sector (OECD 2018). Many actors acknowledge the need to strengthen the link between basic research, applied research and advisory services (OECD 2018).

In an analysis of the Swedish food innovation system, Johansson and Gidlund (2021) identified deficiencies at several levels. At the firm level, weak profitability and low levels of education inhibit the firms' innovative capacity. At the level of

the knowledge infrastructure, relatively little research funding was directed specifically towards the food sector, and the bridges between research and industry were insufficient to create research-based innovation. The innovation support system was not always perceived as relevant by the firms in the food value chain. There was a lack of long-term planning and coordination, and the innovation support efforts were often directed at early stages of the innovation process and did not meet the firms' needs for support for scale-up and market entry (Johansson and Gidlund, 2021).

What is distinctive about Sweden's agricultural advisory system, in a European context, is that it rests to a large extent on market actors and has weak resources for applied research in primary production and rural development. Moreover, the low density and long distances in rural areas pose challenges for the advisory system (OECD 2018). The fact that the applied research is less prioritized leads to weaknesses in the knowledge and innovation system when it comes to making knowledge available, providing further training for advisors, making connections between research and practice, and producing new applied knowledge (SBA, 2021).

2.2. AKIS actors and linkages

In 2015, Brändström reported a still prevailing view in the agricultural sector that innovation occurs according to a linear model – from basic research, to applied research, to demonstration and product development. Furthermore, the author stated that practice and research diverge, with understanding of each other's situation and respect for each other's knowledge decreasing. Brändström (2015) was also concerned that the policy gap with the rest of society was increasing; thus, the agricultural sector risks not being addressed in an integrated manner with the rest of society, but rather being alienated. Moreover, the report stated that crucial knowledge areas such as organisation and management were lost in the shadow of technology and natural science. However, Brändström also noted a widespread awareness that the innovation system must be developed and a sense of urgency around this.

The work to strengthen AKIS has begun and will continue during the current period of the CAP Strategic Plan. The Ministry of Rural Affairs and Infrastructure distributes budget funds, directs authorities, monitors programs and evaluates policy. The Swedish Board of Agriculture (Jordbruksverket) is the managing authority for the CAP Strategic Plan. This national authority has a central role in providing training for advisors and supporting the provision of knowledge within mainly agricultural environmental issues and, in other areas such as animal welfare, it provides support with work-environment and broader competitiveness

issues. The role of the AKIS Coordination Body is carried out in cooperation with the Swedish national Network for the Common Agricultural Policy (from here on the CAP-network, see further in section 2.4).

Vinnova is Sweden's innovation authority. Since 2023, Vinnova has been developing a new and long-term effort to meet the system and policy challenges that hinder innovation and change in the food area. The new effort "A new recipe for the food system" aims to contribute to the work of key actors working together to build capacity and conditions for innovation and sustainability in the Swedish food chain.

Formas is a government research council for sustainable development. In 2017, a ten-year national food research program was started, with the aim of contributing to increased productivity and innovation in the food chain as well as supporting the sustainable production and consumption of food. The program aims to support the transition to a robust and competitive food system and is run within the framework of Sweden's national food strategy.

The Swedish Farmers' Foundation for Agricultural Research (Stiftelsen Lantbruksforskning) funds research and development aimed to strengthen the agricultural sector's competitiveness. The foundation is funded by the agricultural industry through voluntary levies and government funds.

The Swedish Agency for Economic and Regional Growth (Tillväxtverket) is a national authority responsible for coordinating work with the national food strategy, where measures for a sustainable increase in production are the focus. The agency is also tasked with strengthening the implementation of rural policy and working towards coordinated rural action by state authorities. This is much needed, as there has been a critique of incoherence in rural policies, a lack of adaptation of national policies to the diversity of rural areas, and a lack of coordination of regional and national policies and investments (OECD, 2018). As a response to this critique, the government has recently announced a new inquiry into coherence in regional development policy and rural policy (SGO, 2024). Regional and municipality employed rural developers and private advisory services are important parts of the AKIS for rural development.

The Sámi Parliament (Sametinget) is both an elected body and a state authority. The task of the Sámi Parliament is primarily to monitor issues relating to Sámi culture and language in Sweden. The parliament is one of the main actors in reindeer herding, largely taking place in north Sweden (see figure 2b). Reindeer herding has undergone major technological development in recent times, mainly regarding transport and communication. Today, old and new technologies are

used side by side, partly due to the high costs of the new technology and partly due to insufficient communication infrastructure, such as the low quality or absence of internet coverage (OECD, 2018).

Furthermore, the country is divided in 21 County Administrative Boards (Länsstyrelser) and 290 municipalities. There is ambition to increase the integration of the agri-food sector into the wider national and regional innovation systems to contribute to synergies and new networks (SGO, 2023). Here, the regional County Administrative Boards and the Sámi Parliament play a pivotal role. In addition, the Swedish University of Agricultural Sciences (SLU) has a mission to improve coordination and collaboration between actors within Swedish research on rural development and regional development.

At the regional level, 19 "Green Clusters" (i.e., regional competence centres) have been developed where advisory services, education actors and development firms may gather. Such regional clusters can support the development of rural innovation and can be linked to higher education institutions or linked to incubators for regional development (Landsbygdsnätverket, 2024). The around 70 agricultural vocational colleges can function as local and regional knowledge platforms for farmers, advisors and other actors (Nordlund and Norrby, 2021). In addition, there is a national Resource Centre for Artisan Foods (Eldrimner), which provides vital support through its work with local and artisan food production.

The expert interviews conducted by Nordlund and Norrby (2021) showed that the traditional hierarchical system of knowledge development and flow, with research as the sole knowledge producer transferred by extension and adopted by farmers, was no longer relevant. Instead, knowledge was seen as being created in many different ways and acquired through many different sources, making the AKIS system more complex than before. However, there were still gaps in the system, such as those between researchers and farmers, and between researchers and advisors.

