AKIS and advisory services in Denmark

The report is an update of the previous report “AKIS and advisory services in Denmark”.
Report for the AKIS inventory (WP3) of the PRO AKIS project
“Prospects for Farmers’ Support: Advisory Services in European AKIS”. April 2014.
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Contents

Executive Summary

The main aim of the report is to provide a comprehensive description of the Agricultural Knowledge and Information System (AKIS) in Denmark with a particular focus on agricultural advisory services. The description includes history, policy, funding, advisory methods and a section on how the Farm Advisory System (FAS) was implemented.

This report is an update of the previous report "AKIS and advisory service in Denmark". Report for the AKIS inventory (WP3) of the PRO AKIS project "Prospects for Farmers' Support: Advisory Services in the European Agricultural Knowledge and Information Systems". April 2014. The project received funding from the European Union's Seventh Framework Programme for research; technological development and demonstration under grant agreement no 311994. AKIS describe the exchange of knowledge and supporting services between many diverse actors from the first, second or third sector in rural areas. AKIS provide farmers with relevant knowledge and networks around innovations in agriculture.

Denmark covers a total area of 42,926 km^2 corresponding to 4,292,600 hectares of which 2,622,600 are utilised agriculture area (UAA) corresponding to 61.1%. (2016). Denmark has approx. 34,700 agricultural holding (2017), which is a decrease of 8.5 % from 2014. During this period, the average size of a holding has increased from 70 ha to 76 ha. The only farm sizes not subject to decrease are the large farms above 200 ha and the farms under 5 ha.

The average Danish farmer is 57 years old (2017). Especially the number of young farmers (younger than 40 years) has declined from 14.0% in 2007 to 6.3% in 2017.

The supply of advisory services in Denmark mainly happens within the farmer based, owned and controlled advisory system known as the Danish Agricultural Advisory Service (DAAS). SEGES, the Danish knowledge centre for agriculture is part of DAAS, but acts as the national research and knowledge facilitator. The DAAS-cooperation dominates the market for advisory services. Alongside the DAAS-cooperation or the DAAS-system the other main sources of advisory services are provided by private independent companies - all small in size - and input suppliers companies. Public universities and research units do not provide day-to-day advisory services to the individual farmer. Some companies within the food processing industry are involved in advising the farmers when making contracts with them. This happens within specific sectors such as potato growing. It is also significant that private independent advisers have a large role within limited specific sectors e.g. potato growing where the private advisers have a much higher market share compared to the large advisory services' areas of cattle, pigs and crops.

Denmark has overall a very well-functioning AKIS with strong links between universities, public ministries and agencies, agricultural knowledge centres, agricultural colleges and vocational schools, advisory companies, and farmers and vice versa. Furthermore the Danish AKIS and advisory system are responsive towards the needs of the farmers and the demands and wishes from the political system and the public.

List of Acronyms

Acronym	Explanation
AKIS	Agricultural Knowledge and Information/ Innovation Systems
CAP2020	The Common Agricultural Policy (CAP) till 2020
DAAS	Danish Agricultural Advisory Service
DIAS	The Danish Institute of Agricultural Sciences
DKK	Danish kroner
DTU	The Technical University of Denmark
EEC	European Economic Community
EUR	Euro
FADN	The Farm Accountancy Data Network
FAO	Food And Agricultural Organization of the United Nations
FAS	Farm Advisory System
GAEC	The good agricultural and environmental conditions
GDP	Gross Domestic Product
GTS	Authorised Technological Service Institute
LIFE	The Royal Veterinary and Agricultural University
L&F	Danish Agriculture and Food Council
PROAKIS	Prospects for Farmers' Support: Advisory Services in European AKIS
SEGES	The Danish knowledge centre for agriculture
SME	Small and medium sized enterprises
SMR	Statutory Management Requirements
UAA	Utilised agriculture area
USD	United States Dollars

1. Main structural characteristics of agricultural sector of the country

The Danish population is 5.8 million (2017), with 64,000 people employed in the agriculture sector, corresponding to approx. 49,000 full-time employees. The GDP per capita in Denmark is EUR 49,100 (2017), and the contribution of the agricultural sector is 1.18%.

Denmark covers a total area of 42,926 km^2 corresponding to 4,292,600 hectares of which 2,622,600 hectares are utilised agriculture area (UAA) corresponding to 61.1%. (2016).

Denmark has approx. 34,700 agricultural holdings (2017), which is a decrease of 8.5 % from 2014. During this period, the average size of a holding has increased from 70 ha to 76 ha. The only farm sizes not subject to decrease are the large farms above 200 ha and the farms under 5 ha. This indicates the general development - reducing the middle sized commercial farms and increasing the "large industrial" farms and the part-time farmers having their main jobs and main incomes in other sectors of the economy.

The average Danish farmer is 57 years old (2017). In 2007 31.3% of the farmers were older than 60 years, and 14.0% was younger than 40 years. These numbers have changed to 39.3% and 6.3% respectively by 2017. Especially the number of young farmers is declining, which is a concern for the future agriculture in Denmark. Most of the development for younger famers can be explained with the difficulties to get access to venture capital after the international and national economic crisis after 2008.

The Danish agricultural output was EUR 11,100,000,000 in 2017, which was 2.6% of the EU-28 output. The total grain production of the same year was 10 million tonnes, of which almost 48% was wheat. The average grain production yield was 6.9 tonnes per hectare. Vegetable and fruit production was 373,000 tonnes, of which carrot production accounts for 30%. In 2017 there were approximately 1.5 million cattle and 12.31 million pigs. The number of milking cows has been relatively stable around 570,000 within the last 5 years. The number of pigs has also been relatively stable within the last 5 years. Total production of major products in 2017 was 135,000 tons of beef meat; 5.6 million tons of milk; 57,000 tonnes of butter and 447,000 tonnes of cheese; 1,9 million tons of pork meat; 213,000 tons of poultry and 17,9 million mink furs.

In Denmark 95 kg nitrogen fertiliser were used per hectare of arable land in 2017. The same year the active substances per hectare per treatment for herbicides were 0.54 kg, for fungicides 0.26 kg and for insecticides 0.08 kg.

In the period 1990 – 2016 the agricultural production has increased with 31% and at the same time the emission of greenhouse gases was reduced with 16%. In the same period the annual nitrogen leaching to the sea was reduced by 37% and the yearly emission of ammonia (NH_3) was reduced by 43%.

2. Characteristics of AKIS

2.1 Ministries

At governmental level the main official institutions of the Danish AKIS system are the Ministry of Environment and Food and the Ministry of Higher Education and Science who set out the general framework and research strategies which have a profound impact on the direction of the knowledge and information system for Danish farmers.

The Ministry of Environment and Food is responsible for administrative and research tasks in the areas of environmental protection, farming and food production. In Denmark the administration at state level is managed by The Danish Agricultural Agency. At the regional and local levels, much of the administrative responsibility has been delegated to the municipalities. The Ministry is responsible for policy development and implementation of the CAP and its administration and departments provide advice on legal matters.

The Ministry of Higher Education and Science's Department is within these areas primarily responsible for ministerial and management services, quality assurance and coordination of cases, strategy and development, media and press activities, and finance and legal affairs.

2.2 Universities

The two main universities with agricultural related research and education are the Aarhus University and the University of Copenhagen. The Technical University of Denmark (DTU) carries out the food and agricultural research at the National Food Institute. The last two universities with agricultural and spatial planning activities are the University of Southern Denmark and Aalborg University.

2.3 Agricultural colleges

There are 10 agricultural colleges organised as boarding schools. These traditional agricultural educational institutions are today mostly placed in Jutland. Previously they were scattered all over Denmark. They teach modern farmers and offer special courses in farm management and economics. In addition to the 10 traditional agricultural colleges, 8 vocational schools are offering agricultural educations.

2.4 Knowledge centres

SEGES is the main knowledge centre for agriculture in Denmark with expertise within all areas of agricultural activities and issues. The employees transfer the newest national and international research results into new knowledge for all Danish farm advisers and farmers; participate in research and innovative projects and develop new advisory methods and practices for implementation.

2.5 GTS-institute

Many business sectors have a GTS-institute, which stands for Authorised Technological Service Institute. All GTS-institutes are non-profit organisations who have the task of supporting the creation of more innovative and competitive Danish companies. The GTS-institute, Danish Technological Institute develop, apply and disseminate research- and technologically-based knowledge for the Danish and International business sectors. One of the business sectors, AgroTech, delivers research-based consultancy and technological services for the farm and the agro-business industry.

2.6 Advisory service centres

The 29 existing independent local farmer owned agricultural advisory centres form together with SEGES the Danish Agricultural Advisory Service (DAAS).

Patriotisk Selskab is likewise a farmer owned advisory service traditionally servicing the large estate landowners.

Veterinarian services and advising is performed by the farmer owned “LVK – Landbrugets Veterinære Konsulenttjeneste” and by a large number of individual and private veterinarian companies.

The horticulture sector is served by the advisory company HortiAdvice, which is owned by the Danish Agriculture and Food Council, the Dutch advisory company Delphy and the management of HortiAdvice.

2.7 Private advisory companies

A relatively small number of small private advisory companies, typically between 1 to 8 employees/owners, offer advisory services. Most of them have specialised in one or a very few advisory subjects.

2.8 Upstream industries

Suppliers for agriculture also often provide some form of advisory services as an integrated part of their supplies to the farmers. Among the major of those are farmer owned companies within feedstuff, nutrients and seed.

2.9 Danish Agriculture and Food Council

The Danish Agriculture & Food Council represents the farming and food industries of Denmark including companies, trade and farmers’ associations.

Agriculture and food is Denmark’s largest competency cluster, employing some 186,000 people and exporting agricultural products, food and equipment to an annual value of around EUR 22 billion. Two-third of the production is exported.

