AKIS and advisory services in The Netherlands

Updated report for the AKIS inventory (Task 1.2) of the i2connect project

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INTERACTIVE INNOVATION

Executive summary

This report was created to gain an insight on the AKIS actors and factors that play a role in the system. Dutch agriculture has a high intensity level with large production quantities per hectare. The Netherlands hold the second place of exporting countries due to the favourable position of the Rotterdam Port. The total amount of farms has almost halved, but the size of the remaining farms has almost doubled. The Netherlands is frontrunner in sustainability, innovation, and production efficiency. Current challenges for the agricultural sector are lack of finding successors, the changing needs of the consumer and climate objectives.

After the triptych research-extension-education was no longer financed by the Dutch government, the Dutch AKIS remained strong but got fragmented. Though the Netherlands is front-runner in innovation and input efficiency, the fragmentation of the AKIS is caused by a lack of common vision among the AKIS actors. The transition to a circular agricultural system has led to a split in interest between the public and private sector. To steer both sectors towards a common interest the government has started implementing a subsidised voucher system that allows farmers to seek advice and training in an attempt to forward a common vision.

The reason behind the fragmentation of the Dutch agricultural sector lied behind the fall of the national agricultural extension service in the nineties. This extension service was brought to life during the establishment of the EU Agricultural policy by former Minister of Agriculture, Nature and Fisheries, inspired by European Commissioner Sicco Mansholt. Since the reduction of government interference, the only part of the extension service that still falls under the public sector is education.

Service suppliers in the Netherlands are split into sales-driven advisors and independent advisors. Independent advisors are paid by the government, with use of the voucher system or other corresponding subsidies, or paid by the farmers, while sales-driven advisors are paid through a margin on the sold goods. The market share between commercial advisors and independent advisors has grown in a skewed position. For the transition to a circular agricultural system the government wants to secure the position of the independent advisor through the voucher system. The Dutch government supplies subsidies on several themes among which education, projects, advice, and climate. Independent advisors in the system of the association of agricultural advisors (VAB) provide advice on 20 different topics. The vouchers can be used for advice on topics accepted by the Dutch government. Of the total 53,235 farmers, as registered in 2019, an estimated 60% consult independent advisors. The VAB is with 492 members the largest advisory organisation. The organisation is recognized by the European Agricultural and Fisheries Policy and Food Safety Department. The VAB stimulates

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independent advisors, enabling them to get recognized by the EU, creating funding possibilities. AgriVakNet specifically supports agribusiness advisors.

In the Netherlands there are a total of five universities that cover solely on agricultural studies. Wageningen University & Research recommends agricultural policies, enhances innovation processes, and supports the sector in many ways. The other four universities of applied sciences engage with the sector on a more direct scale, holding strong links between the farmer, research, and education. To enable collaboration between advisory services and innovation groups, Top sector Agri-food launched a subsidy track.
Education, as sole public agent within the Dutch AKIS, plays a major role in connecting the AKIS actors.

Dutch farms are varied and require a fitting approach accordingly. With respect for this diversity, and in the context of the National Strategic CAP Plan (NSP), Dutch government took the responsibility to create cohesion on the AKIS. Not by establishing an AKIS institution, but by promoting collaboration, so that networks effectively support innovation and knowledge exchange.
To create this cohesion, measures are taken, for instance:

- Handing over **virtual vouchers directly to farmers** to ensure the advice is more demand- **driven and meets the specific question of the farmer,**
- **To help farmers to find the most competent advisor for a specific subject and spend CAP budget in an impactful way: promote the use of the national advisory database,** provided by the association of independent advisors (VAB)
- **On-farm demonstrations/trainings led by advisors incentivises more farmers to join** and ensures that the demonstration/training is sufficiently applicable and attractive for farmers,
- Providing practical information in **knowledge reservoirs** which focus on practical outputs (main player Green Knowledge Net (GKN). This helps farmers as well as advisors to get up-to-date information, including CAP obligations or CAP support opportunities.

When writing this report the effect of these and other actions are assessed in the mid-term CAP review. in anticipation to the results, we can already say that the different AKIS stakeholders find good ways to coordinate the hard work to cope with the heavy challenges in agriculture.

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Abbreviations

VAB:	Association of agricultural business advisors
CBS:	Central Bureau of Statistics
GDP:	Gross Domestic Product
NOS:	Dutch Broadcast Foundation
LNV:	Ministry of Agriculture, Nature and Food Quality
RVO:	State service for Dutch entrepreneurs
RLI:	Advisory Council for the Environment and Infrastructure
WRR:	Scientific council for government policy
NWO:	The Dutch Organisation for Scientific Research
KNAW:	The Royal Dutch Academy of Arts and Sciences
WEcR:	Wageningen Economic Research
MIT:	SME Innovation Stimulation Region and Top Sectors
SABE:	Subsidy module agricultural business advisory and education
SDE/SDE++:	Stimulation Sustainable Energy Production and Climate Transition
POP/POP3:	Rural Development Program
I&M:	Spatial planning and environment
BAS:	Register Business Advice System
E.L.V.V.:	European Agricultural and Fisheries Policy and Food Safety Department
CAP:	Common Agricultural Policy
AB:	Agricultural business advisor
(Z)LTO	(Southern) agriculture and horticulture organisation
GAEC:	Standards of Good Agriculture and Environmental Conditions of Land
RDP3:	Rural Development Program
WUR:	Wageningen University & Research

1. Main structural characteristics of the agricultural and forestry sector

After the United States, the Netherlands is the world's largest exporter of agricultural products (Agriculture and horticulture, sd). The Netherlands is crowded and the land and labour is very expensive, so the efficiency must be higher than other countries in order to compete on the global trade market. Competition drives innovation and technology (van Adrichem, 2019). All those innovations lead to an export of approximately €91.7 billion worth of agricultural goods – a figure that surpassed the previous year's total by 7% (Coggins, 2018). This intensity is necessary to earn back the high price of land: €63.000 on average per hectare (ha) (Agricultural land prices, sd)

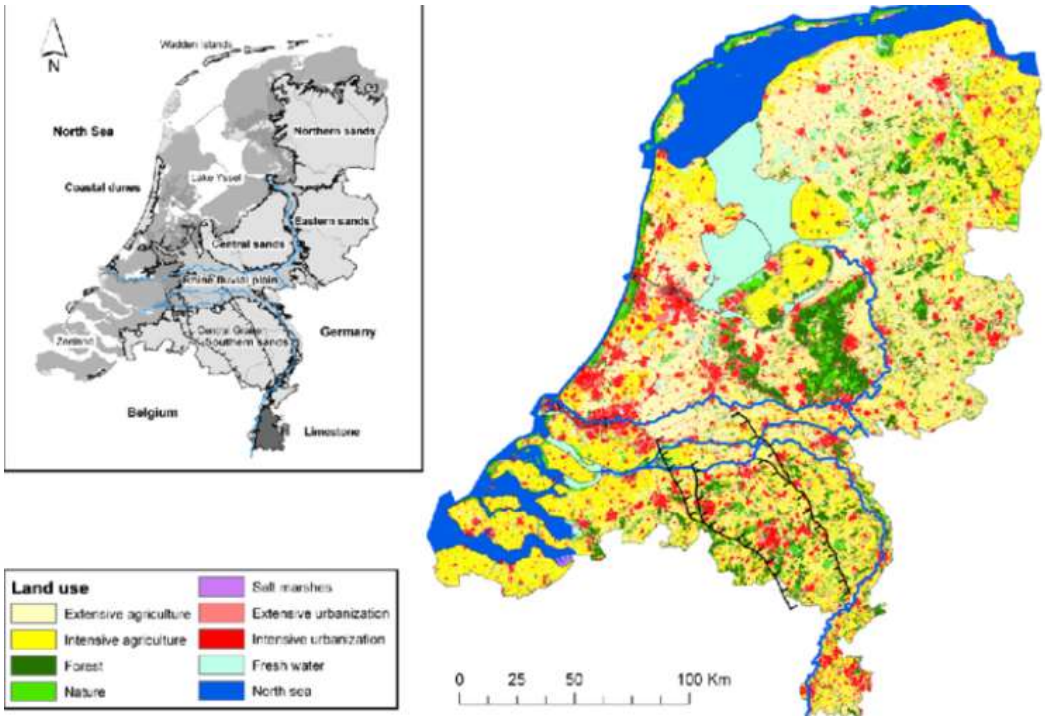


Figure 1, Land use Netherlands 2015 (CBS, 2020)

Figure 1 illustrates the different types of land use in the Netherlands in 2015. In 2015 there was 4.514.303 total ha land and 2.236.317 ha used for agricultural purposes (CBS, 2020). Almost ten years before that, the total land was 4.152.618 ha and the amount of land used for agricultural purposes was 2.360.832 (CBS, 2020). The total hectares of land increased, as did the land used for agricultural activities (increase of 124.515 ha).

Challenges in the sector (Möller, sd):

- Circular agriculture;
- Climate neutral agriculture and food production;
- Climate-proof rural and urban areas;
- Valuable, healthy and safe food;
- Sustainable and safe North Sea and other water works;
- The Netherlands is and will remain the best protected and liveable delta;
- To combat the aging of the agricultural sector (Berntsen, de Ruyter, Menkveld, Klene, & Leguijt, 2018);
- Continue to respond to changing consumer needs;
- Succession for an agricultural company;
- Changing legislations.

Most of the work is provided by entrepreneurs and their family members, who often do not receive a salary. Their unpaid labour is expressed in aje's (annual work unit). A labour force of 2,000 hours or more is considered one aje. (van der Meulen, 2020)
While in other European countries there are mainly part-time farmers, in the Netherlands almost every farmer works full-time on his farm (Wielinga, 2021). The average income of the agriculture and horticulture sector is represented in table 1, the income of the plant sector is shown in figure 2.