In a study of policies and interventions for agricultural and rural entrepreneurship, Cederholm Björklund (2020) found that the support system was overly complex. The large number of variegated organisations involved all had their embedded and institutionalised structures, approaches and actions. The author found that while all actors subscribed to the goal of contributing to the positive and sustainable development of agriculture and rural areas, there was a lack of strategic management and communication between the actors. In order for the support system to be perceived as helpful by farmers and rural entrepreneurs, there was a need for functioning cooperation between the support actors, with the aim of delivering for the needs of their target groups (Cederholm Björklund 2020).

See figure 7 for an update of the Swedish actors and linkages.

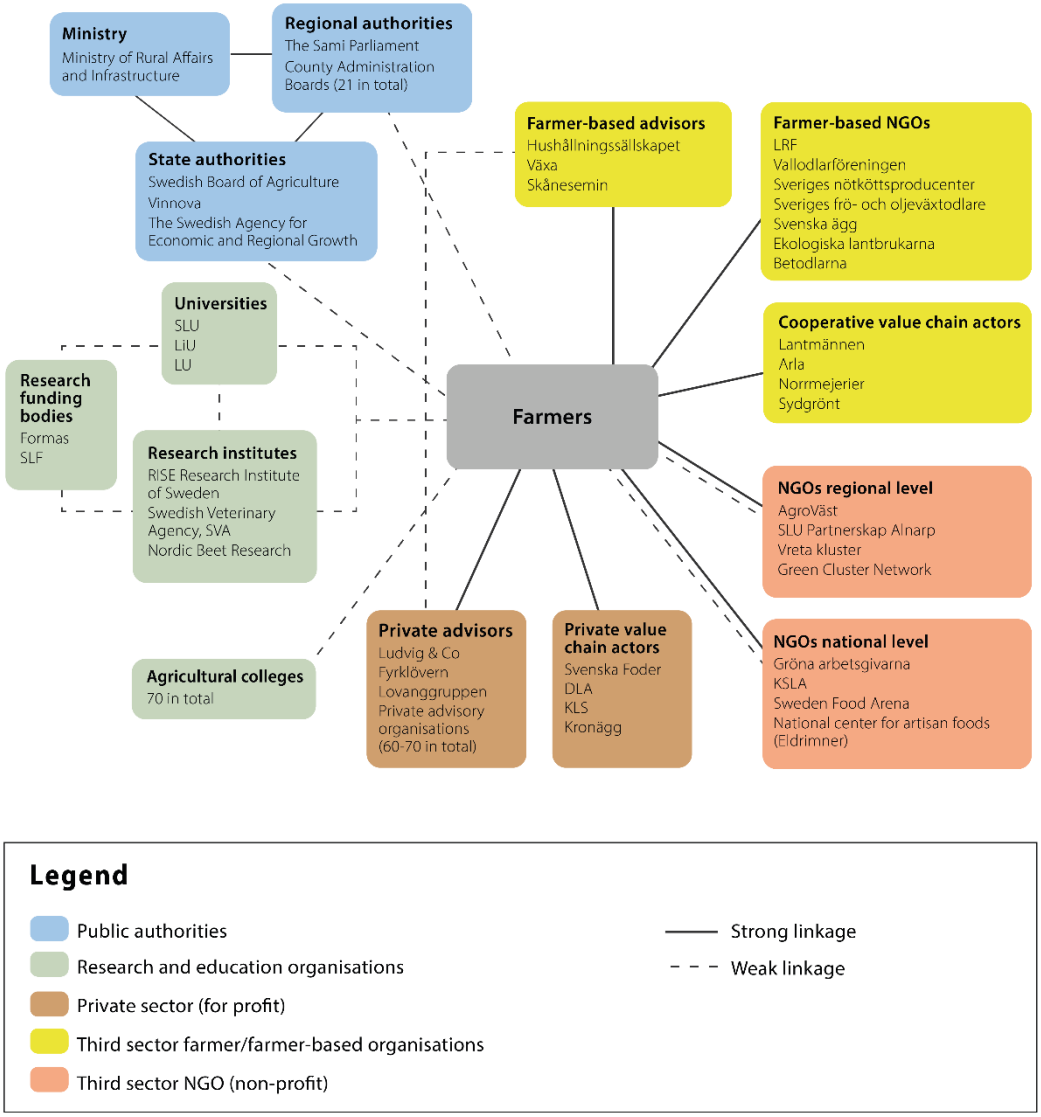


Figure 7. An AKIS diagram of Sweden, following the guidelines from the i2connect project. The figure does not display an exhaustive list of actors for reasons of space, and all linkages are not shown for visibility reasons. Graphics: Anni Hoffrén, SLU.

2.3 AKIS supporting policy frameworks

The policy interventions that mostly contribute to the cross-cutting goal within the CAP strategic plan and strengthen Sweden's AKIS are the following (SGO, 2023):

1) Support for knowledge exchange and dissemination of information (kompetensutveckling) (article 78).
   Total budget in CAP Strategic Plan 2023-2027: €114,703,352

2) Support for cooperation (article 77).
   Total budget in CAP Strategic Plan 2023-2028: €84,388,127

3) Support for cooperation, specifically EIP-Agri (article 77).
   Total budget in CAP Strategic Plan 2023-2028: €56,437,919

In addition, the Swedish national CAP-network plays an important role in meeting the need for a strengthened knowledge and innovation system. The three policy interventions are further detailed below.

1) Support for knowledge exchange and dissemination of information (article 78).

The aim is to increase the skills of those active in rural areas, thereby increasing efficiency and improving the achievement of goals for other measures in the strategic plan, as well as to contribute to the fulfilment of national goals and EU common goals, directives and regulations. The target groups are advisors and firms in the sectors of agriculture, horticulture (including aquaponics), reindeer herding, tourism and local food, and equine firms. The activities can inspire the use of new technology and new methods based on research and trials, and the exchange of experience, as well as returning knowledge needs to research actors (SGO, 2023).