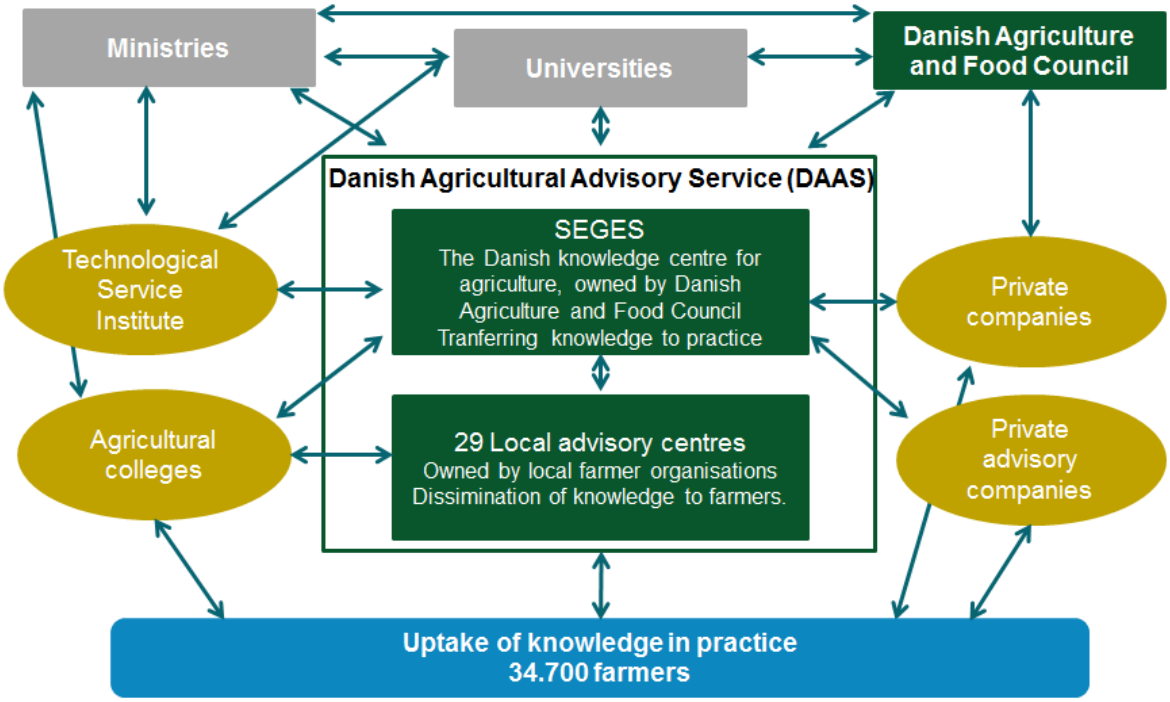

Figure 1. The knowledge channels of the Danish AKIS.

Source: SEGES, the Danish knowledge centre for agriculture.

3. History of the advisory system

The Danish advisory system today is the result of a long term and gradual development – however, with a crucial shift in agricultural production when Danish agriculture changed from plant production to animal production as the basis of Danish agricultural production and exports. It has been shaped and transformed by changes in economic, social and political periods and events in Danish history and by the changes in the possibilities for export products.

The Danish advisory system has its roots in events in the late 18th century and changes in the Danish agriculture up to the 1870s. With the political events and decisions in 1788 the farmers changed from being tenants farmers to independent farmers including smallholders. Changes in agriculture, culture in methods, the invention, introduction and use of new technology and methods accompanied this development and increased with setting the Danish tenant farmers free from adscription. Part of the landowners took part in and was even frontrunners in this project. The culture in the countryside followed and developed into a certain Danish version of cultural cohesion among Danish farmers. Later on the same happened among the smallholders. One dominant feature of this culture, which has lasted until today, is a strong sense of unity and the readiness to help and assist your follow farmer with advice and guidance. It is a constitutive element of the culture among Danish farmers to share knowledge and cooperate about innovation.

The Danish farmers and later on smallholders formed local farmers' and smallholders' associations all across the country as part of this development. In the beginning these new farmer associations were led by the large landowners as they were those locally, who had the resources and the highest level of knowledge.

In the 1860s and 1870s most of Denmark was covered by local farmer associations and most farmers had joined these associations and began to take control of them vis-à-vis the local landowners. The farmer associations began to form a structure towards a national organisation in the 1880s. The smallholders first succeeded with this around 1900.

Around 1915-20 the political institutional setting representing Danish farmers and smallholders was established and the institutional organisation of farmer and smallholder owned cooperatives was in place. Danish agriculture was thus thoroughly organised in the period up to the First World War. This institutional setting regarding the associations and the various farmer political nongovernmental organisations would last without many changes until the turn of the millennium.

From the 1870s to the 1890s Danish agriculture changed from plant production with production of grain to the European market to animal production with butter and pork as the primary products. The traditional grain production was ousted by cheap grain import from Russia and overseas (U.S.A. Canada, Australia, South America) and Danish agriculture was hit by a severe crisis. This crisis was overcome by the great rearrangement of Danish agriculture to animal production which since then has formed the basic characteristic of Danish agriculture with a huge export of dairy and pork related products, even though other products such as seeds and mink skins today contribute to the successful Danish agricultural export.

The forming of farmer and smallholder associations was followed by the creation of the cooperative associations within agricultural production which was an integrated part of the solution of the Danish agricultural crisis. This happened extremely fast. Within 10 years from 1880 to 1890 Denmark was covered with dairy cooperatives and later on with cooperative pig factories. The formation of farmer associations and the shift from grain production to animal production were leading factors in accelerating the introduction and need of agricultural advisory services. Even though the knowledge level among farmers steadily increased due to the establishment and existence of agricultural schools and the special Danish enlightenment of *folk high schools* all across the country from the 1850s and on-

wards the local farmers associations began to invite and to hire agricultural advisory consultants which rapidly increased from the year 1900. The consultants were employed by the local farmer associations. The number of advisers grew steadily into the first half of the 20th century. The attempt of the Danish Ministry of Agriculture to take control of all advisers at the beginning of the 20th century was rejected by the farmers because they anticipated that state control would prevail over desired agricultural consultation. As most other aspects of living and production in the countryside came in the hands of the farmers so did the ownership and control with agricultural advisory services.

Most advisory services are still today provided by and through farmer owned agricultural advisory companies. 29 of these farmer-owned advisory companies make up the national cooperation called Danish Agricultural Advisory Services (DAAS). The 29 DAAS-centres, which are independent of one another, still cooperate today and are dominating the market for advisory services in Denmark. Independent private adviser companies exist, but they are all small in size, typically 1 to 8 owners/employees.

For the last thirty years the DAAS-system has maintained its dominance in the Danish advisory system. However, the significance of private independent advisers has increased somewhat, but not much. The number of DAAS-centres has decreased from around 65 at the turn of the millennium to 29 in 2018. But the number of advisers has remained rather constant over the last thirty years. The constituent tendency in the demand of agricultural advisers in Denmark has followed the economic fluctuation in the agricultural sector rather than a diminishing demand due to the structural development within the sector towards still larger farm holdings. When the level of investments has grown or fallen so has the demand for advisers.

With the decreasing number of farmers, the number of agricultural schools has decreased significantly within the last 25 years. Only 10 traditional agricultural schools are left today. Due to a fall in pupils in the 2000s many agricultural schools have closed down or have found a solution of survival by becoming a subdivision of a vocational school. But mergers and closing down of small educational institutions have been a general trend across the country for the last 20-30 years so this development has not only affected the agricultural schools. The process with still fewer agricultural schools, and the trend that these primary and secondary agricultural educations through new legislation and administrative procedures have increasingly become similar to other ordinary secondary education, has meant that the traditional farmer control of secondary agricultural education and training is slipping out of their hands. The number of pupils who applied to the agricultural schools fell sharply from 2014 to 2015, but there has been an increase again, so that in 2017 there were 326 applicants for the agricultural schools.

4. The Agricultural Advisory Service(s)

4.1 Overview of all service suppliers

The supply of advisory services in Denmark mainly happens within the farmer based, owned and controlled advisory system known as the Danish Agricultural Advisory Service (DAAS). SEGES, the Danish knowledge centre for agriculture is part of DAAS, and acts as the national research and knowledge facilitator. The DAAS-cooperation dominates the market for advisory services. Alongside the DAAS-cooperation or the DAAS-system the other main sources of advisory services are provided by private independent companies - all small in size - and input suppliers companies. Public universities and research units do not provide day-to-day advisory services to the individual farmer. Some companies within the food processing industry are involved in advising the farmers when making contracts with them. This happens within specific sectors such as potato growing. It is also significant that private independent advisers have a large role within limited specific sectors e.g. potato growing where the private advisers have a much higher market share compared to the large advisory services' areas of cattle, pigs and crops. Danish Crown, a farmer-owned cooperative and a global meat processing company, has also started supporting the farmers with advisory service in the pig production area.

The Danish Agricultural Advisory Service (DAAS) cooperation

The DAAS-cooperation consists of 29 advisory centres and they have approx. 2,480 employees. These do *not* form and is *not* to be seen as forming one unified structure with an overall centralised management where each centre forms a subdivision of DAAS. Each centre is independent of one another *but* on the other hand they are all members of DAAS. The director of each DAAS centre is member of the DAAS Board of Directors. The DAAS board regularly meets and discusses the situation and needs of the advisers, of the farmers and the agricultural sector. The reason why having competing advisory companies at the same table is that they all share some common knowledge and information needs and the historical traditions for cooperation in the farmer controlled agricultural sector.

Each DAAS centre is owned by one or several (the trend) farmers' local associations. Traditionally there were many more local farmers' associations and each of them had their own society or association of advisers attached to them. In the last 30-40-50 years these local societies/associations have been separated from – but still owned by – the local farmers' associations and developed into more distinct business-like advisory centres increasingly looking like private business companies.

This development has been intensified over the last 20-30 years, where the structural development within Danish agriculture and in the country side has reduced the number of farmers' associations and the number of DAAS-centres, too. Like many local farmers' associations, also DAAS-centres have merged into bigger DAAS-centres - now often regional in their market perspective and with geographical local offices. The competition among the centres has increased because the DAAS-centres have become more "company-like" (as every other company in every other market).

The different DAAS-centres differ a lot in size. The largest DAAS-centre has approximately 360 employees and the smallest DAAS-centres have 14-17 employees.

Another aspect of the structural development within Danish agriculture which has affected the DAAS-centres is that advisory fields covering animals and special limited fields for advisory service such as stable design have been separated into individual specialised advisory centres. This trend first happened within pig production in the 1970s and 1980s. For example there are two big pig advisory centres where different DAAS centres are cooperating. This trend has also happened in cattle advisory services, where several advisory centres have established two specialised advisory centres offering cattle advisory services.