	2020	**2019**
Average income agriculture and horticulture	€54.000	€74.000
Dairy farmers	€43.000	€49.000
Sow farms	€46.000	€46.000
Poultry farmers	€44.000	€88.000

Table 1, Income livestock farming 2019 & 2020 (CBS, 2021) (van der Meulen, 2020)

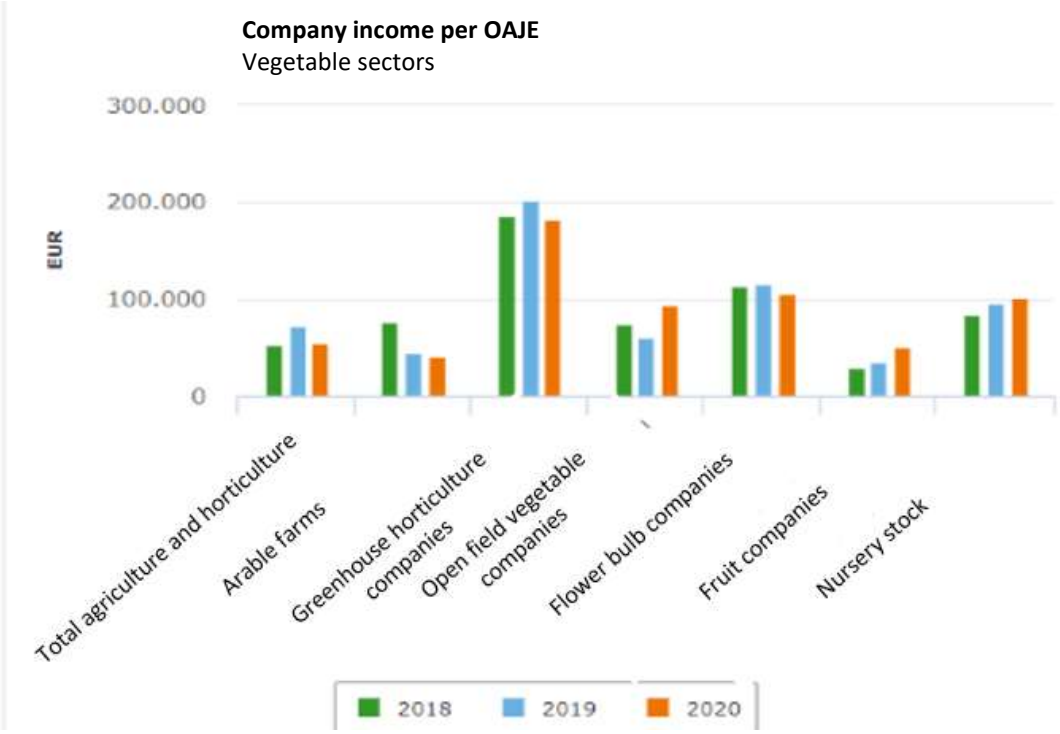
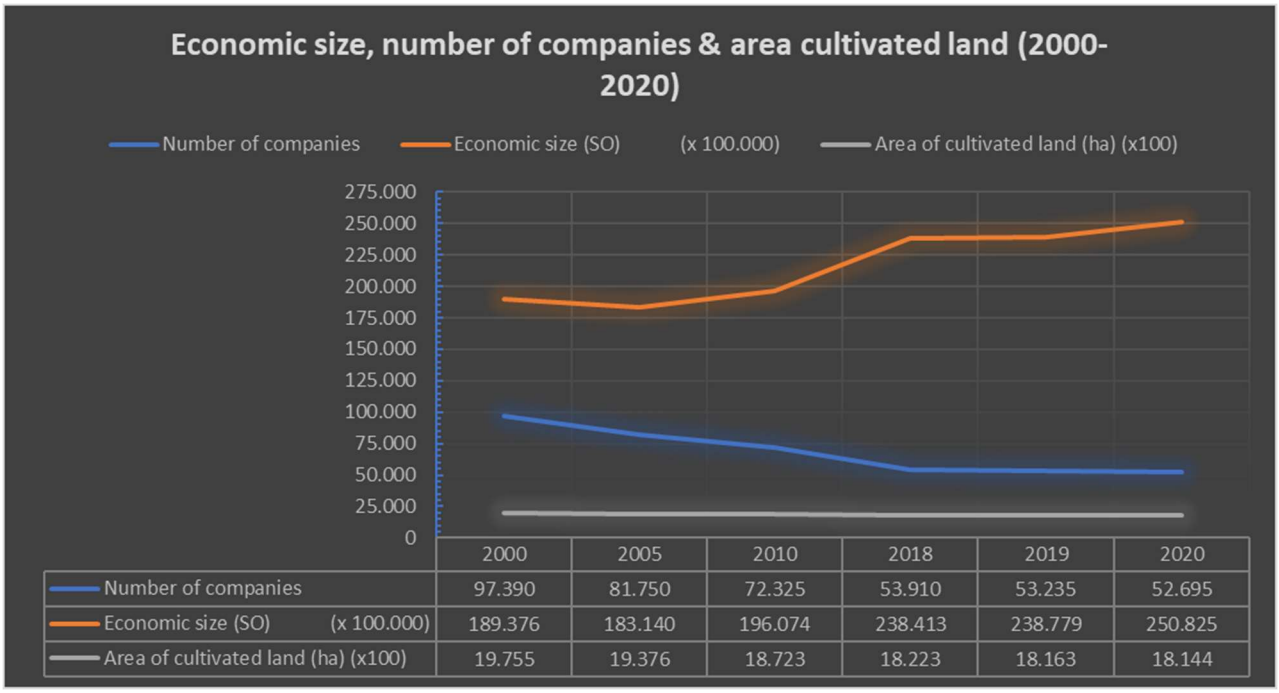


Figure 2, Income from company per OAJE; Vegetable Sectors (van der Meulen, 2020)

The added value of the agricultural sector was approximately 54 billion in 2018. That is about 7% of the total GDP (gross domestic product). Subsequently, the agricultural sector provides approximately 8,5% employment. Primary production and supply provide the most employment with a total of 75%, with a share of 41% and 34% respectively. (Verhoog, 2020)



	2000	2005	2010	2018	2019	2020
Number of companies	97.390	81.750	72.325	53.910	53.235	52.695
Economic size (SO) (x 100.000)	189.376	183.140	196.074	238.413	238.779	250.825
Area of cultivated land (ha) (x100)	19.755	19.376	18.723	18.223	18.163	18.144

Figure 3, Economic size, number of companies & area cultivated land (2000-2015) (CBS, 2021)

Comparison EU

Dutch agriculture knows with a share of about 3.5% in European agriculture labour force to account for about 7% of the production of the EU-15, the sector is therefore strong. The said 7% is produced on less than 1.5% of the agricultural sector acreage of the EU-15, due to intensive production. (Bont & van Berkum, 2018) Flowers and plants make up the major part of agricultural exports, followed by meat and dairy (NOS, 2020).

The Netherlands is centrally located between a few large countries with many consumers. When added together, the Dutch, Germans, the UK, and Belgian residents together make up 35% of the population of the EU-28. Including France, the percentage comes to just under 50. It is therefore not illogical that agricultural exports from the Netherlands are respectively about 45% (based on the three neighbouring countries) or 54% (including France) to these countries in 2020. is going. (Jukema, Ramaekers, & Berkhout, 2021)

The Netherlands has a significant share in European agricultural production (7%) (Bont & van Berkum, 2018). The port of Rotterdam is often used as a transit hatch, making the Netherlands one of the largest exporters. Despite expectations that

growth of the sector would slow down, production and export keeps increasing significantly.

Production growth expected to weaken in 2021

% development of production volume in the agricultural sector

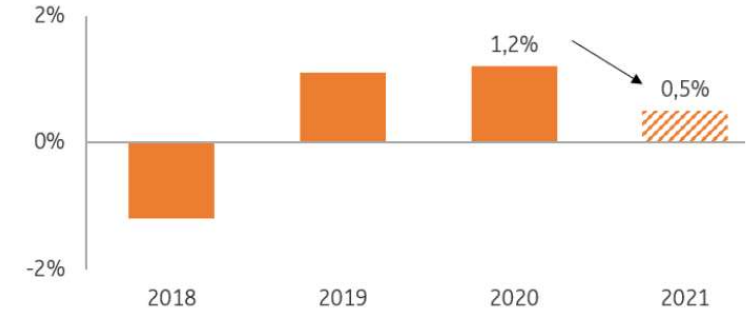


Figure 4, Production growth expected to weaken in 2021: CBS; estimate 2021 ING Bank Economic Bureau.

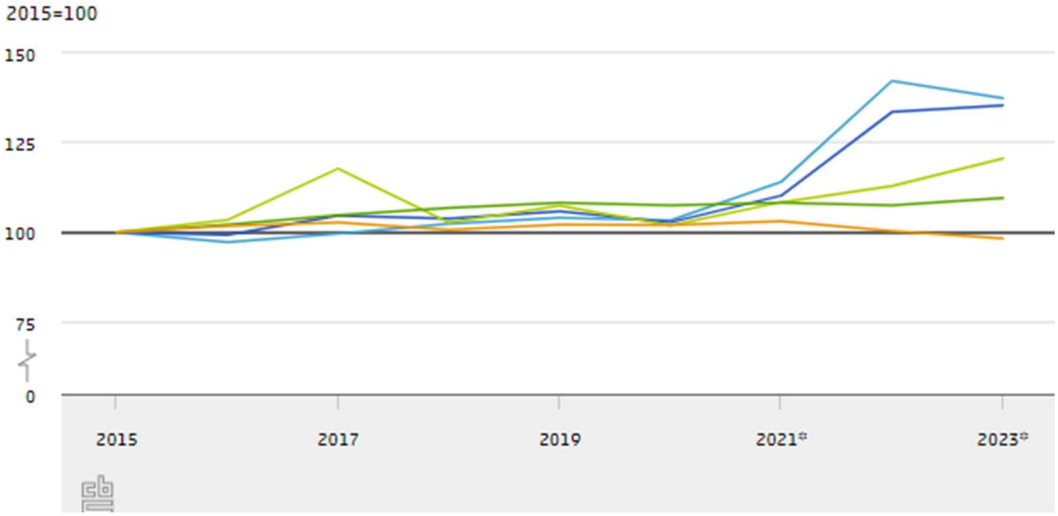


Figure 4a: production (orange), amount of labour (dark green), income (light green), product price (dark blue) and variable costs (light blue) (Source CBS)

We see that the prognosis of decreased production growth was right in volume, but the increase in prices caused a better farm income.

The share of horticulture in the Netherlands has increased, the share of livestock farming has decreased. Within the EU, the Netherlands is the largest agricultural exporter. (Bont & van Berkum, 2018). The decrease in the number of farms in the Netherlands is above the EU average, see figure 3. One of the reasons for this is the lack of succession, this is visible in figure 6.

49% of Dutch Forests are owned by Dutch government, another 18% is owned by a few nature conservation organisations, so only ca. 30% is owned by private persons. In 2018 there were 1.364 private forest companies. Together they are good for 58.757 ha forestry. 30% of the forests is owned by private persons. The results of forestry have been negative in recent years, putting pressure on the continuity of private holdings. (Forestry sector, sd) Dutch arboriculture can be seen as nursery of European forests and green in the landscape: on 16.000 ha all kinds of trees are grown, of which 7900 ha for lane trees and forest & hedge park, good for a much bigger area of forest and parks. Arboriculture sector, just like other sectors, is highly professional and intensive.