In the new CAP Strategic Plan, condition-creating activities are highlighted. This involves the compilation and making available of knowledge and the continuation of the training/education of advisors and farmers, which can take place in groups, individually or through activities such as information, demonstrations and seminars. As a general rule, the results of the activities should be easily accessible and freely available digitally for everyone. The measure has three overarching areas with the aim of reducing administration and increasing flexibility in the design of competence development initiatives:

1) Strengthened competitiveness and improved animal welfare.
2) Environment and Climate, including:

- The Focus on Nutrients program (Greppa Näringen)
- Organic production
- Biodiversity in the agricultural landscape
- Plant Protection Centres (Växtskyddscentralerna, national funds)
- Basic conditions (Grundvillkor, national funds)

3) Local food and rural tourism.

2) Support for cooperation (article 77)

The purpose of this intervention is to support cooperation in areas where there is major societal benefit to collaboration, but where the incentive for an individual actor is too small to be able to fund development work. Rural areas cannot offer the same supportive conditions to people and firms as is possible in more densely populated areas. In combination with longer distances between actors, support for collaborations therefore becomes necessary (SGO, 2023).

The support for cooperation is divided into the same three overarching areas:

1. Strengthened competitiveness and improved animal welfare.
2. Environment and climate.
3. Local food and rural tourism.

This measure can be used to support practical trials, tests and evaluations, and to stimulate increased collaboration on development issues in agriculture and rural development. The measure fills a gap between the knowledge development that is funded via research grants and the knowledge development funded by firms themselves. The measure can also be used to support development and innovation projects that have a lower degree of innovation than projects which fit within EIP-Agri.

3) Support for cooperation (article 77), specifically EIP-Agri

The aim of EIP-Agri is to bring about new innovative solutions to common challenges in various fields in agriculture, horticulture and reindeer herding by creating better connections between research results, new technology and practice. The aim is also for transnational cooperation to promote the exchange of knowledge, results, and methods between groups who run similar projects in different countries (SGO, 2023).

There are two types of support: for the formation of operational groups, and for innovation projects. By forming operational groups around a potential innovation, innovations can be systematically identified, developed and spread. The work must take place in the form of collaboration between, for example, researchers, advisors and entrepreneurs within and outside the agricultural sector. All projects

must be of a clear pilot nature and/or a method-developing nature. When selecting projects, the relevance and survival of the project results after the end of the project are of particular importance.

2.4 AKIS coordination mechanisms

The AKIS Coordination Body and the CAP-Network
The AKIS Coordination Body is regarded in terms of a 'function' as it is carried out through collaboration between the Swedish Board of Agriculture and the Swedish CAP-Network (SBA, 2023b). The Swedish Board of Agriculture is responsible for, for example, being the contact point for all AKIS related issues for the European Commission, monitoring and evaluation related to the CAP indicators, and making calls for proposals, services and activities within the AKIS related interventions. The Swedish CAP network is responsible for, for example, organising and developing thematic analysis groups relating to AKIS, arranging activities which serve as a forum for knowledge exchange and collaboration, employing an innovation coach whose role is to support the network's activities and work with outreach activities, promoting knowledge exchange and innovation, and contributing to increased collaboration and dissemination of knowledge and innovations.

The AKIS Coordination Body works in cooperation with other authorities and other actors. For example, it cooperates with advisory organisations, and with the regional County Administrative Boards regarding the support for knowledge exchange and the dissemination of information. It also works to identify the needs of the industry, carrying out needs analyses and drawing conclusions from these. This is due to the belief that AKIS coordination should be largely needs-driven with the aim of coordinating joint activities, efforts and knowledge development. AKIS coordination should be continuously evaluated and developed going forward.

The CAP-Network aims to openly and broadly bring together actors with significance for the AKIS in agriculture, horticulture, reindeer herding and rural development, creating a network of civil society organisations, business organisations, advisors, researchers and authorities. For example, the CAP-network provides activities to strengthen the cooperation between the regional "Green Clusters" and coordinates two Communities of Practice, the latter bringing together around 30 people who analyse challenges and opportunities for the development of the AKIS. The CAP-network hosts an innovation support service for potential EIP-Agri applicants. It also hosts the "Skills council" (Kompetensrådet), which promotes the training of work-force skills to match the labour needs of rural firms. In addition, the network works with webinars and podcasts to disseminate results from completed projects.

Other coordination facilities

Four new knowledge centres are established as part of the new CAP period for improved cooperation, compilation and knowledge availability. Their focus areas are:

1) Animal production
2) Environment and climate
3) Business management and entrepreneurship
4) Digitalisation.

The four centres have each been preceded by extensive analyses to clarify detailed needs and propose aims, structures, funding and work processes for each centre. While the first two centres are funded by national funds and the CAP, the two latter centres are entirely CAP-funded and are considered as pilot projects; thus, they will initially be run for approximately two years before being evaluated. They are all organised differently, due to the needs and conditions in each specific case. However, their aims are similar; they all aim to act as impartial knowledge centres to reduce distance between research and practice by stimulating cooperation and development work within their respective subject areas. Hence, they are tasked with the compilation and dissemination of knowledge, strengthening of collaboration and knowledge exchange between stakeholders, initiating systemic inventories on the needs of agriculture regarding research and knowledge transfer, initiating tests and evaluations, and improving the integration of advisors within the AKIS.

The 19 “Green Clusters” at the regional level, while having various backgrounds, are organised to facilitate the integration of the agri-food sector into the wider regional and national innovation systems. The clusters work in various ways depending on regional needs and conditions. Some of them are linked to higher education institutions, and some work as business incubators to promote the development of innovation in rural areas. For example, AgroVäst started in 1992 with the aim of contributing to a more sustainable and profitable agriculture in west Sweden by initiating activities and generating project funding. Similarly, AgroÖst started in 2006 with the aim to encourage local and regional authorities, education and research actors, and other regional actors to invest in the agricultural sector in east Sweden.