The DAAS-cooperation market shares within the different advisory fields are estimated to be the following:

Economic advisory service:	Approx. 85 %
Crop Production:	Approx. 85 %
Cattle advisory services:	Approx. 85 %
Pig advisory services:	Approx. 50 %

The reason why the much lower market shares with regard to advisory services related to pig production is due to the presence of private independent advisers but mainly to the presence of advisory services provided by veterinarians partly due to requirements stipulated in law. But the DAAS-centres employ veterinarians themselves among their staff and/or work closely with the (independent) veterinarians used by the farmers. Traditionally there is a good cooperation with the veterinarians. Furthermore it is a constituent feature of the Danish advisory system that the different advisers, though they are competitors, work with one another based on the needs of the farmer. The trend among veterinarians working with the animal production of Danish agriculture is that over the last 20-30-40 years the traditional one-man veterinarian enterprise has merged with others into larger businesses, typically with 5-10 veterinarians. This has not been a slow or hasty trend but a steady trend. In this way Denmark has an extensive veterinary preparedness of control regime covering the agricultural sector.

The DAAS-centres cover and offer full supply of advisory services in relation to organic farming. The cultivated organic area in Denmark has continued to grow since the 1980s and organic farming and attendant advisory services are these days perceived fully in line with other farming and advisory areas.

SEGES, the Danish knowledge centre for agriculture

SEGES, the Danish knowledge centre for agriculture works as the connecting link between university research and education and the Danish day-to-day system of advisory services. In this sense SEGES, acts as first layer of two, where the second layer is the DAAS-Centres. This model is known as the Danish two-layer model for development and delivery of advisory services. SEGES acts as research, innovation and knowledge facilitator in such a way that the knowledge centre for agriculture adapts knowledge from national and international scientific research and knowledge sources. Earlier on - especially during the 1950s and 1960s and as a result of the impact from USA through the Marshall Plan - most agricultural knowledge offered to the farmers had the character of knowledge transfer as in the concept of extension services, but services have since then developed still more in the direction of advice, mentoring sparring and development of the farmers' own knowledge and abilities to be a farmer and manager of his holding. The activities of SEGES are covering all major fields of advisory service, including organic farming which has its own department. Besides research, innovation and being knowledge facilitator on behalf of Danish agriculture SEGES is in charge of running several databases and responsible of delivering on a regular basis reports and analyses of the state and situation of Danish agriculture.

Development of advisory services as such - i.e. how to conduct, build and form agricultural advisory services - has never been a part of the programmes at the universities or other public governed institutions or been in focus in governmental policies. This has always been left to the agricultural sector respectively the agricultural colleges but mainly to SEGES. Training and courses in being an adviser and how to advice are offered alongside the other products and services from SEGES. These products - as all other services within the Danish advisory system – are offered on the basis of the demand of the advisers and on the needs of the farmers.

Upstream industries / input suppliers

Input suppliers supply advice on the products they sell. This seems to be inevitable as an integrated natural part of their business. In Denmark upstream industries provide advice as an integrated part of their business. Concerning the companies dealing with farm supplies, where farmer based and owned

companies today in Denmark almost have a monopoly, do not see their sale and extensive contact with the individual farmer as advisory services. Their perception of advisory services is that advisory services are provided by people specifically called advisers and hired in by the farmer, private or DAAS-adviser.

Upstream companies supplying pesticides have only few people placed physical in Denmark, and it is estimated that they are not or only very little involved in providing advisory services.

Private independent advisers

There are two large private advisory companies. Patriotisk Selskab, which similar to the DAAS-centres is farmer owned but has its roots in being owned and traditionally providing advisory service to the large estate landowners. Patriotisk Selskab who offers advisory services within all areas is invited occasionally and takes part in some meetings with the DAAS-centres. Patriotisk Selskab has about 70 employees. The second one is LVK – Landbrugets Veterinære Konsulenttjeneste. It, too, is owned and controlled by its customers, this means the famers. LVK offers veterinarians advisory service. LVK has about 40 employees.

The horticulture sector is served by the advisory company HortiAdvice, which has the Danish Agriculture and Food Council as its main shareholder. The Dutch advisory company Delphy is shareholder and the management of HortiAdvice owns a small shareholding in the company. HortiAdvice has 34 employees. Besides HortiAdvice, there are an unknown number of private advisers within the field of horticulture.

The National Organic Association (Økologisk Landsforening) and one of the DAAS advisory centres, SAGRO have established a joint advisory company with approximately 20 employees. They are offering farmers advisory services all related to organic farming.

Apart from the DAAS-system, Patriotisk Selskab and LVK, there are 10-15 smaller independent companies employing totally 95-125 people and offering a variety of advisory services. Besides the small companies, a number of enterprises of 1-3 owners/employees exists, who typically have specialised in one advisory service offering advisory services either in relation to cattle, pig, plant, organic farming, bookkeeping or business management. These enterprises have totally 65-90 owners/employees. There is no national public list of all Danish advisers and advisory companies.

Regarding stable building / construction of agricultural buildings there is a wide range of private companies and advice is certainly a part of the relation with these companies. But some of the DAAS-centres have formed 2 advisory centres specialised in advice related to the construction of agricultural production buildings. Some of the other DAAS-centres offer independent advisory services regarding agricultural production/stable buildings within their organisation.

4.2 Financing of the Danish Agricultural Advisory Service (DAAS)

From 1852 the government started paying for advisory services to farmers. This support ended in 2004, but already in the late 1980s and at the beginning of the 1990s much of the support was stopped. So today no public policies exist in Denmark for the funding of agricultural advisory services.

The main sources of financing for the entire Danish Agricultural Advisory Service (DAAS) are generated as payment for services from farmer clients to the local advisory centres. SEGES, the Danish knowledge centre for agriculture's services and advices are primarily financed by user fees.

The income distribution for SEGES in 2017 is shown in figure 1. In 2017 the total turnover for SEGES was approx. DKK 800 million corresponding to EUR 107 million.

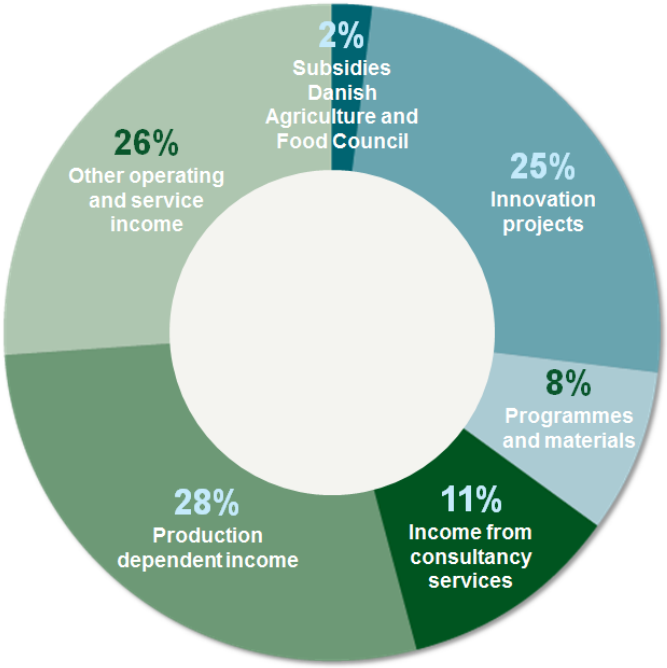

Figure 2. Income distribution 2017 for SEGES, the Danish knowledge centre for agriculture. The annual turnover was DKK 800 million corresponding to EUR 107 million.

Source: SEGES, the Danish knowledge centre for agriculture.

In relation to specific projects that aim at creating new knowledge, research, innovation as well as more applied development, SEGES applies for funds from different foundations, national and EU related funds. Of these, the agricultural sector's funds from production levies and tax reimbursement are extremely important. They consist of production levies, which the sector collects as well as taxes on pesticides, which the government collects and of which a part is returned to the funds for agricultural development purposes to the general benefit of all Danish farmers. Often research and development programmes are co-financed by other Danish and international funds.

Every year, SEGES carries out approximately 250-300 projects funded by national or international funds. In 2018, approx. 30 of these projects were international EU projects mainly Horizon 2020.

Public funds for research are primarily used for basic and strategic research programmes related to issues of public interest, for example environmental protection, organic farming systems and green energy.

<u>Public support to advisory services in the period 1887 to 2004.</u>
The Danish Government provided support for agricultural advisory services since 1887 and up to 1971. This happened based on annual national budgeting.

Between 1971 and 2004 the support for advisory services had its own law, which provided the framework for public support to the agricultural advisory services. For expenses such as salaries, transport, pension and in-service training of the advisers, the law provided for up to 70% support to the expenses and for publication of technical reports up to 50%. In special cases of difficulties, the law, however, had the possibility to support up to 85% of the costs. The percentages were gradually reduced over the years.

Table 1. Sources of financing DAAS 1971 - 2004

Sources of financing of DAAS after 1971 and before 2004
• Public financing • Support to agricultural advisers • Support to education of farmers and advisers • State-consultants to oversee export markets and pass information and feedback to farmer leaders in the coops and to researchers • The agricultural sector's own funds • Membership fees • Subscription fees • Direct user payment • Production levies and chemical taxes

From 1988, the Government, however, decided a gradual reduction of the support and the following years the support developed as described in the following table.

Table 2. Government allocation to advisory services 1988-1992

Government allocation to advisory services from 1988 to 1992	
Year	**Million DKK (Approx. million EUR)**
1988	260 (35)
1989	230 (31)
1990	200 (27)
1991	135 (18)
1992	135 (18)

Source: Chipeta, Sanne 2012. Danish Agricultural Advisory Service – Financing mechanisms for demand driven agricultural extension. Evolvement of the Danish Model. Aarhus: *Unpublished study for FAO*

The mechanism for providing the support was that the national organisations received a frame amount that would be subject to adjustment according to the actual expenses and distributed this to the local organisations.

It is clear that the public support for developing the advisory service system has been of decisive importance. Without this it would not have been likely that the widespread and effective services would have been developed.

Financing of the Danish Agricultural Advisory Service after 2004.

Today no public policies exist in Denmark for the funding of agricultural advisory services. The main sources of financing for the entire Danish Agricultural Advisory Service (DAAS) are generated as payment for services from farmer clients to the local advisory centres. SEGES, the Danish knowledge centre for agriculture's services and advices are primarily financed by user fees.

Since 2004, there has only been public funding of the State Consultants. They deal with tasks related to political issues and the export of Danish agricultural and food products. Hence all State Consultants are attached to a number of Danish public agencies outside Denmark. There are a State Consultant in Japan, China, USA, Malaysia, Russia and Nigeria.