A new development in forestry is agroforestry/food forest, often combined with permaculture fit well in the need for a more environment and climate sustainable agriculture, but it's hard to reach economic sustainability. Most farms are in the Initial (pioneer) to development (project) phase, or just create some activity on a plot that would have staid idle.

In the Dutch AKIS, all services in advice/innovation support, education and research are for farmers as well as foresters. Therefore in this report you can read 'farmers and foresters' on all places where we speak about 'farmers'

Gender and succession

One third of the agricultural entrepreneurs is female: out of 138.000 persons active in family farms, 46.000 are female. The percentage of women differs per sector as the graph shows.

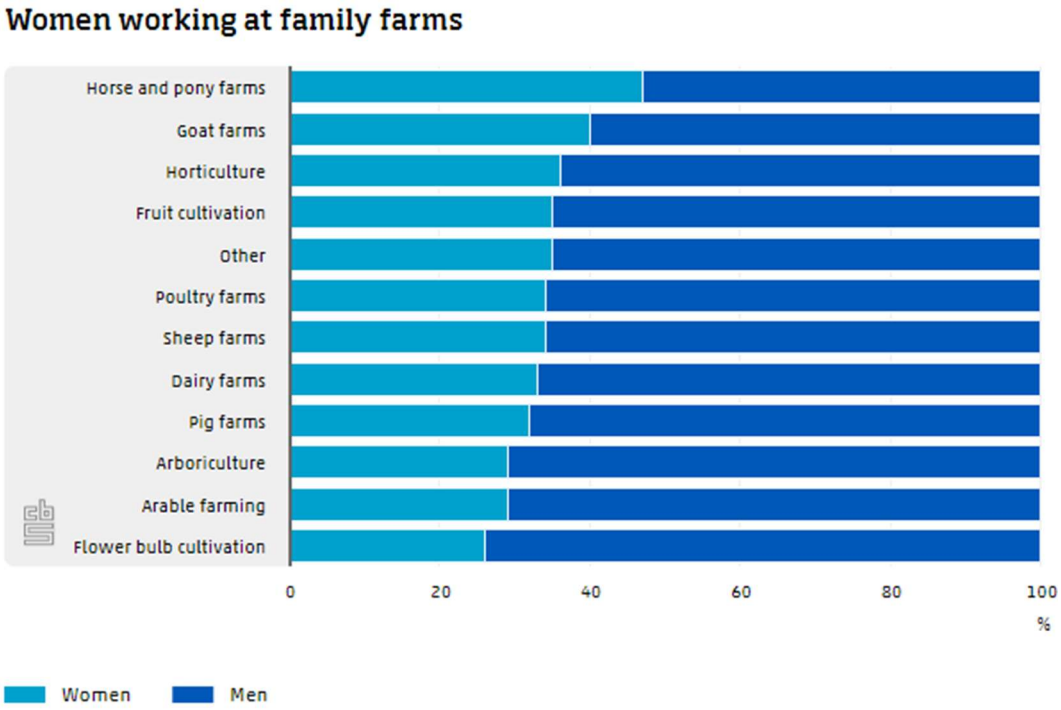


Figure 5, Women working at family farms (CBS, 2021)

The enthusiasm to take over a company is largely determined by the size of the company. With an increase size measured in standard earning capacity, the succession rate rises sharply: 23% for very small companies, 32% for small companies, 46% for medium-sized, 64% for large and 67% for very large companies (see figure 6). Companies need a certain size to be profitable, which is also the basis for a (possible) future takeover. The options for taking over a company also depend on the entrepreneurial qualities, prospects of the sector (market/demand) and the environment in which the company operates (in connection with development and/or expansion opportunities). (Voskuilen, 2018)

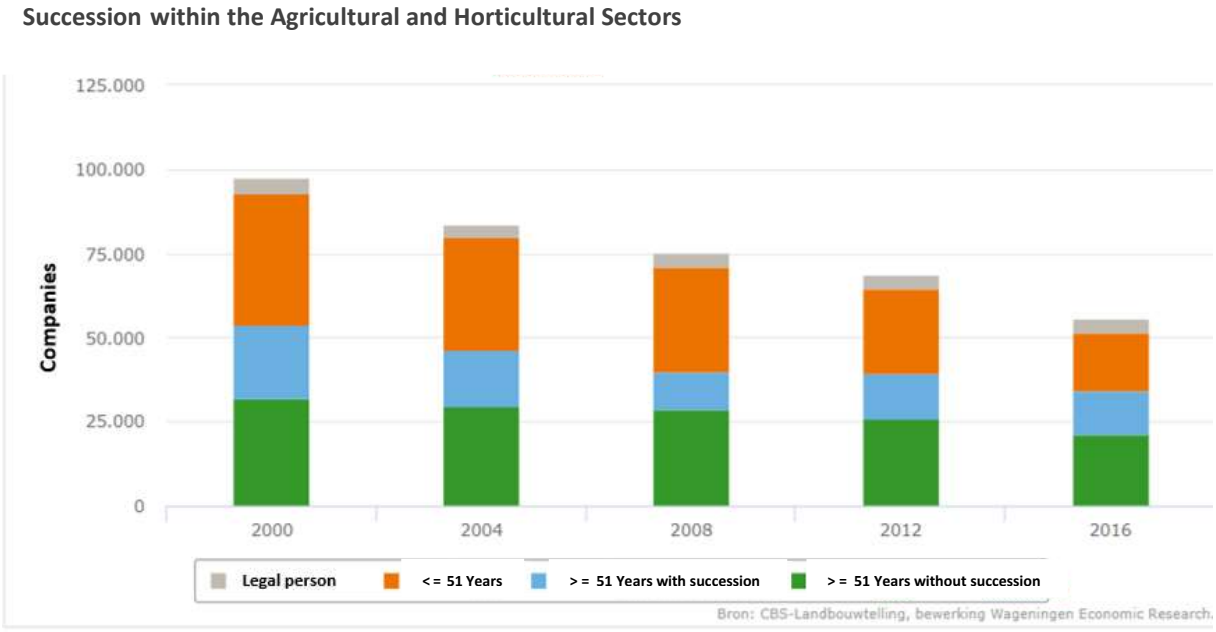


Figure 6, Succession situation (van der Meulen, 2020)

2. Characteristics of AKIS

The agricultural sector in the Netherlands is highly innovative and technologically advanced. The Dutch AKIS has been named as a global frontrunner when it comes to production technology and processes, which have a strong focus on efficiency and sustainability (EU SCAR AKIS, 2019). The system is very complex, with many interlinked actors across sectors. The ProAKIS report (2015) described the Dutch AKIS as strong and powerful, but fragmented. This strong system was able to develop due to intensive collaboration and investments made by knowledge centres, industry, government, and civil society organisations (Knierim & Prager, 2015). The Netherlands is a large exporter of agricultural goods, and the Dutch government closely follows European policies concerning agriculture. The Dutch AKIS is therefore also very internationally orientated.

Farmers have the means to gain access to knowledge and innovation, with many small-scale AKIS-subsystems serving farmers in specific sectoral expertise and regions. These subsystems are well developed and effective, but after the privatisation in the 90s started to work parallel from each other. This lack of unity and common vision caused fragmentation. From 1990, the government gradually reduced public spending related to the Dutch AKIS, which shifted knowledge as a common good to a marketable product (EU SCAR AKIS, 2019). This led to a situation, where product related advisors have frequent contacts with most farmers and are therefore in many cases seen as important discussion partner, while independent advisors mainly give specialist, less frequent advice to a smaller group of farmers.

Now, there are important developments from this fragmentation to cohesion in the AKIS system. The government is making efforts to restore balance and is investing in the agricultural knowledge and advice sectors. They have installed a voucher system, where farmers can request agricultural advice through vouchers, and agricultural advisors can register themselves to provide this advice or to receive training (Floor Geerling-Eiff, 2019). Op top of that, many other actions are de described in the National Strategic CAP Plan (NSP) which also contribute to coherence in the support of knowledge flows and innovation.

Another thread the AKIS faces is the divide that has been growing in recent years between the public and private sector. This divide is partly caused by the governmental aim of a transition towards circular agricultural systems, which causes friction between public and private interests. Another cause is the upscaling and intensification of agricultural enterprises, a process that is accelerated by the government's sustainability goals. The necessary investments in innovation often require a certain scale. The investments for this intensification process are often paid through the private sector, which means that many small

and medium business are not able to keep up. It therefore contributes to the gap that has been growing between large enterprises and small to medium businesses (Floor Geerling-Eiff, 2019). Beside the increasing intensification, an opposite movement has also gained momentum within the sector in recent years. The demand for more sustainable and honest food systems has driven the local to local movement.

Within the Dutch AKIS we can distinguish various types of actors. The government, whose different ministries shape agricultural policies and provide funding for many innovation projects, as well as the twelve provinces. A well-established educational system which operates on all levels, from vocational education to university level. Farmer- and sector organisations which support farmers in many ways, through advice and innovation projects, as well as negotiation and lobbying with other actors. Farmer advisory services, which are provided by independent farm advisors, accountants, veterinarians, and product related advisors of input providers. These services are supported by knowledge circles, the VAB for the independent advisors and the AgriVakNet for commercial ones. The top sector Agri-food, which plays an important role in innovation due to its involvement in public private partnership projects with Wageningen Institutes and TNO on one side and business parnters on the other. Media, which can be subdivided in sector specific information services and the general media play an important role in the public image of agriculture. Important NGOs are those related to animal welfare and sustainability certifications. More detailed descriptions of the various actors, their roles within the system and how they are interlinked can be found in chapter 2.3.

2.1 SWOT analysis

Within a small group of industry experts, a SWOT analysis was conducted to provide insights in the biggest strengths and opportunities related to the Dutch AKIS, as well as to uncover weaknesses and threats.

We can conclude that the biggest **strengths** of the Dutch system lie with the high level of education, innovation, and efficiency. The educational system in the Netherlands is well developed and aimed at practical applications. All farmers are able to receive education at their respective level, and both farmers and advisors are highly educated. Both the geographical and personal distances are small, which enables fast and easy communication between all stakeholders. The Netherlands has a strong position on the international market and a strong export position.

Opportunities can be found in the fact that there is increasing attention, enthusiasm and innovation focused on sustainability. This is seen in practice in animal welfare, the transition of animal protein to plant protein, and local food and circular agricultural initiatives. The independent advice sector has been given

an impulse through the government funded voucher system, which popularity might give an impulse to other reforms and growth of the independent advice sector.

The Dutch AKIS and agricultural sector are also having to face **weaknesses**. The agricultural sector struggles with its public image and receives a lot of negativity, especially concerning intensive agriculture. Another weakness is that the land prices are very high, which makes it difficult to acquire as a new farmer. The aging in the industry is another issue, many agricultural enterprises have difficulties finding a successor. SMEs have difficulties to keep up with investments, since they do not have the same capital power as larger enterprises.