While the CAP-network currently hosts a project which aims to strengthen the 19 Green Clusters through an experience exchange, there are considerable challenges in forming a comprehensive innovation support system throughout the country. Lund et al. (2021) studied the innovation support system for the food value chain and found that the system did not reach firms throughout the whole

country nor did it cater to firms along the entire food value chain. The food innovation support system was found to be fragmented, to vary considerably between regions, to be short-sighted due to project funding, and, in general, to be placed too far from research. Moreover, Lund et al. (2021) report that entrepreneurs had difficulties applying for regional support, as they were difficult to find, often time-limited, and had various complicated application procedures. The authors argue that improved coherence, continuity and efforts that span across several regions are needed for an efficient and more easily navigable support system.

Acknowledging the needs for improvement, regional parliaments and County Administrative Boards across Sweden have agreed on a petition for new long-term investments in regional nodes and a national coordination of these nodes, including connections to national research actors and authorities. The ambition is to improve the effects of investment in research, development and innovation by reaching more firms, which would lead to improved competition and sustainability.

The Swedish University of Agricultural Sciences (SLU) has several platforms as part of their outreach activities. For example, the SLU Partnership Alnarp coordinates collaboration in south Sweden, and the SLU Competence Centre for Advisory Services facilitates change processes for sustainability. The “Future platforms” coordinate SLU’s outreach activities within food, forestry and veterinary health.

Other examples of actors as coordinating stakeholders are the Royal Swedish Academy of Agriculture and Forestry (KSLA), an economically independent network organisation and think tank, and the Sweden Food Arena. The latter coordinates food industry actors for an innovative, sustainable, and competitive food sector. The Sweden Food Arena is the result of the government’s Food Strategy (SGO, 2017), which aims to increase production and contribute to a sustainable and competitive food value chain.

Good practices and lessons learned

The organising of the AKIS Coordination Body in cooperation between the Swedish Board of Agriculture and the Swedish CAP-Network enables them to complement each other, giving the potential to reach farther than they would have been possible alone. However, to realize this potential, new ways of thinking are required, such as cooperation instead of silo-thinking, and new approaches in the form of systems perspective and with the target group’s benefit at the centre across all relevant policy areas. While it takes time to change mind-sets and approaches, a major part of the innovative work within the AKIS Coordination Body has this as a focus.

One of the ways to communicate internally and externally about the new thought processes and approaches that are implicit in the AKIS approach has been the use of circles to illustrate the composition of the AKIS (see figure 8). This also includes conveying the numeracy and variety of AKIS actors with regards to types and aims of organisations.

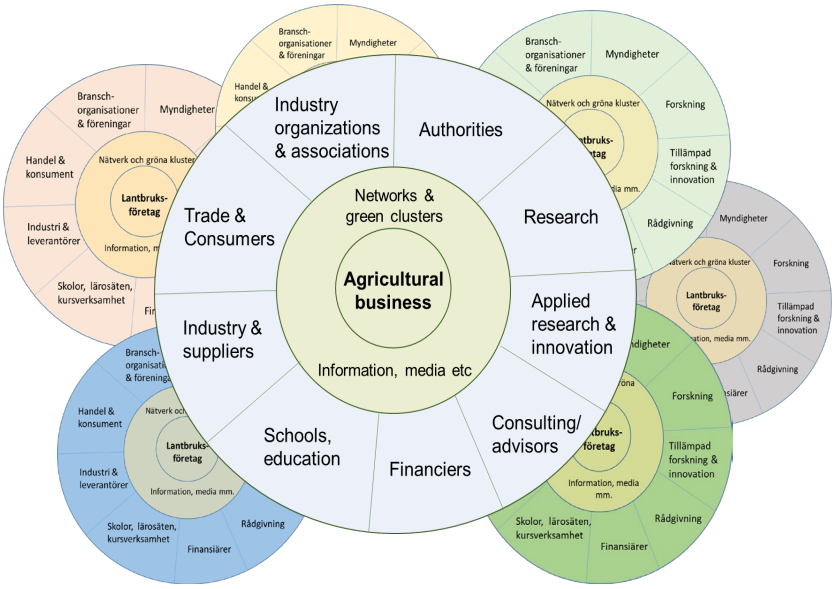


Figure 8. The Swedish AKIS illustrated as consisting of many sub-sectors and geographically delineated AKIS. Idea and graphics: Jennie Cederholm Björklund.

3. History of the advisory system

As an overview, the history of the Swedish knowledge transfer and advisory system can be divided into three overarching time periods (Gielen and Nyström, 2019). It begins with a period from the 19th century until the end of the Second World War, mainly characterized by production-stimulating measures. Then follows a period of rationalisation and structural transformation for agriculture until the 1990s. The third period continues to today and is characterized by measures to promote the adaptation of the agricultural sector to a market economy approach and to promote sustainability practices. In brief, the advisory system has developed from a few actors who act on behalf of the state, to a multi-actor, pluralistic scene where the state's role is limited to areas of the common public good. Other areas, such as production related advisory services, are covered by private actors (Gielen and Nyström, 2019).

In 1791, the first advisory organisation was formed, the Swedish Rural Economy and Agricultural Society (Hushållningssällskapet), owned by the member farmers. Today, there are 15 such regional societies, joined in a national confederation (Hushållningssällskapens förbund). Until the end of the Second World War, the Swedish Rural Economy and Agricultural Society was responsible for most of the dissemination of knowledge and advice to agriculture. Half of their activities were funded by the state, with the rest covered by the societies and other sources (Gielen and Nyström, 2019). It was not until the 1940s that other farmer-based organisations and producer cooperatives started to develop advisory services within their specific segments (Nordlund and Norrby, 2021).

An agricultural college providing training for agronomists was formed in 1932 through a merger of the institutes at Ultuna and Alnarp. At the regional level, the Swedish Rural Economy and Agricultural Society ran agricultural colleges with a more practical orientation (Gielen and Nyström, 2019).

In 1967, the government decided that the publicly supported advisory services should be conducted solely by the regional County Administrative Boards. The motive being that the state wanted full transparency and control over the advisory services. With the withdrawal of public support, the Rural Economy and Agricultural Societies struggled to survive, and a severe restructuring of the advisory services took place (Stjerndahl, in press).