Production levies and tax reimbursements for development tasks

The Danish agricultural sector has a long history of collecting production levies on its own, to be used for important common tasks for the sector that cannot be solved by the individual producer or company. When Denmark entered EEC in 1972, it became necessary to institute the levies by law and the agricultural sector therefore requested the Government to do this and the funds have now its legal framework in the Law of Agricultural Support. Thereby, the funds became public funds, but the agreement was that the sector's own organisations continued to decide the size of the production levy.

The tax reimbursement fund was instituted in 1977. At that time, it consisted of land taxes going back to the agricultural sector. Since 1995, the funds have been complemented by taxes on pesticides which today are the only source of funding. The tax reimbursement fund receives a fixed, annual income from the state's proceeds from taxis on pesticides. The income level is politically determined and stated in the Finance Act.

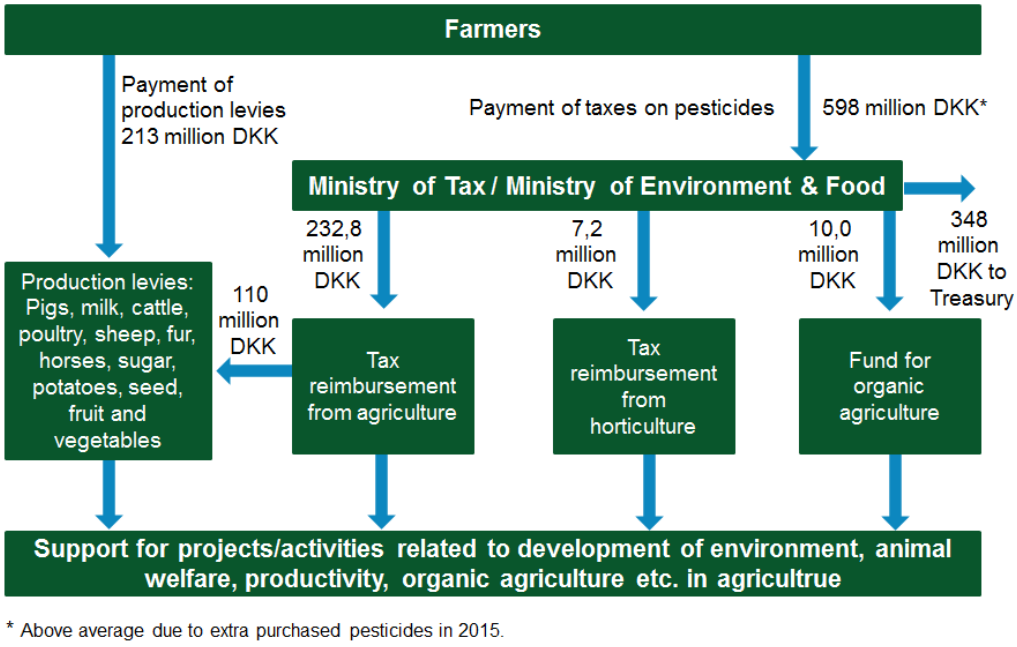

Figure 3. The distribution of agricultural funds 2016

Source: The Ministry of Environment & Food, the Danish Agricultural Agency.

There are today eleven production levy funds. The payment of levies is instituted by law, but the rate of the production levies is decided by the agricultural sector itself. Moreover, there are three tax reimbursement funds – for agriculture, horticulture and organic agriculture. With approximately 90% of the total fund for the three tax reimbursement funds the tax reimbursement fund for agriculture is by far the largest. The rate payment of taxes on pesticides is decided by Government and only part of it is distributed to the tax reimbursement funds. The rest goes to the treasury. Each fund is managed by a Board appointed by the Minister for Environment and Food by nomination from the sector organisations. For the board of the tax reimbursement fund for agriculture there are six representatives of the farmer organisations and five representing different public interest: Workers' unions, consumers and two research councils.

The tax reimbursement fund for agriculture supported development projects within the following five main purposes in 2016:

- Market development 20%
- Research, trials and product development 44%
- Advisory services and education 14%
- Disease prevention, combating of disease and animal welfare 14%
- Co-financing of EU projects 8%

4.3 Methods and Human Resources

Organisation and decision making at SEGES, the Danish knowledge centre for agriculture

The organisation of SEGES is illustrated in figure 4. There are three departments Innovation, Business and Digital. SEGES is strongly user driven, which means that farmers have a significant influence on the innovation and development activities initiated. The farmers are represented in five sector boards: Cattle, Danish Pig Production, Crop Production, Organic Production and Business. Each sector board is supported by a sector director/manager. Sector directors/managers, together with the individual sector boards, must set the strategic direction for, among other things, the professional efforts for the sectors, including setting goals.

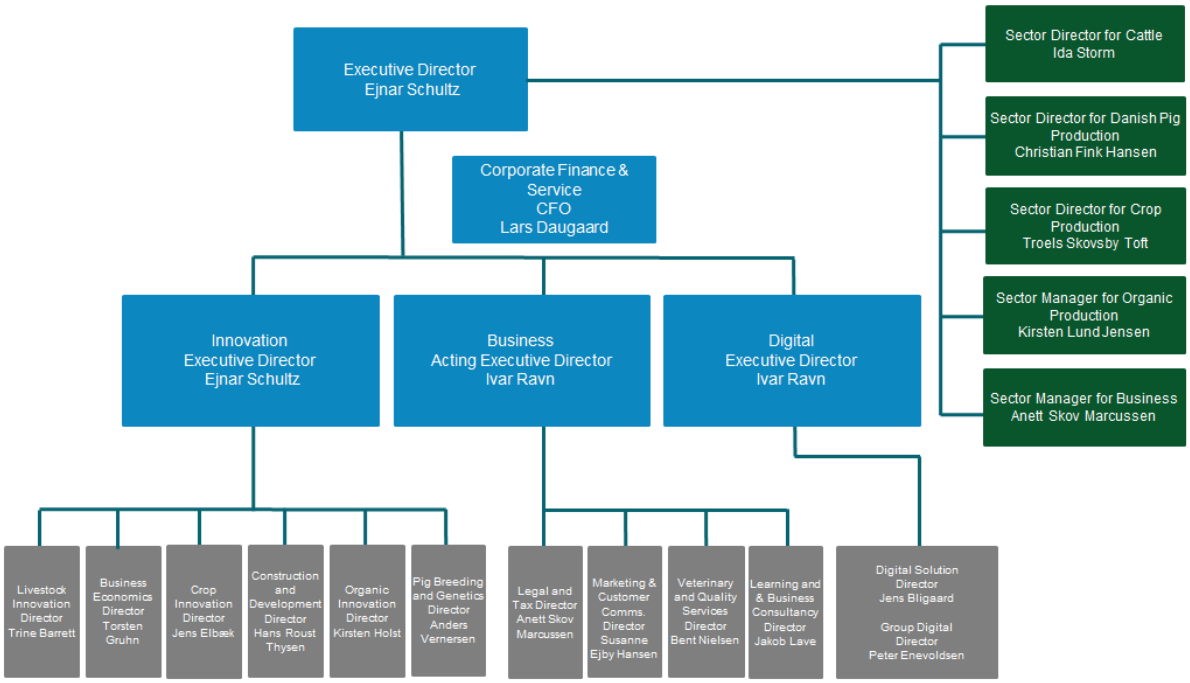

Figure 4. The organisation diagram of SEGES, the Danish knowledge centre for agriculture.

Source: SEGES, the Danish knowledge centre for agriculture.

SEGES has 600 employees, of whom 480 have an academic education. There are represented 70 different educational qualifications at SEGES.

SEGES builds bridges between research and practical farming, and in order to cover all aspects of agriculture SEGES has a very broad scope of activities presented in figure 5. SEGES ensures that the latest knowledge and technology is deployed by Danish farmers on their farms as quickly and efficiently as possible.

Figure 5. SEGES Scope of activities.

Source: SEGES, the Danish knowledge centre for agriculture.

Organisation and decision making at the local advisory centres

Every local advisory centre operates as an independent enterprise, where farmer members can purchase advice and other services as they require.

The local advisory centres are normally organised in departments for each production sector with each a Head of Department. For some of the department there is a committee of three to four elected farmers to whom the Head of Department is responsible. The department committees define the framework within which the advisers work and are also responsible for the departmental budget. The overall Executive Management of the Advisory Centre is responsible to the Supervisory Board of farmers elected by the local farmers' organisations.

The distribution of advisory fields among employees

The distribution of employees within the departments in the Danish Agricultural Advisory Service, 2017 is shown in the table below. As seen from the figures the majority of employees at the DAAS-centres are working with 'Farm accounting' covering bookkeeping, economic advice and business management.

Table 3. The distribution of advisory fields among employees at the DAAS-centres

Farm accounting	Plant production	Dairy & Cattle	Pig production	Others	Total
1550	410	85	65	370	2.480

Source: SEGES, the Danish knowledge centre for agriculture.

Educational levels among advisers

In 2019 approx. 50% of all employees at DAAS including SEGES, the Danish knowledge centre for agriculture have an academic education. At SEGES 480 employees have an academic education.

On the agricultural schools about one third of the teachers have a university degree. Some of the teachers have educational background from the agricultural schools themselves supplemented with in-service training and experience. Most of the rest of the teachers have an educational background, and this is very traditional, as primary school teacher.

Advisory methods

Interviews in 2014 and a former conducted survey showed that a large variety of advisory methods are being used by the advisers. This include face to face and visit at the farm 40%, meeting with groups of farmers 10%, conducting demonstrations, workshops and field days for farmers and meeting with farmers at the office 30%.

The internet as a knowledge source has been in use for many years now. SEGES is running several websites either on its own behalf or on the behalf of others where knowledge and information are distributed. There are three categories of websites: 1) A news site regarding all kinds of news within or with relevance to the agricultural sector. This site is open for everybody and contains commercials. 2) SEGES is running a number of sites, where knowledge from projects funded by public or partly public funds is distributed. These sites are, too, open for everybody. 3) SEGES is running a website where all agricultural knowledge and every type of relevant knowledge for the sector is gathered, e.g. legal questions, latest news of the local need for the use of pesticides etc.. This site is partly closed and some articles are only open through subscription (see (only in Danish) https://www.landbrugsinfo.dk/Sider/Startside.aspx)

The use of information and communication technologies such as the mobile phone, tablets, apps and social media have increased tremendously.