These weaknesses in the system lead to **threats**. The social pressure on farmers is high and combined with the unclear prospects for farmers this leads to less interest within the younger generation to choose for job opportunities within the agricultural field, which then can decrease the number of students in different sectors below the minimum. The intensification of the sector can also contribute to environmental challenges, reduced soil quality and zoonoses are threads to the system. Since highly intensive enterprises are inflexible, small changes in the system can cause them to fail.

Table 2, SWOT analysis of the Dutch AKIS and Agricultural sector (source 'SWOT Netherlands AKIS', Floor Geerling-Eiff, 2019

Strengths	*Weaknesses*
Highly developed, strong sector *- Several AKIS components, including the publicly funded research and education system, are well developed and vital.* *- Much mutual cooperation within both research and green education.* *- Short lines of policy, research and business, history of strategic cooperation.* *- Much experience in peer-to-peer knowledge exchange between entrepreneurs, including in practice networks.* *-Big variety of independent specialist advisors* *- Wide variety of educators, knowledge brokers and intermediaries, from individual entrepreneurs to AKIS system level.* *- Frequent use of POP (RDP) instruments in the field of knowledge transfer & innovation* *- The education of, mostly full time, agricultural managers is higher in the Netherlands than EU average an they have a strong drive.* *- An extensive and varied pallet of initial and post-initial training.*	*- High costs of farm land and inputs, creating stress for smaller and average farmers* *- Lack of good flow of knowledge to the 'farmyard' partly due to poor translation to practical level, no publicly funded information and disappearance of product boards.* *- Relatively low public investment in R&D compared to other industrial sectors over the past decade.* *- Farmers and intermediaries find procedures for AKIS instruments complex, time-consuming and risky.* *- Limited synergy between education, research and advisory organisations.* *- Farmers have limited willingness to pay for innovation advice and support. Competition and potentially conflicting advice and information (linked to products such as animal feed, plant protection products, etc.).* *- Entrepreneurs are overloaded with information by a forest of information sources, resulting in an information 'fog' (need for skills to deal with volume of information flows).*

- Farmers own most of the rural land and thus have a position in the face of developments	*- Large companies lead in terms of investment in innovation but, on the other hand, are not always the most innovative companies.*
chances	*Threats*
- The AKIS with its 'golden triangle' (insitutes-government-business) collaboration, is an example for other sectors (and an important part of the top sector approach). *- International focus/export orientation gives new chances for production, advice and research.* *- Pluralistic system with innovation facilitation services.* *- Commercialisation of knowledge organisations creates demand and stimulates institutional changes, towards a more demand-driven way of working.* *- Much experience with homogeneous and heterogeneous networks forms good basis for further developing a network approach in the future.* *- More heterogeneity in production modes: new modes of production alongside traditional export-oriented production.* *- Specific support instruments aimed at promoting innovation among SMEs.* *- Many different types of infrastructures for dissemination and interaction around knowledge and innovation, including voucher system.* *- Ensuring continued availability and accessibility of knowledge resources.*	*- Environmental challenges, including climate change, soil quality and diseases (zoonosis)* *- Lack (and therefore need) of a shared vision of the future of agriculture among all actors.* *- Lack of an overarching vision of the desired knowledge level and profile (translated into a strategy on how to achieve this).* *- There are more sources of funding and emerging but research institutes remain dependent on funding from the ministry of agriculture.* *- Funders are often impatient and want to see results quickly; promising initiatives have to stand on their own feet too soon.* *- Continuous tension between public and private interests in supporting innovation instruments.* *- 'Accountability': risk-averse behaviour in public investments. Proposals for funding have to be worked out in increasing detail relative to results, leading to selection of 'safe' research.* *- Research is still too often judged on scientific output and too little on its contribution to public debate or practice impact.* *- Recognition (by public and private sector) of impartial advisory services.*

2.2 AKIS actors and knowledge flows

Within the Dutch AKIS many actors work together. In this chapter some of these actors and their functions are highlighted. An elaborate overview of AKIS actors can be found in the appendix, AKIS actors within the Netherlands.

Dutch agriculture has a strong international orientation: in the supply chain and trade of produce, many organisations work internationally or have international connections. To include all these connections would be very relevant, but the overview of AKIS actors and diagrams would become illegible.
Important to mention here are some international umbrella organisations: the Dutch Farmers Organisations are connected to COPA, where LTO is member, Dutch Cooperatives are connected to Cogeca, where their umbrella Narional Cooperative Board (NCR) is member, and Dutch advisors are connected to

EUFRAS, where Association of Agricultural Advisors (VAB), ZLTO and Delphi are member.

2.2.1 Government

AKIS Coordination Bodies
The ministry of Agriculture, Nature and Food Quality (LNV) is as Managing Authority the AKIS Coordination Body. It implements the CAP in close collaboration with provinces, water boards. As delegated AKIS Coordination Body, the Regieorganisatie GLB carries out the activities to strengthen the AKIS in NL. That is also the reason why the Regieorganisatie GLB is a partner in modernAKIS at the request of the Ministry.

2.2.2

National ministries
The most important Ministry for the Dutch AKIS is the Ministry of Agriculture, Fisheries, Food and Nature (LVVN, formerly LNV), who shapes the National Agricultural Policy. This is done in accordance with European policies. Other responsibilities are that they fund research and innovation projects. The Dutch agricultural, horticultural and fishery sectors have a leading position in the world. In order to maintain a leading position, to ensure sustainability goals are met, and to provide future generations with a vital agricultural sector, the Ministry has taken on the aim to have a circular agricultural system by 2030. This process was started in 2019. To foster innovation and to make it attractive to farmers to make the shift to a circular system the ministry is providing farmers with land plots to experiment with circular practices. Furthermore, they are changing regulations to make it easier to use restreams from the food industry as animal feed. Another change in regulation has been the tightening restrictions on Nitrogen emission (LNV, 2021). The Ministry's future vision is built on providing farmers with a fair price for their produce, to maintain a leading position in the agricultural sector and to be a frontrunner on sustainability, as well as closing the gap between farmers and the general public.

Other ministries that hold connections to farmers and AKIS actors are the Ministry of Economic affairs and Climate, the Ministry of Infrastructure and Water and the Ministry of Education, Culture and Science. The ministries are connected through various transdisciplinary subjects concerning farmers that they collaborate on.

Regional government
Within the Netherlands there are twelve provinces which each carry out both national and regional policies. They are responsible for the creation of nature and

decide on the building of roads and infrastructure. They also supervise the waterboards and the compliance with environmental laws (Rijksoverheid, 2021). The Netherlands is divided further into 355 municipalities. Like the provinces they can decide on the development of roads and buildings. Furthermore, they can issue subsidies (Rijksoverheid, 2021)

RVO

The RVO is the National Enterprise Agency. They are a public organisation that carries out policies composed by the National ministries, especially the Ministry for Economic Affairs and Climate. They support entrepreneurs and policymakers with advice, funding, and networking opportunities. The domains they focus on are innovation, agriculture, sustainability, and international business. They also monitor the compliance of entrepreneurs with regulations. They carry out annual farm audits which are obligatory to all farmers (RVO, 2021).

Nature and water management

Nature and water bodies are managed by both public and private organisations and partnerships. Staatsbosbeheer, the Forestry Authority, is a public entity and the owner of large patches of nature in the Netherlands. Most of this is open to the public. The land is used for recreation and to generate wood and planting materials. To support the effort of the Ministry of Agriculture, Nature and Food to create a circular agricultural system they have made land available to farmers to perform experiments with nature inclusive agricultural systems.

The waterboards in the Netherlands are public organisations that manage waterbodies, monitor water quality and work on the protection against flooding. They work closely together with the national and regional government and other regional actors.

2.2.3 Education and Research

The agricultural educational sector in the Netherlands is well developed. We can distinguish twelve vocational schools for agricultural education, four Universities of Applied Sciences focused on agriculture, twelve non-agricultural Universities working on related subjects, as well as three technological Universities that support the agricultural sector. Most farmers are graduated at the level Vocational education. Therefore, these schools create an involved group of young farmers.

Agricultural Universities of Applied Sciences

In the Netherlands there are four Universities of Applied Sciences that focus on agriculture. Hall van Larenstein, who profiles itself as the most sustainable University of Applied Sciences in the Netherlands. All their thirteen bachelor programs have a three-star AISHE rating, which stands for Auditing Instrument for Sustainability in Higher Education. They are also the first and only University of

Applied Sciences to have gained an MVO certificate, which is another instrument to rate sustainability within higher education programs. HAS University of Applied Sciences offers sixteen bachelor programs spread across two branches. They were founded over 70 years ago by the primary sector. This connection with the primary sector is still important today. Aeres has three branches that each have a specific focus. Beside bachelor programs all Universities of Applied Sciences offer courses for professionals. Within applied research practical knowhow is very important, and all universities work closely together with the primary and private sector in doing research and offering students real-life experience.

Wageningen University and Research
Wageningen University and Research plays a very important role in the Dutch AKIS on different levels. The University has been ranked as the best in the Netherlands for sixteen subsequent years and can be regarded as one of the top universities in the world focusing on the green sector (Wageningen University and Research, 2021). Connected to the University are nine research institutes who participate in many of the Dutch innovation projects. The research institutes are commissioned by the government, business, and non-profit organisations. They mostly work collaboratively with each other as well as national and international external knowledge institutes.

TNO
The TNO, the Netherlands Organisation for Applied Scientific Research, was founded in 1932 to enable business and government to apply knowledge. They aim to provide solutions for pressing social and economic challenges in society. Their output needs to have a practical application.

2.2.4 Farmer Organisations

LTO
The LTO, The Netherlands Agricultural and Horticultural Association, is the umbrella organisation of the three regional associations LTO Noord, ZLTO and LLTB. Together these organisations represent 35.000 farmers. About 60% of farmers is member, which can be considered as a high number reflective of a high degree of organization within the sector (EU SCAR AKIS, 2019). The organisations have a multitude of functions. They provide farmers with advice, lobby the position of farmers both in national and international government, work on innovation projects and more. They are paid through membership fees.

Sector organisations
Within the different agricultural subsectors, we find sectoral organisations. These organization play an important role in representing farmers in their area of

expertise and the execution of sector related innovation projects. These organisations are funded through levies.

2.2.5 Advisory services

Farmers can call on advisory services for strategic decisions; agronomic/husbandry issues; finance; and daily management. We distinguish independent and product related advice. These actors are elaborated in more detail in chapter 4.1. A general overview of these actors is given here.