To meet the competition from the free advice from the County Administrative Boards, new concepts were developed within the Rural Economy and Agricultural Societies in the 1970s. One of them being a new intensified advisory service, one which provided a personal advisor for each farmer, adapted to individual needs

and with multiple farm visits. This was sold in packages which contained crop rotation planning, soil analyses, plant nutrient balances and a new data system, in which each field was evaluated economically and compared with other farmers in the vicinity. Moreover, as a complement to the individual follow-ups and evaluation, there was a comparison and review of the results in peer groups of farmers. The farmers were now supported to adapt all activities to the specific field, with better monitoring of individual fields being the result. Forecasting methods were developed at the Swedish University of Agricultural Sciences (SLU) that supported advisors and contributed to further knowledge. The new concept was a success and is still partly offered by the advisory organisations (Stjerndahl, in press). The monopoly of the County Administrative Boards over the publicly supported advisory services ended with the deregulation of the 1990s.

In horticulture, in 1964, the SLU began to collect and analyse data from horticultural producers on a much more detailed level than had been done previously. The aim was to provide researchers, advisors and producers themselves with a basis for economic analysis and production planning. The producers received individual feedback in a comparison between cultivars and years, as well as a comparison with a peer group. Groups were formed of producers, advisors, researchers and students to discuss the results, and to compare and exchange experiences. The method was successful and was named the Horticultural Economic Survey. The model was soon turned over to advisory organisations and used as the basis for further work. This may have been one of the very first working methods of collaborative learning between research and practice. It contained many features that later research would recognise as success factors, such as using detailed data to give primary producers insight and comparison with peers, as well as collaborative learning in small groups, including students (Blix Germundsson, 2023).

4. The agricultural advisory services

4.1 Overview of all service suppliers

The Swedish advisory system consists of a few large advisory organisations who are represented by regional or local offices in the main agricultural areas, complemented by a number of smaller consulting firms that operate on a local or regional basis. Advisory services aimed at environment and climate issues are largely publicly funded, while production and business advice is generally commercial (i.e., takes place on market terms).

Low density and long distances in rural areas pose challenges to the advisory system (OECD 2018). In general, advisory services are available in the main agricultural areas, although there is a lack of capacity in some subject areas and in some locations. Waldenström (2023) points out that advisory services and other kinds of support for farmers' learning are dismantled in areas of farmland abandonment, such as in north Sweden.

The advisory services can be divided into groups based on their role and organisation; these are as follows:

1. **Independent advisory services**

These constitute the main body of advisory services in Sweden and are either farmer-based organisations or private firms. The advisors operate on a commercial basis, providing independent advice to farmers paid for by the farmers. They also perform publicly funded advisory services procured by national and regional authorities. Hence, these advisors are funded by farmers and public authorities, the latter mostly through the CAP strategic plan.

Examples of farmer-based advisory organisations:

- The Rural Economy and Agricultural Societies (Hushållningssällskapet), providing advisory services for agriculture, forestry, food and rural entrepreneurs. 15 regional societies organise around 1,000 employees.
- Växa Sverige, the largest cattle farmers' association, with around 330 fulltime employees working mainly with dairy and beef farmers.
- Gård och djurhälsan. Veterinary services. Partly farmer-based, partly privately owned, with approximately 50 employees.

Examples of private advisory firms:

- Ludvig & Co, with 130 operational sites and around 1,300 employees, providing advice related to finance, real estate, law, tax and business consulting within agriculture and other business sectors.
- Fyrklövern, with 10 operational sites and more than 100 employees, providing advice within business economics and law.
- Lovanggruppen, with around 15 employees, working mainly with crop production advice.
- 60 - 70 small, private advisory firms, often one-person firms with book-keeping services (Yngwe, 2013).

The larger independent advisory organisations have joined together in a "Branch Council for the Agricultural Advisory Organisations". The council is a non-profit association with the aim of being a meeting place for agricultural advisory organisations.

2. Advisory services as part of a sales strategy

Advisory services are part of a sales strategy in which the advisor works for an organisation also selling farm input supplies. This relates to the sales of, for example, plant protection chemicals, machinery and other equipment. There are also a few examples of advisors working for buyers of farm products, where advisory services are provided as a part of securing the quantity and quality of farm products. Examples include:

- Lantmännen
- Svenska Foder
- Gullviks
- DLA / Danish Agro

3. Public advisory services

Since the deregulation of the 1990's, the publicly employed advisors have become very few. Today, these advisory services are focused on providing back-office functions to the earlier mentioned advisors, such as plant protection prognosis and diagnosis, and procuring advisory services with an environmental focus. Examples include:

- The Swedish Board of Agriculture, Växtskyddscentralerna
- The County Administrative Boards

4. Other advisory and innovation support services

This category summarizes advisory services not included in the three mentioned earlier. It includes organisations of various origin, such as the regional Green Clusters, incubators who support the development of innovations in rural areas, innovation platforms placed at universities, research and education institutes, and

the national Resource Centre for Artisan Foods (Eldrimner). These provide advice either directly to firms or as back-office services to other advisors.

5. **Knowledge provision in reindeer herding**

Knowledge provision within reindeer herding is based on Sámi traditional knowledge - árbediehtu - which is both material and immaterial in nature. It is a collective knowledge that individuals carry with them, acquired knowledge about nature and ecosystems. It may be directly related to reindeer herding, such as knowledge of how reindeer move over the landscape and which plants they graze on; be knowledge about the weather, how and where to fish, hunt, and pick berries; be information on the way to take care of meat and fish; or be about how to build huts and create utility objects from nature's materials.

Included in the concept of árbediehtu is a need to show consideration for the cycle of nature, to treat everything with care through reuse and repair. This involves not taking more than you need, not destroying nature needlessly, and being grateful for what nature gives. It is about maintaining the traditional knowledge of how to survive and make a living in a harsh and barren climate, where some of the old knowledge has already been lost. The Sámi Parliament has overall coordination responsibility for traditional knowledge linked to biodiversity, a work that takes place in collaboration with the SLU Swedish Biodiversity Centre.