A typical adviser at a DAAS-centre spends around 60% of his or her time with educational and advisory service activities directed towards the customer – the farmer. 35% of the advisers working hours are spent with planning and support activities.

In 2014 it was not possible to detect any general data or answers across the companies on the number of farms per adviser. The figure seemed to vary a lot depending on the type of farm and the type of advisory company – whether it is an advisory company offering a variety of advisory services compared to companies specialised in only one or few areas of advisory services to large input/up-streams companies advising about/selling their products.

4.4 Client and topics/content

The Danish advisory system - both the DAAS-centres and the private advisers - is capable of delivering the services including all topics within organic farming demanded by the Danish farmers, including large, small, full-time and part-time farmers. This includes young farmers (less than 40 years) and young farmers are perceived as one of the most important groups. Though in recent years attention among SEGES and the DAAS-centres have been directed towards the challenges of offering services to a sector undergoing a continued structural development where the large farms are growing in size while the number of smaller farms – where the overwhelming majority are part-time farmers with a job outside the agricultural sector – remained the same. This development meant that the traditional customer (the medium-sized farm) were those most rapidly leaving the sector. This has led DAAS to focus on developing advisory services targeted the very large farms who increasingly are looking and working like ordinary private companies.

At the other end of the spectrum more attention has been directed towards part-time farmers who will not or cannot pay the same for advisory services as full-time farmers and who have other needs, e.g. an interest in nature preservation or farm shop. In recent years SEGES has furthermore put attention to those farmers who would like to change their traditional farm into a more diversified enterprise with increased variety of products, e.g. tourism or farm shop with own or local products.

Other new areas of advisory services are services related to how the farmers are to deal with laws and regulations related to the issue of the environment. Advisory services related to the subject of the environment have increased since the 1980s when environment as a political issue came on the political

agenda. The newest type of farmers' demanded services is advisory services related to bioenergy, resource efficiency, the use of financial products, improvement of sustainability, including reduction of climate impact.

Danish farmers are not asking for much advisory service regarding rural development. The reason for this is twofold: 1) There are not many new possibilities for new earnings or income seen in the perspective from the farmer, 2) the public implementation of the rural development programme done through the regions have not included the agricultural sector. The farms in the country side are simply seen as farms and not as SMEs and furthermore it has been difficult to see the farms as companies that could create new types of business for the local communities. This situation may also be an unintended effect of the Danish advisory system and of the organisation of the entire Danish agricultural sector whereby most activities are under the control and in the hands of farmers themselves through their extensive network of associations with long historical roots. This excludes the areas of environment, spatial planning of the territory and the veterinarian control- and regulatory system which are in the hands of the government.

Beside these new trends Danish farmers are as always demanding advisory services within the classical topics of crop production and production of pig, cattle and other animals.

The DAAS-centres have approx. 4,600 customers outside the agricultural sector. Local knowledge and a long tradition and knowledge of advising SMEs have helped the DAAS-centres to attract these new customers. Attracting new customers who are not farmers has been a deliberate strategy in the face of the structural development with still fewer farmers.

4.5 Linkages with other AKIS actors

The impacts of the agricultural funds for development have been substantial. As the funds are utilised on the part of research and development that is closest to practise, it has enabled the collaboration between the universities and SEGES, the Danish knowledge centre for agriculture. The universities address the needs for basic and strategic research in the areas of agriculture and food, while SEGES contributes with research and practise related trial development, advice and implementation. This division of roles enables development at a very high level of professionalism and is a strong contributing factor to the success of the Danish agricultural sector both in terms of production and environmental sustainability.

The particular set-up of the agricultural funds – the production levies funds and the tax reimbursement funds – with representation of the farmer organisations in the boards ensures ownership by the sector and thereby a strong engagement in order to ensure the maximum added value from the allocated funds. Hereby the funds have enabled independent testing of new technologies as well as development of knowledge that is closely related to the farmers' actual challenges. The independent trials and testing have had crucial outcomes for the farmers' ability to adapt to new policy frameworks which the very low use of pesticides and nitrogen in Denmark illustrates.

Farmers make their influence on priorities and the actual running of the agricultural research through the governance structures. As a general rule for both public and private funded research, there are representatives from both the farmer organisations and the advisory services in the research councils and also in the steering committees for most research programmes and projects. This ensures the relevance of most research programmes from both the perspective of the agricultural sector and the rest of society. Moreover, the fact that the production funds and the tax reimbursement fund is headed by a practice-based board that decides what the strategic focus should be for the individual fund, and which projects are to be granted grants, is another important aspect of the agricultural innovation system and contributing to effectiveness of agricultural knowledge creation and adaptation of new technologies in Denmark.

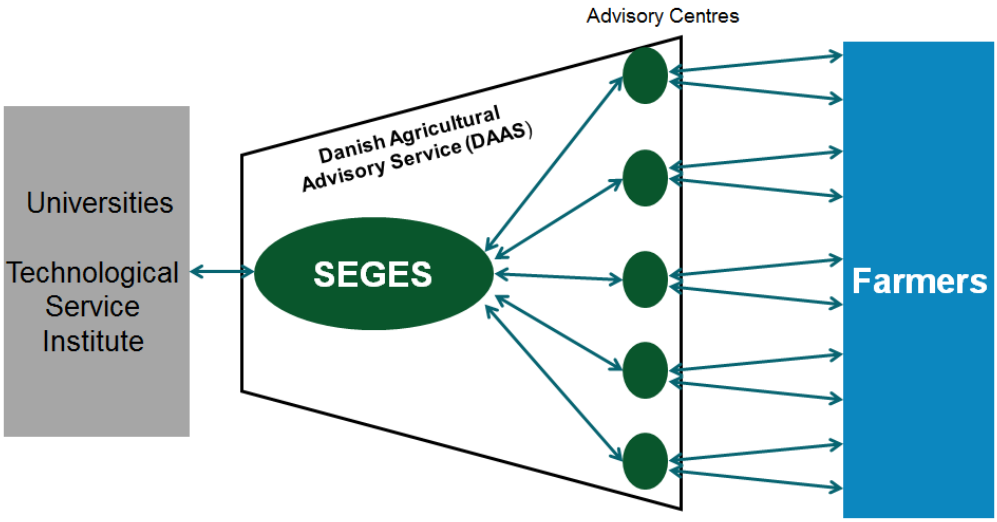

Figure 6. An overview of the knowledge links between agricultural research and sharing of knowledge in Denmark.

Source: SEGES, the Danish knowledge centre for agriculture.

It is characteristic that the innovation and knowledge system involves collaboration between many stakeholders and institutions in Denmark:

- Research institutes – of which the main agricultural and life science oriented universities is Aarhus University and University of Copenhagen.
  Denmark does not have separate sector research institutions in the field of agriculture and food, due to the fact that they were merged with the universities in 2007. Thus, the universities, in agreement with the Ministry of Environment and Food, carry out scientific advice, sector-supporting research and the maintenance of the necessary veterinary and food safety preparedness, laboratory activity, etc.
- The Danish Agricultural Advisory Service (DAAS) including SEGES, the Danish knowledge centre for agriculture.
- Farmers and their organisations.
- Private advisory companies.
- Technological Service Institute, a GTS-institute – establishes collaboration between companies, research institutions and advisory services on different technology innovations within the agricultural area.
- Input supply companies such as seed companies, chemical factories developing fertilisers and pesticides, feed factories, livestock breeding associations, manufacturers of farm machinery and equipment etc.
- Food industries.
- Agricultural colleges.

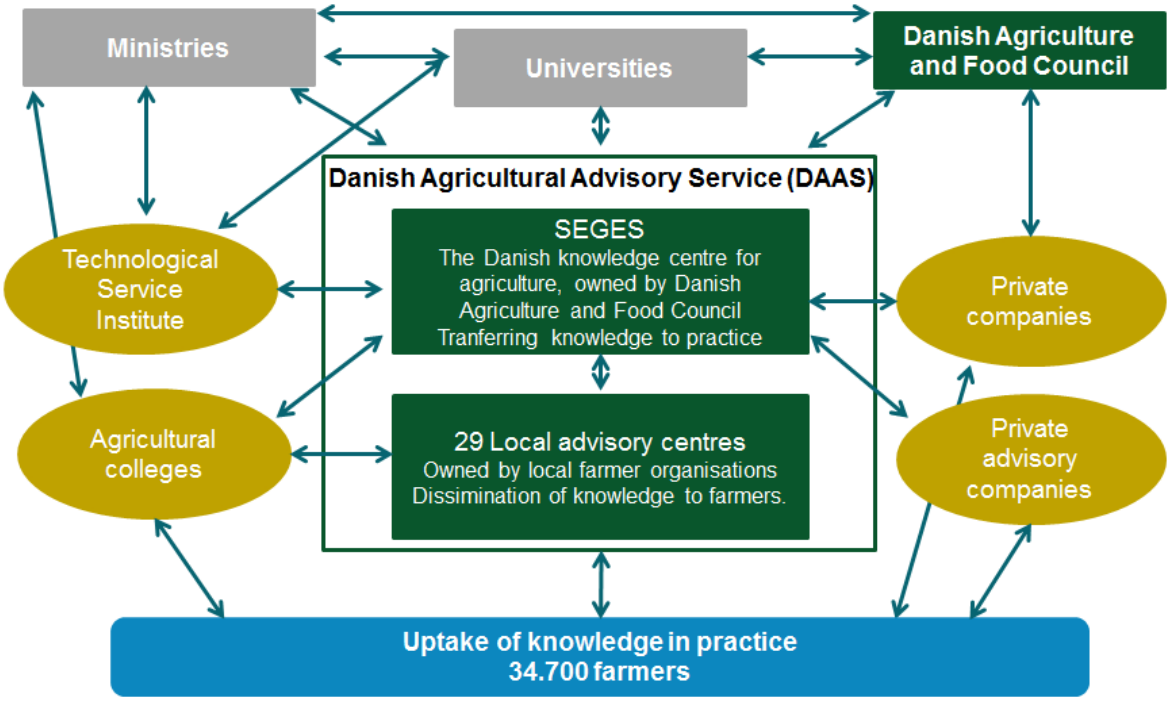

Figure 7. The knowledge channels of the Danish AKIS.

Source: SEGES, the Danish knowledge centre for agriculture.

In terms of identification of research topics and issues important and crucial for the Danish agriculture, SEGES has developed a bottom-up approach and practices directly involving outspoken and engaged farmers; representatives of the farmers' unions, directors and advisors of the local advisory centres, researchers from universities, private companies etc.