Independent advice
There is a wide variety of farmers profiles and connected to that, there is a wide variety of independent advice. To demonstrate the quality of advisors, the Dutch Association of Independent Agricultural Advisors (VAB) established a quality system for advisors, that is connected to the EU registration. The badges that advisors with from permanent education and collegial assessment are published in the BAS (business advisory system) registry. This registry is now a basis for the voucher system, that the Ministry established for independent advice.
Technical advice is given by the organisations DLV and Delphy, that came forward from the government advisory service. They reach farmers per consult or with a subscription for three to six visits a year. DLV focusses on animal related advice and Delphi on plant related advice.
Advisors of the farmers organisations reach the members individually at strategic decisions and groupwise in members' meetings.
Independent specialists have frequent contact with a focussed target group.
In Dutch situation veterinarians provide independent advice since the sale of medicine is legally separated from advice; we estimate vets give monthly advice and medication.
Accountants are a special group within the farm advisory services. Because Dutch farmers must submit their financial progress/VAT, accountants have at least a few contact moments a year.

Product related advice
Most cooperatives and commercial dealers build a relationship with farmers by a providing a combination of both product and advice. The idea is that products they sell are used better in a combination with advice. These product related advisors are appreciated very well by the farmers: they give hands-on technical advice to daily problems, they visit farms frequently and farmers don't have to pay (they do pay for the products).
Apart from the advisors working for dealers, soil/plant/quality labs have their contact persons visiting farmers in addition to the mainly electronic exchange of information. The industry of chemicals and machinery has direct contact with a small group of front running farmers.

Knowledge circles
Agricultural advisors are supported by knowledge circles. For independent advisors and accountants this is organised by the VAB, the Association for Agricultural Business Advisors with more than 1000 members. In accountancy the organisation VAB started as meeting place for agricultural advisors in the accountant's organisations. VAB has organised, with the Ministry of Agriculture, the BAS, a registry of independent advisors.
From the technical advisory interest, the organisation AgriVakNet was started. In this organisation you find product related advisors. They focus on animal related advice and have approximately 650 members.

2.2.6 Private sector

Agribusiness
Companies that supply the farmers with feed, fertilizer, plant protection, seed, machines, etc. and companies that do processing and marketing of farmers' produce, often add knowledge to these products, to enhance a good production of the desired quality.
Agribusiness partners are involved in innovation projects for their sector, often financed by Top sector Agri-food (50% private, 50% by Ministry LNV).

Banks
In the past banks had a very important role in advisory services to farmers. In recent years this advisory service between banks and agricultural enterprises has become less intensive. Banks still provide financing but are less involved in the advisory service surrounding this financing. This service has been taken over by other agricultural advisors, for instance accounts. Sustainability is an important theme also within banking. Banks create favourable conditions for sustainable initiatives, for instance by providing lower interest rates when farmers are looking to install solar panels.

2.3 AKIS diagrams, different aspects of the Dutch AKIS

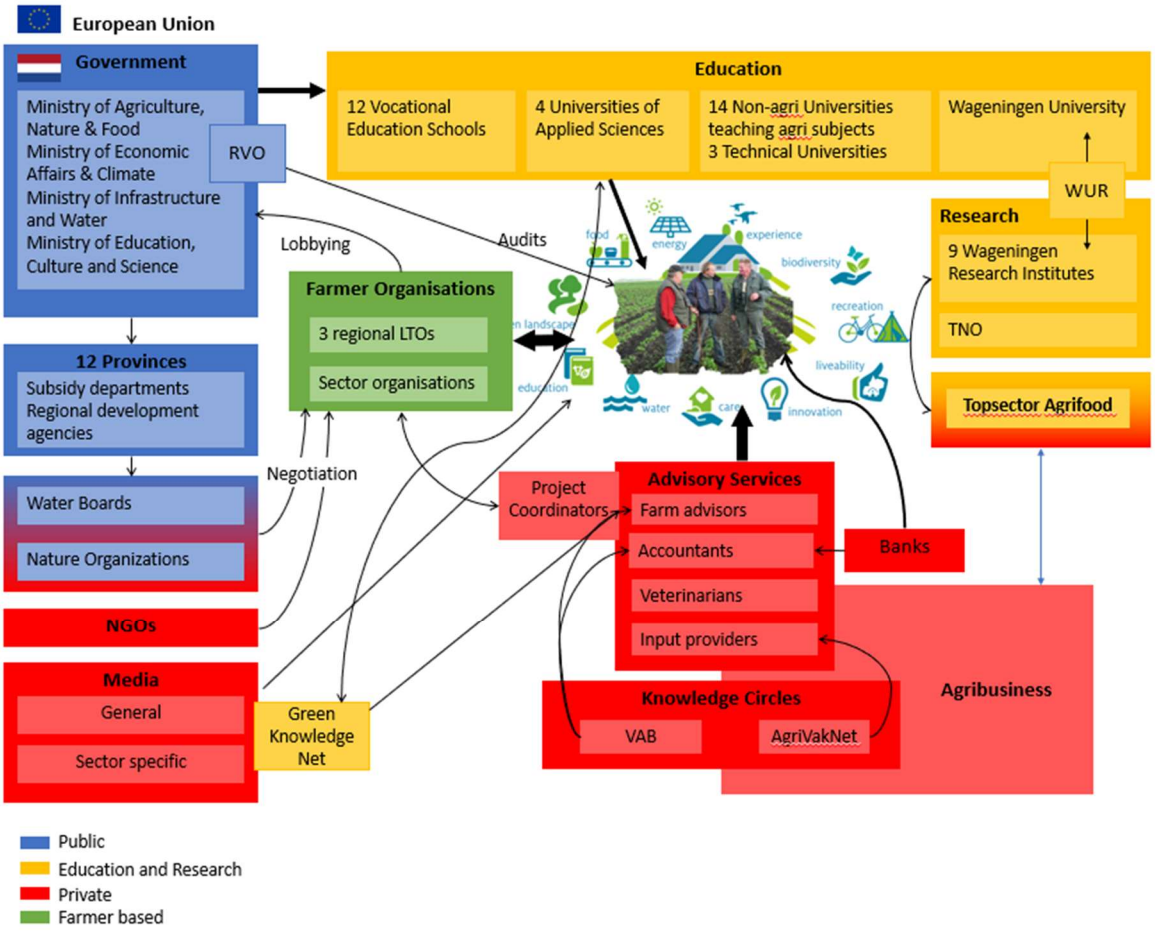
In the last 4 years, different aspects of the Dutch AKIS are described with different descriptions as result
The first diagram describes the AKIS in general, in terms of the key AKIS actors. In this version of the overview, the farmer is placed in dialogue with his peers: colleague and advisor.
The second, third and fourth diagram are more related to AKIS supporting policies, coordination mechanisms and funding: on Innovation project flows;

constructing the National Strategic Plan and for the tasks of the National CAP Network.
Every aspect has it's rationale to draw the AKIS structure and contributes to the general insight about the AKIS performances.
In the next paragraphs the schemes are shortly described, and I add reflections on the functionality.

There are no separate structures for farmers or foresters. All AKIS actors work for farmers AND (agro)foresters

2.3.1 General diagram

In this paragraph we first describe the general AKIS structure, from a farmers centric perspective. The diagram positions main actors and relations between them within Netherlands.



We have divided the actors in four groups:

- Farmers and their organisations (green). They are positioned in the center of the diagram, as they are beneficiary *and* main actor in the AKIS
- Private organisations (red), from agribusiness, often via advisors in close contact with farmers to NGOs which have more contact to farmers'organisations.
- Public organisations (blue): national and provincial government institutions, where water boards are specific for Netherlands, they are responsible for water quantity (previously protection for too much, now also concerned about too little) and quality, which has direct relation to environmental measures on the farm. Nature organisations have a special position: Staatsbosbeheer is governmental and Natuurmonumenten provincial organisations are private but strongly government supported.
- Education and Research (yellow) has a strong infrastructure in agriculture, with education from vocational to master and PhD level. Until a few years ago, agricultural education had it's own pillar, now it integrates more and more with general and technical education. One or the reasons: the numbers of students in primary agriculture decrease.
  The international flagship Wageningen is a combination of university and institutes.

In the diagram, the relation of farmers with organisations in the AKIS and between those organisations is shown.

- *Relations farmers- other AKIS actors (shown with thick and thin arrows):*

The diagram shows that the Farmer organizations have a very important role (fat bidirectional arrow): they represent farmers towards other stakeholders, by negotiating and lobbying their needs; they also have an important role as advisors and connect farmers to innovation projects taking on the role as project coordinator.
Farmers are provided with knowledge through advisory services (main source, big arrow) education (important source, medium arrow) and sector specific media including Green Knowledge Net (see 2.3.2).

- *Relations between AKIS actors (shown with positioning and arrows):*

Interaction between AKIS actors is crucial to create a consistent message in knowledge transfer and to have a fertile ground where innovations can sprout and grow. In the diagram, the organisations that have many relations are positioned close to another (see the description of the four groups). Here we focus on organisations that take specific action to integrate the different Dutch sub AKIS:

- Green Knowledge Net (GKN) originates from vocational education and applied science, is based in Wageningen library, and focusses on providing scientific and practical knowledge in an easy to access way. Therefore it's

positioned close to (private) media. Originally teachers made use of GKN, now GKN has the assignment to facilitate also advisors and farmers.
- One department of Service for Entrepreneurs (Rijksdienst Voor Ondernemers, RVO) gives advice to the government on how to implement subsidies (CAP and many others), another department facilitates and controls the beneficiaries in the application and justification. The annual production administration makes that they interact with all farmers.
- The institutes of Wageningen and TNO (technical research) are encouraged to collaborate with business with 50% subsidy on research in Public Private Partnerships, managed by Topsector Agrifood.

In addition to these institutions, the National CAP Network takes actions to bring all stakeholders in the AKIS together. This is described later.

2.3.2 CAP National Strategic Plan: AKIS with focus on education

Here we describe the AKIS actors that are financed by government and therefore mentioned in the National Strategic Plan.