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

The policy interventions outlined in the CAP Strategic plan (SGO, 2023) are administered by the Swedish Board of Agriculture, the regional County Administrative Boards, the Sámi Parliament, and the Swedish Forest Agency. The Swedish Board of Agriculture and the County Administrative Boards frequently procure advisory services carried out by market actors within the policy intervention of "Support for knowledge exchange and dissemination of information" (see section 2.3). The aim is to increase the skills of those active in rural areas through the compilation and availability of knowledge and continuing training/education of advisors and farmers, which can take place in groups, individually or through activities such as information sharing, demonstrations and seminars. The procurement of advisory services is mostly within the overarching field of environment and climate:

- The Focus on Nutrients program (Greppa Näringen)
- Organic production
- Biodiversity in the agricultural landscape

Part of the funding for the CAP policy interventions described in section 2.3, especially funding related to article 78, is distributed by the regional County Administrative Boards. The boards may adapt their procurement of projects and advisory services to regionals needs, and this is one of the funding sources for educational activities provided by advisory organisations. As an example, regional co-innovation groups working with environmental improvement in agricultural areas were described and evaluated by Ljung and Nordström Källström (2013). The authors identified critical success factors and concluded that cooperation and joint learning processes are efficient tools for environmental improvement in agriculture. An agenda was suggested for the further development of such local and regional initiatives for agri-environmental measures.

The public funding schemes that may be relevant for reindeer herding are similar to the regional, national and EU funds for agriculture. In addition, support can be applied for via the national Reindeer's Promotion Grant.

The Swedish Board of Agriculture organise further training of advisors, fund field trials and demonstrations, and provide back-office functions for advisors within the following areas:

The Focus on Nutrients program
The Focus on Nutrients program (Greppa Näringen) was started by the farmers' organisation LRF, together with the Swedish Board of Agriculture, the County Administrative Boards and advisory organisations. The aim was to reduce eutrophication of inland and coastal waters and avoiding more detailed regulations regarding fertilizer use. The initiative involved systematic and recurring advisory visits at the farm level in combination with traditional information work (Hjelm et al., 2022; Hoffman and Blix Germundsson, in press). Since its start in 2001, the Focus on Nutrients program has educated more than 1,000 advisors and reached Swedish farmers with 68,000 advisory visits. Today, the initiative includes modules on fertilizing, animal feed, pesticides, energy, climate, biodiversity and overall farm sustainability.

The Plant Protection Centres
The Plant Protection Centres (Växtskyddscentralerna), organised within the Swedish Board of Agriculture, works with diagnosis, prognosis and advisory back-office support related to weeds, diseases and insects for agricultural crops, vegetables, fruit, berries and greenhouse production. They monitor pests in the field, publish reports and newsletters, provide information and demonstration activities, and arrange seminars and courses as further training for advisors. The plant protection centres are located at five sites around the country.

Organic production
The Swedish Board of Agriculture had the assignment of coordinating efforts to stimulate organic production and consumption between 2017 and 2023. The tasks include needs identification, coordinating organic actors, and funding projects and activities that promote organic food. For example, providing information to stakeholders about organic production and consumption, procuring advisory services to support potential and existing organic farmers, and providing back-office support to advisors.

Biodiversity in the agricultural landscape
Providing information and demonstrations related to biological diversity in agricultural landscapes. For example, how to promote useful insects, birds, and wild game in the agricultural landscape, and how to manage and restore meadows and pastures to preserve biodiversity. They also provide advice on regulations related to natural and cultural protection.

The alignment of public policies and funding schemes to the needs of farmers and rural entrepreneurs can be challenging. Cederholm Björklund (2020) studied agricultural entrepreneurship and the support provided by entrepreneurship oriented policies broadly, including AKIS related policies. She found that the policies and efforts to encourage rural entrepreneurship and innovation were based on economic growth perspectives, i.e., ones assuming that agricultural entrepreneurs prioritize financial results. However, according to her results, economic sustainability implied an ability to hand over a farm in good condition to future generations, as farms were often passed down through generations. As farmers were firmly embedded in the local community, they often took a long-term view of the sustainability perspective, according to Cederholm Björklund (2020). The author pointed to this gap in the understanding between policy makers and farmers and noted that interventions from public policies and support systems based on economic growth strategies were not always perceived as helpful by farmers and rural entrepreneurs.

4.3 Human resources and methods of service provision

Changing needs in agriculture require an increase and a broadening of advisor competence. As well as being experts in agricultural production, advisors increasingly need to act as coaches and work with a holistic view of the farm (Lovén Persson et al., 2020). This requires new and adapted advisory methods and a better understanding of the farm managers' role. While many advisors received formal education from SLU, there is little formal education specifically aimed at an

advisory career. The university course in advisory methodology was terminated in 2007.

Nordlund and Norrby (2021, p 18) note that while advisors and advisory organisations need to be updated to meet the demands of farmers, they often lack the time and resources for back-office work. The large advisory organisations often work internally on a national level to provide further education to their advisors. However, to a certain degree, it is up to the individual advisor to find the right knowledge, which implies that every advisor is responsible for their own learning. This applies to small production orientations in particular.

In the interview study carried out by Nordlund and Norrby (2021), several advisors mention "farmers' best practise" as an important source of knowledge. A farmer who has seen positive results can become a good example to other farmers. By letting farmers present their results and solutions, other farmers can be inspired. One expert says that when actors speak the same language, they understand each other to a greater extent; hence, "best practise" is a useful coaching method (Nordlund and Norrby 2021, p 18). This connects to the historic tradition of working in groups of 1-2 advisors and a small number of farmers (erfa-grupper). This mode of working has shown potential to be very rewarding, while also seen as being demanding by advisors. Examples are the intensified advisory service emerging in the 1970s, and the Horticultural Economic Survey from the 1960s, both of which included result evaluation in groups of farmers (see chapter 3). Persson and Ljung (2013) provide a modern take on group advisory services, with experiences and practical recommendations for advisors and farmers.