This process goes generally through several stages ending up with the prioritised research issues and recommendations.

The inspiration phase

Initially the five sector boards: Cattle, Danish Pig Production, Crop Production, Organic Production and Business decide the focus areas for the coming year based on the individual sector strategies. Based on this the first stage is initiated, which is the inspiration phase.

SEGES and the sector directors/managers organises inspiration forums of ideas with relevant researchers from the universities, agricultural advisers, farmers etc.

At the Danish Agricultural Advisory Service (DAAS) level user-driven dialogue meetings are organised with DAAS and the elected farmers from the Farmers' Unions.

These activities generate a number of ideas and project proposals and direction for the structure of the concretisation phase is decided.

The concretisation phase

During this phase the project proposals and ideas from the inspiration phase are going through different screenings. The sectors each have their own procedures for screening the ideas. Overall, there are following steps:

- A test for research suitability.
- A test for the potentials for agricultural development.
- A test for the business potentials.

The priority phase

Based upon the results of the screenings from the concretisation phase the sector boards decide, which projects and activities to apply for funding for the coming year.

The application phase

On the background of the individual project's activities, any collaborators, etc. it is assessed and decided where funds are to be applied for. Subsequently, applications are made to the relevant funds.

The above process ensures that the activities, for which funding is sought, is based on the farmers' needs and therefore supports future agricultural practices and business.

5. Characteristics of Farm Advisory System

5.1 Organisations forming FAS

In Denmark there are no organisations as such either public or private who operate or perform as FAS-organisations. A number of advisers went on supplementary training back in 2006 and became certified advisers according to the minimum statuary rules of FAS. The Knowledge Centre for Agriculture was responsible for the training course and certification. This happened on request and behalf of the Ministry of Environment and Food. No specific assessments were carried out and the implementation of FAS was thus designated to be part of the framework of existing advisory services, where the major criterion for implementation and use of the national FAS would remain at the farmers and their effective demand for the services (*Evaluation of the Implementation of the Farm Advisory System* 2009; p. 18-25). But like some others countries (BE, FI, NL and SE) the FAS in Denmark were seen as something introduced from above, top-down, as an autonomous institutional set-up alongside or within the existing advisory and extension system. Since 2006 new advisers have not been trained with regard to the Directive with the requirement of establishing a Danish version of FAS. Neither the Ministry nor the farmer based advisory organisations have kept a record of the advisers who were certified back in 2006 to the extent the interviews in 2014 have been able to reveal this fact. Therefore it has not been possible to get any confirmed knowledge of whether or not an official public record of certified advisers exists. Thus the FAS has not been used or implemented in Denmark as it de facto has been seen as redundant by all actors of the Danish AKIS and by the public authorities, because a well-established advisory service system covering all farmers was already in place. This was also revealed in the report *Evaluation of the Implementation of the Farm Advisory System* from Dec. 2009, which showed a rather low rate of involvement and interest from the Danish side. As stated in *Evaluation of the Implementation of the Farm Advisory System* Denmark along with three other Member States (FI, FR & NL) considered that there was not any more need for FAS in their country (p. 97).

Further about the FAS in Denmark - see below.

5.2 Give an evaluation of the implementation of FAS

Since 1 January 2007 it has been compulsory for the Member States to set up the Farm Advisory System (FAS). Denmark took initiative to do so in the years 2005 and 2006. In 2005 the setting up of the FAS in Denmark began on the basis of two cabinet regulations. The first regulation dealt with the establishment of a system of accreditation and the Ministry of Environment and Food asked the DAAS-system of advisory centres in the form of the Knowledge Centre for Agriculture to take responsibility for establishing a short-term educational and training programme for advisers to become a certified FAS-adviser. The Knowledge Centre for Agriculture developed a course and carried it through with a large number of advisers. The courses only dealt with Cross Compliance that is the minimum requirements of the FAS (Pillar one as defined in regulation (EC) Number 1782/2003), the field of environment, food safety, animal health and welfare (Statutory Management Requirements – SMR) and the requirements under the obligation to maintain land in good agricultural and environmental condition (GAEC).

The second regulation dealt with the (public) financial support of the Danish version of the FAS, but *only* for the year of 2006. The reason for only dealing with the financing of FAS for the year of 2006 probably rest on two arguments. First of all and very typical for the Danish public authorities, they were quick to respond to new directives from the Union, and implement the Danish FAS. Secondly the reason for this one year financing mechanism of the Danish FAS is probably due to the fact that the public financial support to the FAS from the year 2007 and onwards was to be found in the Danish version of the Rural Development Programme for the period of 2007-2013. But when the Danish Rural Development Programme was launched, any reference to the FAS and any public funding or support was left out. The completed courses by and at the Knowledge Centre for Agriculture and the undertaken training course of a group of advisers in 2006 thus have not been repeated. So in practice there has

not been any Danish FAS. The interviews conducted also revealed that FAS is unknown to all AKIS-actors interviewed, including public officials.

This means that FAS *formally* was established but not in use in the Danish AKIS. One interviewee - who was approached especially in relation to having some knowledge about the introduction and implementation of the FAS back in 2006 and 2007 - stated that officially it would probably be claimed that a Danish FAS exist, since a number of advisers have been trained and certified, but in practice no farmers demanded or had any need for advice according to the formal umbrella of FAS. Practically there has not been any need for the Farm Advisory System in Denmark, since Denmark already had a well-established system of advisory services which met the intention and requirements of the FAS before the introduction by the European Union of the obligation to set up the FAS. The advisory services provided in Denmark by both farmer-owned and private-owned companies already did this or were able to do so from the introduction of the CAP- reform of 2003, where the cross compliance regime was introduced in order to connect the respect of existing directives and regulations to EU direct payments. Thus national rules and the national implementation of European directives and regulations were already covered more than the minimum demand in the FAS about cross compliance. For example – according to the interviewee – today about 120 cross compliance rules and regulations exist, which also cover or meet the demands of the Statutory and Management Requirements (SMR) and the Good Agricultural and Environmental Conditions (GAEC) compared to that of 30 rules and regulations of cross compliance of other Member States. Already before the introduction of the FAS nearly all Danish farmers including part time farmers used and still are using advisory services to meet the demands from the public authorities in order to receive direct payments from the CAP. Conversely all local DAAS centres together with most private advisers - both private companies and individual private advisers - are able to provide advisory services in relation to the rules of cross compliance. For instance it is mandatory for every farmer to work out yearly a fertiliser plan for his holding. This is done with assistance from advisers. The farmer is then given a fertiliser account of approved amount of fertilisers to be used. If he/she does not apply to the amount given in the fertiliser plan, he or she will face a financial payment in the form of reduced direct payments or will have to repay direct payments (*Agri-environmental measures in the Baltic Sea Region*, 2011).

6. Summery and Conclusions

Overall the Danish AKIS and the Danish advisory service system are both strong and able to produce and deliver both knowledge and advisory services to all groups of Danish farmers, but some challenges might occur for both of them.

6.1 Summery and conclusions on section 1-3

Denmark is (still) an agricultural country where almost two thirds of the area are cultivated and the animal production is high, especially and foremost the pig production. The sector is still important for the Danish economy and export of agricultural products including products from a significant agribusiness and agro machinery industry is of high importance for Danish employment and trade balance. If one disregards the financial crisis which has affected the sector, the challenges for the sector have since the 1970s or at least since the 1980s all been related to the sector's relations to the surrounding society - initially the questions of environmental impact/sustainability and the impact on animal welfare from an increasingly industrial scale of production. Within the last 10-20 years the parameters of environmental impact/sustainability and animal welfare have been supplemented with the question of agricultural production and climate changes (both agriculture's impact on the climate and also challenges for the agricultural sector stemming from climate changes) and the production of bioenergy as both fuel and substitutes for current unwanted chemicals. But these challenges have also been positive as driving forces in the continuous development of Danish agriculture and as new opportunities for how Danish agriculture could keep its position in front of agricultural production when demands from the political agenda and from the consumers were transformed into production advantages and innovations.

The Danish AKIS and advisory system are strong due to their deep roots in long historical traditions and due to some specific institutional legacies and characteristics of the Danish AKIS and advisory system. There has been a powerful class of farmers – population – in the country side, since the nineteenth century, a very strong dependency on agriculture as *the* main earner of foreign currency until the 1960s – and today the Danish food cluster is the largest competency cluster in Denmark. This in combination with an advisory system controlled by a system which is demand driven by the daily needs of the farmers and finally input and downstream companies also in the hands of the farmers have created a very strong and viable agricultural advisory system. Furthermore the advisory system has been strengthened by a traditionally close cooperation and network between Danish agriculture and Danish agricultural sciences.

The basic characteristics and surprise of the links between the different parts of the Danish AKIS are that they are at the same time both very informal as there are no or very few official documents papers connecting them, and on the other hand they are rather strong linkages. This basic characteristic is even more evident and especially strong concerning the Danish advisory system with its dense network of formal and personal linkages between associations, organisations, boards, institutions and companies. And at the centre of all these linkages are the Danish farmers or their representatives.

Denmark thus has overall a well-functioning AKIS with strong links between universities, public ministries and agencies, agricultural knowledge centres, agricultural colleges and vocational schools, advisory companies, and farmers and vice versa. Furthermore the Danish AKIS and advisory system are responsive towards the needs of the farmers and the demands and wishes from the political system and the public. But there are challenges.

<u>Challenges for the Danish AKIS and the Danish advisory system</u>

The number of full-time farmers continues to decline. The classical farmhouse farm may be at its end, and in future the ever increasing growth in size of farms will turn farms into large scale farms organised legally as a business owned by financial actors outside the sector and thus turning the farmer into a farm manager employed on ordinary employee conditions and not owning his own farm. Further-

more the number of people who are employed or just having contact with the agricultural sector and farmers in the countryside are also decreasing. Will this affect a system based on farmers' associations and the accompanying dense network of farmer controlled organisations including the farmer owned and controlled advisory companies?

The increased size of the large full-time farms on one hand and the many part-time farmers with farming more or less as a hobby on the other hand confront the advisory system with the challenge of serving two different groups of customers while the traditional dominating customer – the middle sized farmer – are the farmers most rapidly disappearing. The advisory companies have been confronted with this issue within the last 5-10 years. Again the expectation among interviewees in 2014 was that the flexibility of the Danish advisory system will make sure that the advisory companies will adjust to this development and new needs. And rightly this development is already happening.