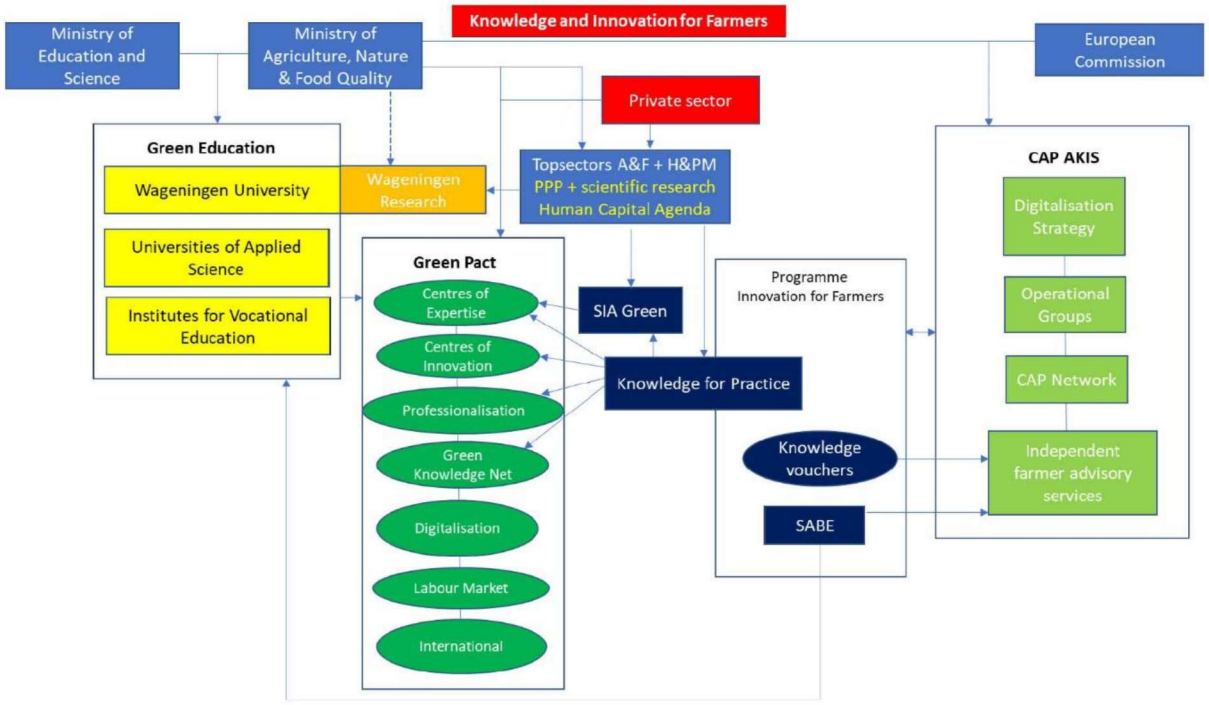


Figure 7, Dutch AKIS diagram

In this AKIS diagram the focus is on universities, education and the National CAP Network, all entities that Dutch Government and European commission are legally committed to finance. Main groups are 3 levels of agricultural education, the Public Private Partnership (PPP) 'Topsectors', PPP Green Pact, including

Green Knowledge Net (linked to EU-Farmbook) and the CAP AKIS program that includes the advisory services (receiving Knowledge vouchers) and Operational groups. Farmers are not mentioned in the overview, but they are beneficiaries of all these structures/instruments.

In addition to the general diagram, the Green Pact, SIA Green and the programme Innovation for Farmers (innovatie op het boerenerf) are added.
The Green Pact is a cooperation between Green Vocational Education, Ministry and Private sector. For this report, most interesting initiatives under this umbrella are:

- the Centers of Innovation and Centers of Expertise, linked to vocational education and universities of applied science
- Green Knowledge Net, which creates a repository of scientific and practical information (linked to the EU-Farmbook).

SIA coordinates and finances practice oriented research and connects the research and education institutions.
Innovation on the Farm provides project subsidies for practical networks or "learning networks" and for demonstration companies. Within these projects, there is room to finance training, workshops, coaching, and demonstration activities.
Not only instruments in the CAP are coordinated, in the larger EU-wide EIP program, cooperation is promoted between the NSP and Horizon Europe, in which focus groups, thematic networks and multi-actor approach are the other components..

2.3.3 Dutch AKIS and Innovation Projects

In this paragraph we describe, how actors are involved in innovation projects and the financing of them.
The diagram shows the financial sources of projects and the organisations that run the projects for the 'beneficiaries': farmers. It expresses that farmers are mostly not in the driver's seat of projects, that is done by project leaders/ experts working in advisory services: the yellow circle.
Farmers can participate in EU related projects, CAP, RDP, EFRO, ESF and H2020. These projects are executed by the National and Regional governments and Research facilities.
National projects are mainly PPP "Top sector"-projects funded by the Ministry of Agriculture, Nature and Food Quality. These national projects are executed by the Top sector Agri-food and Research facilities. Most of these projects are closer to agribusiness than to farmers.

Closest to farmers are the sectoral projects, funded by sector organisations, that are funded by levies.
Lastly there are numerous regional RDP and other projects which focus on nature and water. These are executed by provinces, sometimes with related water boards and nature organisations.
Advisory service providers play an important role in innovation projects. Often, they are the project coordinators and provide a link between farmers and other project stakeholders, in the diagram they are represented as the yellow circle around the farmers and foresters.

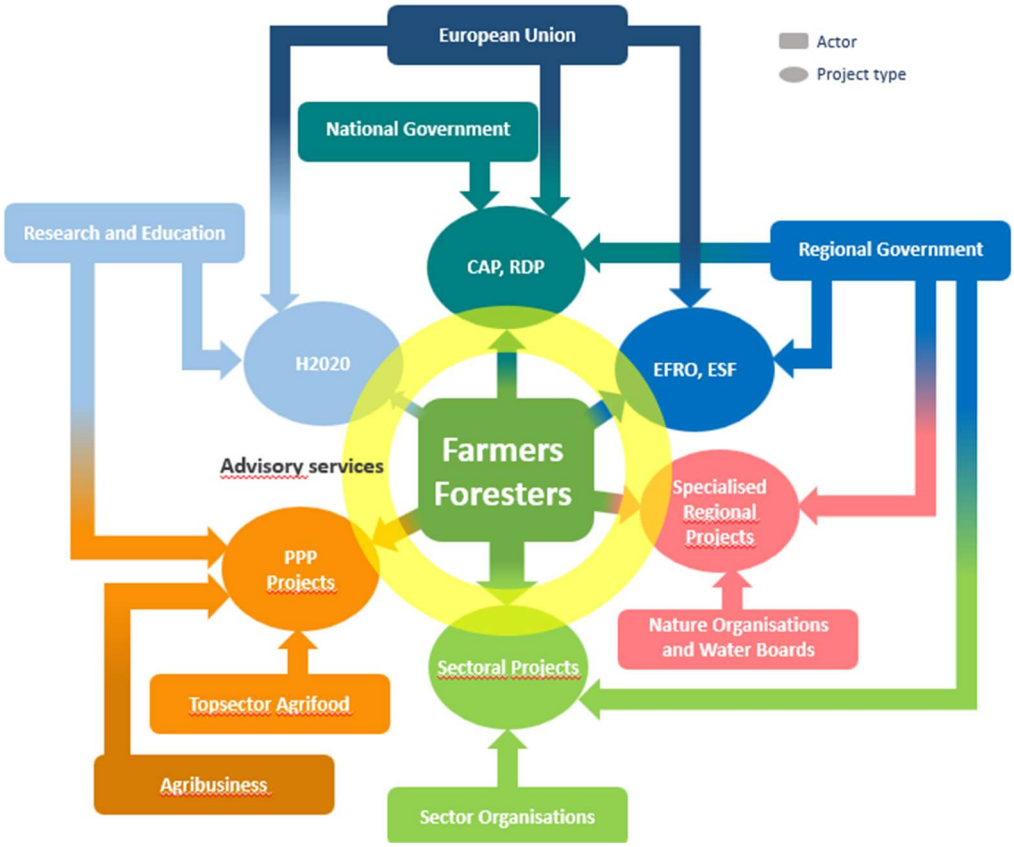
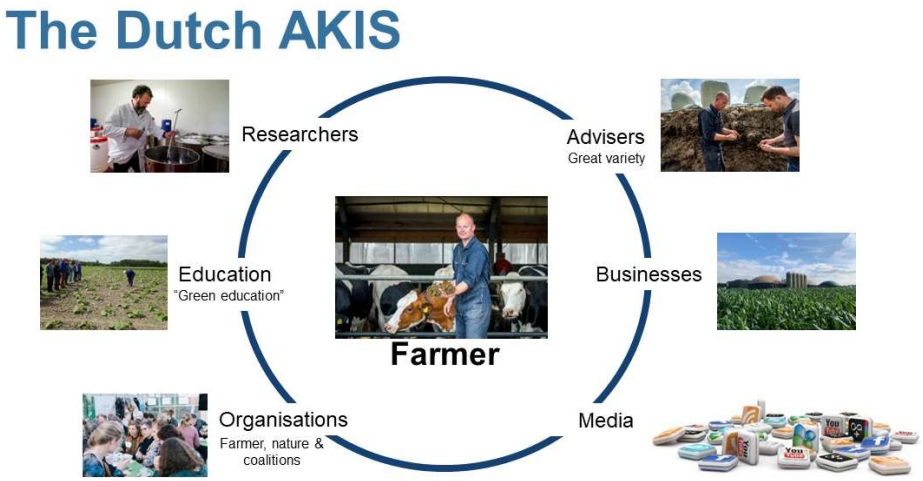


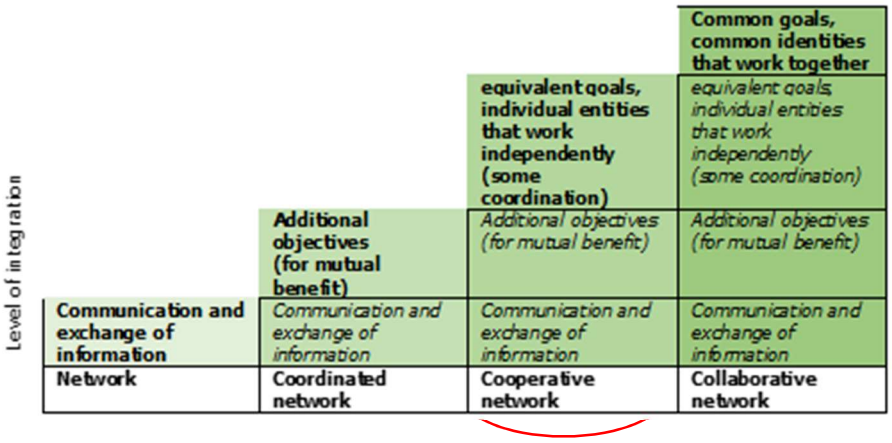
Figure 8, Innovation Projects and Actors within the Dutch AKIS

2.3.4 Development to integration: the National CAP Network

The Dutch National CAP Network (part of the Regieorganisatie GLB) supports the implementation and integration of CAP measures, including the development of the Dutch AKIS.



The ambition for the National CAP Network is to build a network with a cooperative character (see image), which looks wider than the CAP (an instrument). Focused on realisation of CAP goals and fits a performance-based steering. In this way, the National CAP Network contributes to greater coherence and strengthening of the AKIS.