Digitalisation has the potential to facilitate the accessibility of advisory services across the country. An overview of early experiences and practical recommendations for distance communication for advisors and farmers is provided by Larsen et al. (2015).

4.4 Clients and topics

Nordlund and Norrby (2021, p 19) note that "farmers ask different questions today compared to ten years ago; the questions have changed from being about production and biology, to become more about technical and digital tools, bureaucracy, business management and environment. The scope of the questions is bigger than before as a consequence of the fact that agriculture has become a subject of discussion in society at large. Previously advisory service was often between one advisor and one farmer, but now when the need for advisory services is broader, the advisors need to connect different types of expertise, and thus need a broader understanding of farming as a whole."

In addition, Nordlund and Norrby (2021) note that their expert interviews show how the role of advisory organisations has changed, with tools like social media facilitating access to knowledge. A new role for advisory organisations is to help farmers find, sort, and value information. This is similar to arguments made by Lovén Persson et al. (2020), who note that advisors need to evolve from being experts in agricultural production towards acting as coaches and taking a holistic view of farm operations in order to support the needs of farmers. They saw a need for advisors increasing their competence regarding the possibilities of digitalization and their understanding of how new technology should be adapted and utilized in the individual operations on a specific farm.

Krafft et al. (2022) studied the perceptions of advisory services of both farm advisors and full-time farmers in Sweden. The results indicate that similarities in the perceptions of advisory services among advisors and farmers were found in areas characterized by well-defined questions and production related issues. However, significant differences in the perceptions of advisors and farmers emerged in less concrete areas and on topics connected to change, management and strategy. This may indicate that the latter areas were less well developed and integrated into Swedish advisory practices than the traditional production related advisory services.

In a study of the change processes in Sweden's agricultural advisory system over the past two decades, Höckert (2017) found that the advisory system was poorly adapted to support farmers in long-term strategies and sustainable farm development. The author claimed that the two interrelated reasons for this were reductionist knowledge possessed by advisors and advisory organisations and the structural arrangements of the advisory system. While the challenges facing agriculture are systemic, contemporary advisory services were built on compartmentalised knowledge and non-systemic models. Though different measures to change perceived shortcomings have been attempted, the desired changes have not materialised, mainly due to a lack of discussion of long-term development, and resource constraints in the advisory organisations (Höckert, 2017).

When the "Focus on Nutrients" initiative started in 2001, the advisory organisations had concerns that the free advice in the initiative would outcompete the current paid advice. It was soon realised, however, that this was also a great opportunity to reach new customers who had not previously been clients of the advisory organisations. It also became a perfect introductory gateway for new advisors, who could specialise in a module, learn about client contacts and visits, and practice becoming a good advisor. Hence, the "Focus on Nutrients" initiative

was beneficial for the advisory organisations as it would lead to contact with new clients and provide the means for the introduction of new advisors (Stjerndahl, in press).

As an example of evolving advisory topics, the “Focus on Nutrients” initiative has gone through development of its advisory offer. The early years focussed on eutrophication, successively adding advisory services to reduce pesticide residues in watercourses. A few years later, an advisory module for energy management was introduced. In 2011, the “Climate check-up” (Klimat-kollen) was launched, a tool to calculate the farm's climate impact. Soon after, advisory services related to farm biodiversity started. In this way, the “Focus on Nutrients” initiative has developed over the years into a sustainability project. In 2023, the Sustainability Analysis (Hållbarhetsanalysen) was launched, where data from several sources is compiled to give an overall picture of the farm's sustainability (Hoffman and Blix Germundsson, in press).

4.5 Linkages with other AKIS actors and knowledge flows

Many actors in the agricultural innovation system acknowledge the need to strengthen the link between basic research, applied research and advisory services to improve the impact of research. In some areas in particular, advisory services are poorly related to frontline research (OECD, 2018, p 169). The weak applied research resources in primary production and rural development lead to weaknesses in making research knowledge available for practice, further training of advisors, connections between research and practice, and the production of new applied knowledge (SBA, 2021). The lack of applied research funding makes small production orientations especially vulnerable.

Nordlund and Norrby (2021) noted that the lack of applied research hampered knowledge flow to and from research; “Farmers rarely use the research material that is produced in Sweden and the researchers do not focus on practical issues which make knowledge flow weak in both directions. Research results are shared with advisory services and are important for their work as advisors, but the knowledge flow from advisory service to research is considered weak by experts. This means that research on applied issues is missing, and, therefore, gathering of knowledge from advisory organisations rarely happens” (Nordlund and Norrby, 2021, p 10).

As research is too little focused on practical farming issues, advisors and farmers have to look abroad for relevant knowledge, for example to Denmark and the Netherlands (Nordlund and Norrby, 2021, p 10). However, this is more demanding

and creates institutional, social and linguistic barriers. In addition, the advisors themselves need to have something to offer foreign advisors in exchange for their knowledge. While the expansion of social media has led to new opportunities for finding relevant knowledge, it can be difficult to validate. On the other hand, the link between farmers and advisory services was found to be well-functioning.

In a study of researcher - advisor relations, Tönnberg (2019) found that advisors and researchers needed to learn to implement new and better methods for collaboration and a process-oriented way of working in agricultural knowledge development. While such ways of working are already described, they are not sufficiently put into practice. The author noted that collaboration and process competence need to be transferred from the individual to the organizational level with the help of the organisations' management. Tönnberg also suggested that in order to stimulate needs-driven development, the funders of research and development projects should consider assessing the process that precede the project proposals to ensure an inclusive process.

Krafft et al. (2022) note that the consequences of the discrepancies in perceptions between advisors and farmers are that advisors may deliver too much, too little, or be off target. This is especially true in the areas where the expectations of advisory services are not clearly expressed, such as change, management and strategy. The authors call for strong and proactive back-office functions, supporting the advisor's ability to deliver relevant and well adapted services.