The decreasing number of farmers with resulting decreasing number of customers

So far the demand for advisers has not experienced any structural fall in demand (apart from the impact from the financial crisis). But the number of DAAS-centres has continued to fall through the last decades and is predicted to continue do so. How will the situation be like when there are only few DAAS companies left? Will they corporate in the DAAS-cooperation? And will they still be in a need of the Danish knowledge centre for agriculture? The interviewees in 2014 who brought up these issues were not nervous and predicted that the Danish advisory service system would continue to exist in the existing form.

The increased educational level and the continued trend for specialisation among farmers

The knowledge level among Danish farmers has always been high due to farmer cooperation and a very long tradition for attending agricultural educations – first and foremost the agricultural colleges. But today's Danish farmer - especially the young ones - has a very high knowledge level and many of them themselves have a high level of agricultural education. In addition to this the agricultural production is continuing the process of getting still more specialised. This confronts the advisers when meeting the needs and demands of the farmers. This may be a challenge and even a threat to the traditional advisers but can bring new demands and new types of advisers forward and change the composition of the group of advisers. The development may be strengthened by the fact that the increasing number of full-time farmers is seeking advice concerning the topics of entrepreneurship, management, or being a business owner with a multitude of employees. And on the other hand farmers, especially part timer farmers, who have not seen the same decrease in number as the medium sized farmer, are seeking advice on product differentiation. The advisory companies expect to be able to respond to this change in need and to this development for the business.

The impact of the reform of the universities in 2007 – good or bad?

In 2007 the Royal Veterinarian and Agricultural University was made part of the University of Copenhagen and elements of the agricultural research within the public sector were merged with the Aarhus University and the Technical University of Denmark. This meant that research within the public sector was transferred from the Ministries and merged with the universities. Various people have feared that this could have an effect on the type and level of applied research done within different fields including agriculture in Denmark. Some of the interviewees in 2014 agreed to this analysis and feared that the attention towards applied research and the funds for applied research would be reduced. Furthermore that such a development may turn away the academic meritocracy from applied sciences. They feared that in the future this would affect the production and supply of knowledge with direct relevance to the farmers and the accompanying advisory service sector. Some interviewees were more optimistic and thought the farmer controlled advisory system may be able to deal with this challenge and situation and bring about what the sector may need in terms of agricultural research. Furthermore political attention nationally and in the European system towards applied sciences and the political desire of a stronger focus on getting innovation and more knowledge implemented into practice will work in the opposite direction.

The number of young people attending agricultural educations at the agricultural colleges, vocational schools and at the universities

The number of young people attending agricultural colleges and vocational schools has increased after a decrease. In 2015 and 2016 there were approx. 260 applicants to the agricultural colleges. In 2017 this number increased to 325. The number of pupils is so far sufficient to satisfy the demand of the sector. The main challenge is to get an adequate number to go for a higher level of agricultural education and the level of managerial education, rather than just to settle with the traditional farmer training level. But again there is not any deep pessimism, although the traditional system of agricultural colleges is under pressure. Over time the numbers of agricultural colleges will probably be reduced even further.

It is a challenge for the agricultural sector and the advisory system to make the sector and the profession attractive. The sector cannot take for granted that young people will choose agricultural educations and a career in the Danish advisory system.

The students at the universities are not enrolling in the same number as earlier when it comes to the classical agricultural university educations - but again no deep pessimism. The industry will manage and already today the highest numbers of advisers work within business and bookkeeping. Furthermore in the future the highest growth in the demanded services will be in relation to the increasing regulation of the agricultural sector and advisory services concerning the issues related to the environment, sustainability, the climate, bioenergy and biotechnology.

Erosion of production levies funds and the tax reimbursement fund?

Some fear that the system of levy funds paid in by the farmers with the backing of the public authorities is under pressure. Fear is especially expressed in relation to the dominant tax reimbursement fund for agriculture, which is the largest fund and which funds stems from taxes on pesticides. This fund has traditionally both contributed to the production funds and also been the main source for financing new and common projects with common value for the entire agricultural sector. Even today the significance of the dominant tax reimbursement fund is great, as this is very important for the research and innovation activities carried out by, among others, SEGES, the Danish knowledge centre for agriculture and the National Organic Organisation. In the last few years the actual value of the funds from the tax reimbursement funds have been reduced as the fund is only receiving an unchanged fixed sum from the State budget for the last couple of years.

6.2 Summery and conclusions on section 4+5

The core of the Danish advisory system is the farmer based owned and controlled DAAS-system with SEGES, the Danish knowledge centre for agriculture (600 employees) and 29 advisory centres (about 2,480 employees), who are independent from one another and who are all members of the DAAS-cooperation. This is called the two-layer system. Outside the DAAS system two private medium-size advisory companies exist with respectively around 70 employees (Patriotisk Selskab) and 40 employees (LVK – Landbrugets Veterinære Konsulenttjeneste). There are 10–15 relatively small advisory companies with a total of 95–125 employees. In addition to this there are also some very small advisory enterprises with 1–3 owners/employees, who have a total of 65–90 owners/employees. In addition to these companies a number of medium sized and smaller veterinarian companies provide veterinarian advisory services to the farmers, sometimes on the basis of legal requirements, e.g. mandatory animal health visits on the farms. Finally the GTS-institute, Technological Service Institute within the agricultural sector exists. Their job is to assist research and businesses within agriculture and food in order to facilitate product and technology introduction, development and innovation in the agricultural and food sector.

Universities, agricultural colleges and vocational schools are all important in educating the future scientists, researchers, agricultural teachers and farmers. They are also important providing new

knowledge and research, knowledge transfer, educations, training etc. – together with SEGES, the Danish knowledge centre for agriculture, the DAAS-system and with non-agricultural public and private institutions and companies.

The financing of mainly the services provided to the farmers is done through billing services. Since the beginning of the 1990s there have not been any public funds providing or paying some of the costs regarding advisory services.

SEGES, the Danish knowledge centre for agricultures income originates from sales of services, project financing from national and European funds, from levy funds paid by the Danish farmers and a small sum from the Danish Agriculture and Food Council. Some of the research and innovation funding within the area of pig production stems from the sales of genes.

The Farm Advisory System (FAS) does not play any role for the Danish AKIS and for the delivery of advisory services. Formally a number of advisers received training in order to fulfil the minimum requirements – the field of environment, food safety, animal health and welfare (Statutory Management Requirements – SMR) and the requirements under the obligation to maintain land in good agricultural and environmental condition (GAEC) – of the FAS back in 2006, the year before the implementation of the FAS in the Member States, but there have not been any demand for or delivery of these services. The FAS is thus implemented in Denmark but not in use as there is no need of FAS. The existing supply of advisory services - both in terms of the number of advisers, the qualifications of these advisers and the supply of advisory subjects – make up a well-functioning advisory system which covers the intention of the FAS. Furthermore the extensive number of public regulations and laws to respect in order to receive direct payments fully covers the minimum requirements sat by FAS.

This leads us to the advantages of the Danish advisory system.

Generally the Danish advisory system is characterised by:

- Its impartialness.
- Being non-profit.
- Its ability of fast and effective implementation of the newest knowledge.
- Its high impact in terms of reaching the desired goals of the sectors.
- An effective channel for knowledge transfer through the 2-layer system within Danish Agricultural Advisory Service made up of SEGES, the Danish knowledge centre for agriculture and as first layer and 29 independent advisory companies in the DAAS-cooperation. This is supplemented by the GTS-institute, Technological Service Institute.
- Its ability to produce and bring knowledge and value to the Danish agricultural sector and the Danish society, e.g. to develop and to administer a series of databases covering Danish agriculture such as data on animals and arable land and through its activities to assist with implementing public policy goals.
- Being highly flexible to new needs, technologies and to the structural changes within Danish agriculture.
- Its ability to quickly and effectively initiate research and innovation activities based on farmers' needs.
- Being based on the cultural heritage characterised by independence, mutual trust and a deep-rooted tradition for cooperation.

The Danish advisory system is thus today still a vivid and powerful system. It is still a system working for the benefit of the Danish farmer and where the Danish farmer has the control. The two main factors are that firstly the Danish advisory system is a demand-driven system. It is the need of the farmer, which drives the system in terms of providing existing and developing new advisory services.

Secondly and as the backbone of the Danish advisory system most advisory services are provided by farmer owned companies. Thus the Danish farmer interacts with a system where he is both customer and owner at the same time. This ensures a system which *at the same time* is robust, stabile and comprehensive on the one hand and on the other hand makes the system flexible in order to adapt to new challenges and needs of the farmers.

7. Methodological reflections

This report is based on the Danish country report “AKIS and advisory services in Denmark – Report for the AKIS inventory (WP3) of the PRO AKIS project” outlined in the project PROAKIS “Prospects for Farmers’ Support: Advisory Services in European AKIS”. April 2014. The project received funding from the European Union’s Seventh Framework Programme for research, technological development and demonstration under grant agreement no 311994.

This report is prepared in February 2019. Information on organizations, structures statics etc. has been updated. Comments and conclusions are also adjusted in relation to the current situation for the Danish agricultural advisory services. Updates and adjustments have been made by employees at SEGES.

The report in 2014 was based mainly on semi-structured interviews conducted and supplemented with short interviews with people identified who had a specific knowledge of a topic or of one part of the Danish AKIS or Danish advisory system. The first round of semi-structured interviews was supplemented with two additional semi-structured interviews and with some short interviews.

Regarding identifying the private agricultural advisory companies – not the input or output companies, but the private companies owned and run by private advisers outside the DAAS-system - this was quite a challenge both in 2014 and 2019 as there is no public record of either companies offering agricultural advisory services or any public list of all agricultural advisers in Denmark. These private advisory companies were thus – but also due to lack of time and resources – identified through internet research. The veterinarian companies also thought to be part of the AKIS and advisory system and they were also identified through internet research.