Netherlands does not have an AKIS institution or a leading organisation in AKIS. Since agriculture is very diverse, such an organisation would not fit in Dutch context. Therefore the choice is made to support collaboration between networks, so that cohesion services is enhanced, leading to a effectiveness in innovation and knowledge exchange.

The following activities are carried out by the National CAP Network:

1. Stimulating the use of and access to knowledge and innovation measures within the NSP
2. Providing overviews: Operational Groups and knowledge projects are visualized for the dutch Green Knowledge Net database and EU database.

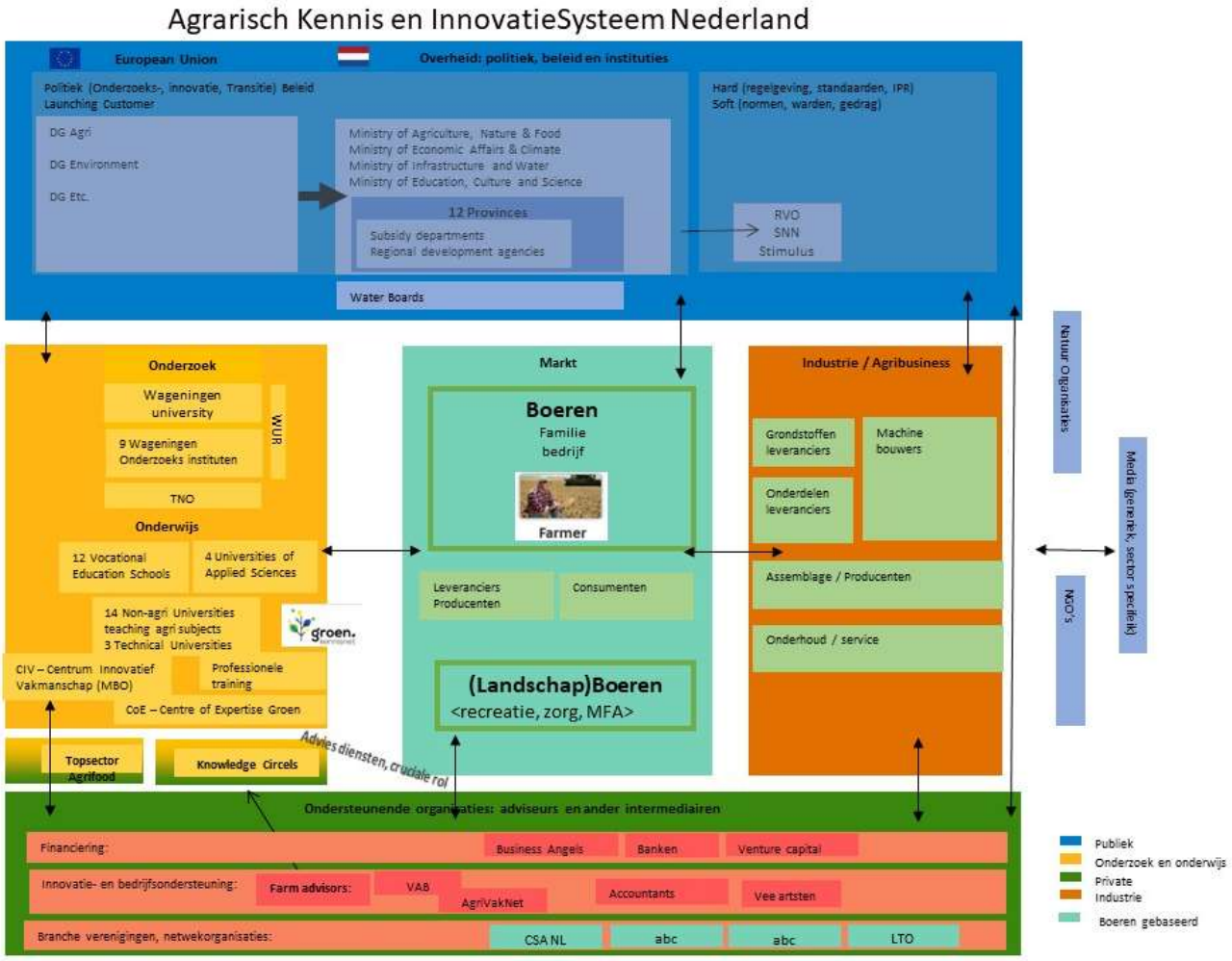
Overview of relevant players and initiatives (including trial and demo companies and field labs) in the AKIS.

3. Connecting Operational Groups with EU and national research projects; with Thematic Networks and Focus Groups
4. Knowledge dissemination: storing results of OGs and other CAP projects on Green Knowledge Net, which creates a repository of scientific and practical information (linked to the EU-Farmbook)
5. Monitoring & Evaluation: monitoring the development of the AKIS and reporting on the state of affairs of the AKIS
6. Fulfilling our role regarding impartiality and competence development of both impartial and commercial organizations (suppliers and buyers).
7. Raising AKIS issues in the National Assemblies under the Dutch CAP (Werkplaatsen Netwerk Platteland) and other partner and stakeholder meetings.

A challenge in all these actions is: convince the advisors to join in the meetings, etc. There a clever solution is found: National CAP Network got in contact with VAB to design the meetings in a way that they fit in the VAB quality system (advisors get study points). The knife cuts three ways: it connects important aspects of the Dutch AKIS, the meetings are more focused on 'what's in it' for the target group, and the meetings have more impact because more advisors come in.

Making of…

To make an overview of this workfield, the National CAP Network used the i2connect AKIS description as basis. In their overview, different categories are included for agribusiness and farmers (producing feed, fiber and/or societal functions like landscape, care, tourism). The farmers organizations are included in the 'support' block: representation and community functions play a minor role in this aspect.



Important addition by CAP support are eight functions of the AKIS: entrepreneurship, knowledge development, knowledge exchange, guidance of the (re)search, market development, mobilizing resources, tackling resistance and coordination. The first seven come from Technology Innovation System (TIS) analysis (Functions of Innovation Systems: A new approach for analysing technological change — University of Twente Research Information (utwente.nl), which is still improved, f.i. with an extra function: 'demonstrative value' Energies | Free Full-Text | Validating the "Seven Functions" Model of Technological Innovations Systems Theory with Industry Stakeholders—A Review from UK

Offshore Renewables (mdpi.com). In general we can say that more functions in the enhancing mode increase the chance that the innovation leads to an irreversible transition.

2.3.5 Comparison the AKIS descriptions

Interactive innovation occurs, when different partners join effort to solve a practical problem and co-create an innovative solution. Obviously, farmers should be included in agrarian interactive innovation, advisors play an important role to bring practical and scientific knowledge together and scientists bring the language to understand what is happening.

- The general overview (top left) is farmer centric, it gives a general overview of organisatons.
- The National Strategic Plan gives additional information to all subjects where the government has a mandate to finance, especially educaton.
- The project flows diagram shows a vision on the limitations of what innovation projects can mean for farmers, and how this is managed in practice.
- The last diagram and description explains the different actions that the National CAP Network undertakes to enhance the cohesion between the many networks in the Dutch AKIS.

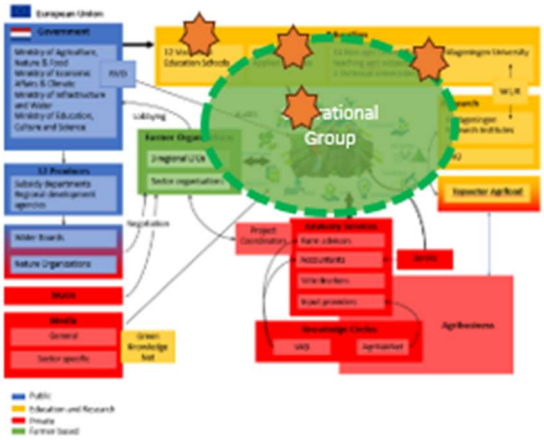
Operational Groups in the AKIS descriptions

In the four AKIS descriptions these actors and Operational Groups, their collaboration platforms, are referred to explicitly or implicitly. Locating them (green circles) shows the actors involved and the different environments that support or challenge the Operational process.

- The general overview is farmer centric, it covers farmers & organisations, advisors/project leaders, scientists. They find ways for progress in the innovation and manage project funding with managing authorities.
- The National Strategic plan mentions Operational Groups under CAP AKIS, together with the CAP Strategy, National CAP Network and Advisors. This acknowledges the value of advisors roles in innovation processes.
- The project flows diagram shows the role of advisor/project leader between the CAP/RDP managing authorities and the farmers. There is an interaction with other project funding agencies. Other stakeholders are mostly hired to execute specific tasks, so they are not mentioned. The role of advisors/project leaders in subsidy management is ambivalent: on one hand,

farmers are quite happy when others carry the administrative burden. On the other hand, this 'fire wall' keeps the status quo that projects are too complex in a farmer's perspective.

- The National CAP network undertake actions to bring those efforts together, where the farmers' progress and future is core.



Facilitation of innovation

We conclude that many representations of the same AKIS can be true and additional to each other. Each representation expresses another aspect in Agricultural Knowledge and Innovation.

3. History of the advisory system

Sicco Mansholt is a name that cannot be left out when speaking on the history of Dutch agriculture. In the fifties of the 20th century he was the founder of the agricultural education and research system that was implemented up until the nineties. However, agricultural research and education was started to gain an interest as early as the late 19th century when cheap grain from America caused a crisis in European agriculture.

The developments of new techniques, including the use of fertilizer, and the growth of cooperatives in the agricultural landscape in the late 19th century, were enhanced by education and research in the sector. After 1945 the national agricultural extension service was established. Research, advisory and education services were still mostly focused on new technologies increasing productivity. Also, farmers started to focus more on economic aspects. Wageningen Economic Research (WecR), specialised in cost calculations. From 1950 on business operations started to interact more with aspects outside of the farm. Competences to operate with processing and supplying industries, trades and banks grew in importance. Agricultural sciences also started to interact with non-agri facets (Bauwens, De Groot, & Poppe, 1990). Minister of Agriculture, Nature and Fisheries and European Commissioner Sicco Mansholt held an important role in the modernisation of the Dutch agricultural sector. He initially focussed on removal of hunger through lack of food production. He focussed on policies that would allow farmers to become self-sufficient and less reliant on government subsidies. To get to the point of self-sufficiency he steered for fair price politics, affordable land prices, a new design of the landscape and an infrastructure of knowledge. Smaller farms had to seize in order to give room for big and modern farms to grow and scale up, or modernise to heighten their own welfare and not being dependent on government subsidies. In the fifties Mansholt's plans appeared to be a success. His next plans for the Dutch agricultural sector was to establish a strong position on the global produce market. Mansholt's policies caused an outrage among farmers, but through decrease of cost prices, specialisation and upscaling the Dutch sector was able to develop its strong position on the global trade market as it is today (SchoolTV, 2020).