The four new knowledge centres aim to work towards the development of advisory concepts, training of advisors, and the compilation and availability of knowledge for advisers and the agricultural industry as a whole, thereby contributing to a strengthening of the advisory system. To this end, Hansson et al. (2024) investigated the needs of advisors within the field of traditional financial advisory services, such as accounting, auditing and tax matters, as well as new areas, such as strategy and leadership. The authors made three recommendations to strengthen advisory services: 1) strengthening subject competence, 2) developing advisory methods, and 3) establishing forums for collaboration. The results also showed how the advisors want new knowledge delivered, through shorter courses, seminars and webinars.

5 Summary and conclusions

The aim of this report is to provide an update on the AKIS country report of Sweden, describing the national AKIS and advisory organisations. The methods followed the guidelines provided by the i2connect project, a desk research effort based on collecting and analysing relevant documentation, based on the first version of the AKIS country report (Nordlund and Norrby, 2021). The forestry sector is not included in this report, as it is a large industry sector with its own extensive knowledge and innovation system.

5.1 Summary and conclusions on sections 1 – 3

The main structural characteristic of Swedish agriculture is the regional differences in the nature and climate conditions for primary production. Of the total land area, only 7% is agriculture, while 68% is forestry. While arable land, pastures, and the number of agricultural holdings are declining, farm sizes are increasing. The top subsectors are cereals, dairy and horticulture. Reindeer herding is important in the north.

The major characteristic of Sweden's AKIS is a diversified and fragmented system, as indicated by several analyses. Many actors acknowledge the need to strengthen the link between basic research, applied research, advisory services, and firms. The view that innovation occurs according to a linear model partly still prevails. The fact that applied research is weak leads to challenges in making knowledge available, further training advisors, creating connections between research and practice, and in the production of new applied knowledge. Regional differences make policy coordination vital, alongside coordination between national, regional and local level policies and efforts.

The CAP strategic plan policy interventions that mostly contribute to the strengthening of Sweden's AKIS are the following: 1) Support for knowledge exchange and dissemination of information (competence development, article 78); 2) Support for cooperation (article 77); and 3) Support for cooperation, specifically EIP-Agri (article 77). The AKIS Coordination Body within the framework of the CAP Strategic Plan works in cooperation between the Swedish Board of Agriculture and the Swedish CAP-Network. Four new knowledge centres are established as part of the new CAP period to facilitate bridging the gap between research and practice. In addition, regional "Green Clusters" are important centres to increase the integration of the agro-food sector into the wider national and regional innovation systems. Other coordination facilities include outreach platforms at SLU, KSLA and the Sweden Food Arena.

The history of the Swedish knowledge transfer and advisory system has developed from a few actors acting on behalf of the state, to a multi-actor, pluralistic scene where the state's role is limited to the funding of activities for the public good. Other areas, such as production related advisory services, are provided on market terms.

5.2 Summary and conclusions on section 4

What is distinctive about Sweden's agricultural advisory system, in a European context, is that it rests to a large extent on market actors. The low density and long distances in rural areas pose challenges for the advisory system. The advisory system consists of a few large advisory organisations, which are represented in the main agricultural areas, complemented by a number of smaller consulting companies that operate on a local scale. Advisory services aimed at environment and climate issues are largely publicly funded, while production and business advice generally takes place on market terms. The low resources for applied research leads to: weaknesses in making knowledge available to advisors, and a lack of regionally adapted knowledge.

The policy interventions outlined in the CAP Strategic plan (SGO, 2023) are administered by the Swedish Board of Agriculture, the regional County Administrative Boards, the Sámi Parliament, and the Swedish Forest Agency.

Changing needs in agriculture require an update and a broadening of advisors' competence. As well as being experts in agricultural production, advisors increasingly need to act as coaches and work with a holistic view of farm operations. However, advisors and advisory organisations struggle to find the resources needed for further education and back-office functions. The need to strengthen the link between basic research, applied research and advisory services is acknowledged by many actors. Studies show that the advisory system is geared towards production and environmental advice and needs to develop and integrate advisory services on long-term and strategic issues.

6 Reflections and outlook

Based on the AKIS and advisory system described in this report, the question becomes whether the CAP Strategic Plan and the related national policy interventions are sufficient to adequately address the perceived deficiencies. The regional differences in natural conditions, and the lack of policy coordination between authorities at different levels, contribute to the fragmentation and dismantling of the Swedish AKIS and advisory system. While many actors acknowledge the need to strengthen the entire system, there is a need to find new methods of collaboration and support not only within the AKIS, but also in the institutional structures beyond.

The work done by the Sweden Food Arena highlights a related question, whether the concept of a national AKIS, with its thought boundaries around the agricultural sector, is sufficient when attempting to reach the goal of competitive and sustainable agriculture. Rather, the Sweden Food Arena argues that the entire food value chain should be focused on. They point out the barriers to cooperation that exist among actors in the value chain, and the lack of policy coordination between authorities, among research funders, and in the innovation support system. The Sweden Food Arena advocates, as examples, a stronger focus on the agri-food entrepreneur, and improved coordination of innovation support and funding schemes.

An important perspective underlying the implementation of the AKIS interventions of the new CAP is what working with a systems view entails. New ways of thinking are required, such as the reduction of silo-thinking, and putting the target groups' benefits at the centre. While it takes time to change mind-sets and approaches, a major part of the work within the AKIS Coordination Body lies herein. The number of AKIS actors is very large and varied, suggesting that actors will not lend themselves easily to "coordination" (however much the naming of the "AKIS Coordination Body" may lead one to believe this). Perhaps a long-term effort to inspire new forms of cooperation and foster systems views could see new seeds grow for the future.

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An AKIS inventory is delicate to write, as there are as many perspectives on the AKIS as there are actors. The ambition is for it to serve as an overview and the basis for further discussion. It is by definition a snapshot and should be updated regularly to maintain its relevance.

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