8. References

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9. Appendices

Appendix A – Overview of organisations creating the Danish AKIS

Provision of service												
Status of the organisation	Type of organisation	Number of organisations	Number of advisers	Public funds			Farmers			Private	Other	
				EU funds	National funds	Regional funds	Farmers' levies	Farmers' contribution	Billing services	Other products (in-, output)	
Public sector	The Danish Agricultural Agency	None	-									
	Local/regional agencies	None	-									
	Other (specify)	None	-									
Research and Education	University (all public)	5	None									
	SEGES, the Danish knowledge centre for agriculture	1	520	X	X	- -	X	- -	X		X	
	Technological Service Institute, AgroTech	1	80		X	X					X	
	Other education bodies: Agri. colleges + voca. school	10 + 8	None (Teach)									
Private sector	Upstream industries	6-8	40-60	-	-	-	-	-	-	X	-	
	Downstream industries	-	-									
	Independent consultant	-	65-90	-	-	-	-	-	X	-	-	
	Private agricultural advice company	10-15	95-125	-	-	-	-	-	X	-	-	
	Farmers' owned advice company – DAAS		1,680	-	-	-	-	X	X	-	-	
	Farmers' owned advice company – outside DAAS	2	85	-	-	-	-	-	X	-	-	
Farmer based organisations	Farmers' cooperative	None	-									
	Chambers of agriculture	None	-									
	Farmers' circles/groups	None	-									
	Other	None	-									

Appendix B – List of Danish AKIS Institutions

Status of the organisation	Type of organisation	Organisation	Website
Public sector / State organisations	Ministries	Ministry of Environment and Food	Ministry of Environment and Food of Denmark
		Ministry of Higher Education and Science	https://ufm.dk/en/the-ministry/organisation/the-ministry
	Agencies under ministries	The Danish Agricultural Agency (Under the Ministry of Environment and Food)	https://eng.lbst.dk/
		The Danish Environmental Protection Agency (Under the Ministry of Environment and Food)	https://eng.mst.dk/
		The Danish Nature Agency (Under the Ministry of Environment and Food)	https://eng.naturstyrelsen.dk/
Research and Education	Universities and research institutes (all public)	**Copenhagen University, Faculty of Science**	http://www.science.ku.dk/english/
		Department of Food Science	https://food.ku.dk/english
		Department of Geosciences and Natural Resource Management	http://ign.ku.dk/english/
		Department of Plant and Environmental Sciences	http://plen.ku.dk/english/
		Department of Food and Resource Economics	http://www.ifro.ku.dk/english/
		Department of Veterinary and Animal Sciences	https://ivh.ku.dk/english/
		Aarhus University, Science and Technology	http://scitech.au.dk/en/
		Aarhus University, Department of Agroecology	http://agro.au.dk/en/
		Aarhus University, Department of Food Science	http://food.au.dk/en/
		Aarhus University, Department of Animal Science	http://anis.au.dk/en/

Status of the organisation	Type of organisation	Organisation	Website
		DCA – Danish Centre For Food And Agriculture	Dhttp://dca.au.dk/en/?no_cache=1&cHash=4f4b1bcc2ec367dc30ce133ed9bb49ec
		DCE – Danish Centre For Environment And Energy	http://dce.au.dk/en/?no_cache=1&cHash=4f4b1bcc2ec367dc30ce133ed9bb49ec
		Technical University of Denmark:	*http://www.dtu.dk/english/*
		DTU Aqua – National Institute of Aquatic Resources	http://www.aqua.dtu.dk/english/
		DTU Food – National Food Institute	http://www.food.dtu.dk/english/
		DTU Vet – National Veterinary Institute	http://www.vet.dtu.dk/english
		University of Southern Denmark:	https://www.sdu.dk/en
		Danish Centre for Rural Research	http://www.sdu.dk/en/Om_SDU/Institutter_centre/C_clf_CenterLanddistriktsforskning.aspx
		Centre for Fisheries & Aquaculture Management & Economics	http://www.sdu.dk/en/Om_SDU/Institutter_centre/C_FAME.aspx
		Department of Sociology, Environmental and Business Economics.	http://www.sdu.dk/en/Om_SDU/Institutter_centre/I_miljo_og_erhvervsoekonomi
		Aalborg University:	https://www.en.aau.dk/
		Department of Planning	https://www.en.plan.aau.dk/
		Department of Learning and Philosophy	https://www.learning.aau.dk/
	Agricultural colleges (farmer based) (all public funded)	Agroskolen Hammerum	http://www.agroskolen.dk/
		Asmildkloster Landbrugsskole	http://www.asmildkloster.dk/
		Bygholm Landbrugsskole	http://www.bygholm.dk/
		Dalum Landbrugsskole	http://dalumls.dk/
		Grindsted Landbrugsskole	http://www.grindstedlandbrugsskole.dk/en.html
		Gråsten Landbrugsskole	http://www.gl.dk/

Status of the organisation	Type of organisation	Organisation	Website
		Jordbrugets UddannelsesCenter Århus (Horticulture, Agriculture and Forestry)	http://www.ju.dk/
		Kalø Økologiske Landbrugsskole (Organic agricultural school)	http://www.kalo.dk/
		Kjærgård Landbrugsskole	http://www.kjls.dk/
		Nordjyllands Landbrugsskole	http://www.njylls.dk/
	Vocational schools offering agricultural educational programmes (all public)	Tech College Aalborg	https://techcollege.dk/uddannelser/agri/
		CELF – Center Erhvervsrettede Uddannelser Lolland Falster	http://www.celf.dk/
		Kold College	http://www.koldcollege.dk/
		Uddannelsescenter Holstebro	http://www.ucholstebro.dk/
		EUC Nordvest	http://www.eucnordvest.dk/ The agricultural department: http://eucnordvest.dk/landbrug/om-morsoe-landbrugsskole/
		Hansenberg	http://www.hansenberg.dk/ The agricultural department: https://www.hansenberg.dk/uddannelser/erhvervsuddannelser/foedevarer-jordbrug-og-oplevelser/grundforloeb-1-dyr-landbrug-og-gartneri/landmand/
		Roskilde Tekniske Skole	http://www.rts.dk/ The agricultural department: http://www.rts.dk/afdelinger/akademiet/landbrugsskolen
		Selandia CEU	https://www.zbc.dk/ The agricultural department: https://www.zbc.dk/kurser-og-efteruddannelse/gartneri-anlaeg-og-landbrug/landbrug/?subject=12523

Status of the organisation	Type of organisation	Organisation	Website
Private sector / Organisations	**Farmer owned advisory companies**		
	R&D and advisory services	SEGES, the Danish knowledge centre for agriculture	In Danish https://www.seges.dk/da-DK In English Shttps://www.seges.dk/en
	Advisory services – The DAAS nationwide network of 29 independent agricultural advisory services companies	DAAS (comprised of 29 independent agricultural advisory centres and SEGES)	http://www.dlbr.dk (only in Danish)
	DAAS – Centres:	**Individual Advisory Service Organisations**	
		Agri Nord	http://www.agrinord.dk/
		Agrovi	http://www.agrovi.dk/
		Bornholms Landbrug & Fødevarer	http://www.bornholmslandbrug.dk/
		Centrovice	http://www.centrovice.dk/
		Djursland Landboforening	http://www.landboforening.dk/
		Kolding Herreds Landbrugsforening	http://www.khl.dk/
		Landbo Limfjord	http://www.landbo-limfjord.dk/
		LandboNord	http://www.landbonord.dk/
		LandboSyd	http://www.landbosyd.dk/
		LandboThy	http://www.landbothy.dk/
		Landbrugsrådgivning Syd	http://www.lrs.dk/
		Lemvigegnens Landboforening	http://www.lemvig-landbo.dk/

Status of the organisation	Type of organisation	Organisation	Website
		LHN	http://www.lhn.dk/
		LMO I/S	http://www.lmo.dk/
		nf plus	http://www.nfplus.dk/
		Odsherred Landboforening	http://www.ohla.dk/
		Rådgivningscenter Nord	http://www.hjff.dk/
		SAGRO	http://www.sagro.dk/
		Sønderjysk Landboforening	http://www.slf.dk/
		Vestjysk Landboforening	http://www.vjl.dk/
		VKST	https://vkst.dk/
		Østdansk Landboforening	https://ostdansk.dk/
		Collaborations on specific advisory services.	
		Byggeri & Teknik I/S (owned by Lemvigegnens Landboforening, Vestjysk Landboforerning, Djursland Landboforening and SAGRO)	http://www.byggeri-teknik.dk/
		BK Nord (owned by AgriNord, LandboThy and nf plus)	http://www.bk-nord.dk/
		KvægXperten (owned by AgriNord, Landbo Limfjord and LandboThy)	http://kvægxperten.dk/
		Svinerådgivningen (collaboration between Kolding Herreds Landbrugsforening, Lemvigegnes Landboforening, LHN, SAGRO, Sønderjysk Landboforening and Vestjysk Landboforening)	http://svineraadgivningen.dk/

Status of the organisation	Type of organisation	Organisation	Website
		SvineXperten (owned by AgriNord, Landbo Limfjord and LandboThy)	https://www.midtsvin.dk/
		Syddansk Kvæg (owned by Landbrugsrådgivning Syd and Sønderjysk Landboforening)	http://www.sd-k.dk/
		ØkologiRådgivning Danmark ApS (collaboration between SAGRO and Økologisk Landsforening)	https://oerd.dk/
	Approved Technological Service Institute (combine research-based consultancy and technological services)	Technical Service Institute (GTS Institute) Business unit AgroTech is specialised within agricultural services	https://www.teknologisk.dk/
	Advisory services on horticulture	HortiAdvice	http://www.gartneriraadgivningen.dk/
	Farmers' owned advice companies outside the DAAS-system	Patriotisk Selskab (traditionally the advisory service organisation for landowners/owners of estates – have close and cooperative links to the DAAS-cooperation)	http://patriotisk.dk/
		LVK – Landbrugets Veterinære Konsulenttjeneste (Veterinarians, farmer based and owned; 40 employees – delivers only advisory services with regard to veterinarian topics)	http://www.lvk.dk/
	Upstream industries / Input providers (all owned by farmers and dominate the national market)	DLG (Major national player)	http://www.dlg.dk/en/
		Danish Agro (Major National Player)	http://www.danishagro.dk/
		Vestjyllands Andel (Western part of Jutland)	http://www.vja.dk/
		DLA Group (owners; Danish Agro, Vestjyllands Andel and others (small shareholders)	https://dlaagro.com/?

Status of the organisation	Type of organisation	Organisation	Website
		(Big player in the Nordic countries, The Baltic countries, Russia).	
		DLF Trifolium (The world's largest producer of clover and grass seeds; world market share of 25%).	http://www.dlf.dk/
	Private agricultural advice companies and independent consultant.	A number of small and independent private advisory companies exist. There is no official list of these companies/advisers.	