Since the early 1970's nature, environment and ecology became a focal point in research. In the 1980's these aspects started impacting agricultural policies (Bauwens, De Groot, & Poppe, 1990). Due to the growth of the poultry and pig sectors, the production of phosphor and nitrogen grew significantly. The overproduction of manure in non-ground-bound animal husbandry and the excessive use of fertilizer caused a surplus of nitrogen. The past ten years phosphor usage has decreased due to government regulations on usage of fertilizer. Additionally, manure has found a market outside the agricultural sector (Rijksoverheid, 2019).

The end of the eighties gave birth to the phenomenon neo-liberal market thinking. Knowledge changed from a common good to a product. The agricultural extension service led by the government stopped and became a commodity of private institutions. This started the fall of the public Dutch agricultural extension service, and education and research services. In 1990 the government stated that seeking technological and business economical advice should be the responsibility of the farmers themselves. This led to subtraction of the subsidisation for education and advisory services, and privatisation of advisory

service in the sector. Private advisory organisations sprung from the national agricultural extension service and developed themselves in their specific target subjects. Just like several accountant offices, they have a business model with subscriptions and pay-per-hour from the agricultural sector. The government focussed on additional finance in projects, changing from input financing to output financing, thus becoming a client of the research facilities. Representatives of suppliers also took up the role as advisor concerning their specific business activities, as did representatives of financial companies, nature specialists and other type of advisors and advisory organisations that interact with the sector. In an assessment by Erisman & Verhoeven (2019), farmers voiced their opinions on the current advisory services. According to them the bottlenecks are based on the lack of time and money, plus the lack of well-educated advisors. They miss the opportunity to consult generalists as opposed to specialists and the opportunity to find strategic and integral advice (Breembroek J. , et al., 2020).

The advisory services could play an important role in the transition to circular agriculture. To facilitate this, the Ministry of Agriculture Nature and Food Quality started a voucher system for this purpose. Currently the association of agricultural advisors (VAB) has set up the BAS register, in which independent advisors are registered. The government provides a voucher for advice on specific subjects to the farmer. With that voucher he can pay one of the independent advisors. Independent advisors are not commercially driven like product linked advisors could be. That way advice will be directed towards the same goals, and cost arguments will be subdued (Breembroek J. , et al., 2020).

4. The agricultural and forestry advisory service(s)

4.1 Overview of all service suppliers

The advisory service suppliers can be divided into independent or product related advice. Independent advisory services are paid directly by farmers for the service they provide, and/or by the government. Product related advisory services are paid through a margin on the product they sell. This means the farmer does not pay directly for the advice, but it is calculated into the cost of the product. How close their relationship with farmers is, is determined by the type of service they provide. About the frequency of contact we can say that the independent advisors, except veterinarians, are less often consulted by farmers due to the associated costs.

Independent advisory services:

- Farmers organisations LTO-Noord, LLTB and ZLTO have advisors and project leaders/ project experts that give strategic advice to the (potential) members. On average they reach farmers twice a year for the provision of advisory services.
- DLV (animal production) and Delphi (plant production) come out of the former state advisory services. In the 90s this service was privatized and both organisations made the successful shift from guaranteed funding to tendering for projects and payment by clients. On one hand this made the services agile and client oriented. On the other hand, the advice on strategic issues and societal challenges got a lower priority. Therefore, as mentioned, the government is testing new funding mechanisms (vouchers).
- Independent specialists, often working alone or in SME businesses find their market with outstanding knowledge on their subject.
- Accountants provide administrative reports. With the complete overview of costs and benefits, they can produce detailed advice for farmers.
- Veterinarians are trusted partners of the farmers. It is estimated that they visit farmers monthly to provide advice and medicine. Their business models have changed. While previously veterinarians had a combined model to pay their advice with a fee for advice and a percentage on medicine, now this is separated. Therefore, we qualify them as independent.

Product related advisory services:
Many farmers have a very close relationship with advisors of their input providers that often provide them with the necessary advice on daily management.

- Dealers of supplies: in Netherlands half of the supplies for farmers are provided by cooperatives, and half by commercial dealers, these companies build a relation with farmers by a combination of product and advice. Of course, the advisors are dependent of the margin when they buy or sell goods, but they cannot sustain their client relations without support that helps the client. Because they visit the farmer more frequently than any other advisor, often the farmers see these advisors as thrusted person.
- Account managers of soil/plant/quality labs: they visit the farms with very specific information, which is often essential for the farmer, to be able to sell the products.

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

In the Netherlands there are many more product related advisors than independent farm advisors. The employers of these advisory services, commercial companies, are focused on lowering costs and the increase of production. Advice of these companies usually are on business management and are short-term.
Independent advisors focus on more long-term goals, based on the identity of the farmer and their own future goals (Breembroek, et al., 2020). The regulations that accompany the push for a circular agricultural system from the Ministry of Agriculture, Nature and Food Quality ask for long-term solutions (Rijksoverheid, 2018). In 2020 the report “Quality assurance of agricultural advice” advised the Ministry on accomplishing this mission. The report encourages securing the position of the independent agricultural advisor (Breembroek, et al., 2020).
Research financed by the Ministry of Agriculture, Nature and Food Quality is carried out by different parties. An important party is Wageningen University & Research. This research institute counts six areas of expertise, one of which is policy support research. The researches carried out by this facility supports the choices on regulations and directions the ministry will take (Wageningen University & Research, 2021).
Several subjects for agricultural companies and organisations can get subsidised. For this report the subjects that may directly be tied to AKIS actors are divided in the subgroups: advice, projects, education, and climate. In table 3 some of the different types of subsidies are explained.

Various types of grants within the Dutch AKIS		
Type of subsidy	Subsidy name	Subsidy explanation
1. Advice	SME Innovation Stimulation Region and Top Sectors (MIT): Feasibility	Subsidy for feasibility projects based on economic and technical risk analysis. For these projects the government is willing to subsidize 40% of the project with a maximum of €20,000 and a maximum study length of one year (Rijksdienst voor Ondernemend Nederland, 2021).
	Advice and education for farmers	Subsidy module agricultural business advisory and education (SABE). This system lends a voucher of €1500 per year to farmers that want to work on their company's sustainability. This voucher can be used as payment for advisory service from advisors that are recognized by the BAS register, a register with independent advisors only. It can also be used for education purposes by the acknowledged institutes (Rijksdienst voor Ondernemend Nederland, 2021).
2. Projects	Rural Development Program (POP/POP3)	POP covers five themes: strengthening innovation, sustainability and competitive power, young farmers, nature and landscape, improvement of water quality, strengthening of rural areas (Rijksdienst voor Ondernemen Nederland, 2021).
	Subsidy for Circular supply chain projects	Subsidy for designing a circular product or service. In total the government will subsidise 50% of the project's costs, with a total of €20,000 per participant and a total of €4,500,000 for the entire project.
3. Education	MIT knowledge voucher	The entrepreneur can claim a knowledge voucher in order to get the answers to questions on account of renewals of products, product processes or services. One voucher holds the worth of €3,750. The vouchers can be submitted at educational institutes (Rijksdienst voor Ondernemend Nederland, 2021).
	Learning together in projects	This type of educational projects is connected to the SABE mentioned in this

	sustainable farming	table before (Rijksdienst voor Ondernemend Nederland, 2021).
4. Climate	Stimulation Sustainable Energy Production and Climate Transition (SDE/SDE++)	Subsidy for the investment in energy production and/or climate transition. This subsidy covers the themes renewable energy, warmth and gas, low CO2 warmth and low CO2 production (Rijksdienst voor Ondernemend Nederland, 2021).

Table 3, Various types of grants within the Dutch AKIS

Product related advisory service, as opposed to independent advisory services, are completely funded through a percentage of the payment of the product. These advisors are normally don't use government subsidies, project tenders nor vouchers. The administrative burden of such grants conflicts with the commercial focus of these advisors and their companies.

4.3 Clients and topics and methods

Topics

Agricultural entrepreneurs may have questions or difficulties with various topics. They can have issues related to technical, economic, managerial, construction, and environmental challenges.
The VAB indicates that their advisors provide these types of advice according to the website, see table 4 (VAB, 2021).

	Nitrogen emission and reuse of nutrients: source-oriented reduction of emissions;	Healthy soil, water, and cultivation;	Resilient cultivation systems and crop protection;	Circular use of crops, raw materials and new vegetable protein sources;	Nature-inclusive agriculture;	Precision farming.	Horizontal collaboration;	Business takeover.	Cross Compliance; good agri+environmental condition of land	Greening, conservation of the agricultural area;	Measures from RDP3	Water Framework Directive;	Use of plant protection products; IPM	
Agricultural legal advice;	x	x	x	x	x	x	x	x	x	x	x	x	x	13
Agro ICT and automation;	x	x	x	x		x			x		x		x	8
Agro marketing and communication;				x	x					x	x			4
Agro market forces;				x										1
Business guidance;					x	x	x	x		x	x			6
Business development, strategic management;				x		x	x	x		x	x			6
Company takeover, company termination;							x	x						2
Biologically agricultural;	x	x	x	x	x	x				x	x	x	x	10
Sustainability;	x	x	x	x	x	x			x	x	x	x		10
Energy, CO2 emission reduction;	x		x	x		x			x	x	x			7
Financing, banking, and insurance;							x	x						2
Fiscal advice;							x	x						2
International business and emigration;								x						1
Brokerage and appraisals;						x								1
Mediation, coaching, career guidance;							x	x						2
Regenerative agriculture;	x	x	x	x	x	x			x	x	x	x	x	11
Spatial planning and environment (I&M);	x	x	x	x	x	x			x	x	x	x	x	11
Social agro and care farms;														0
Specializations;														0
Licensing.														0

Table 4, Agricultural advisory topics and whether they can be provided through a governmental voucher

If an agricultural entrepreneur wants to use the voucher system, there are some conditions that must be considered. The vertically written data at the top of table 4, is advice that is linked to the voucher system (Register Business Advice System (BAS), 2017). These topics are divided into the categories: Circular agriculture, personal development of the entrepreneur and his company and some European laws and regulations.
One of the things that stands out, visibly in table 4, is that all advisers who are specialized in the field of Agricultural Legal advice, can also give all advice in the field of the subjects of the FAS register. Also, for the topics regenerative agriculture and spatial planning and environment there are several VAB advisers who can give advice on almost all FAS topics.

Clients

Entrepreneurs in agriculture and horticulture are clients of advisors. In 2019 there were 53.235 farmers in total (van der Meulen, 2020). They are divided into categories, see table 5.

2019	Number of farmers
Greenhouse horticulture and mushroom companies	2.700
Open ground horticulture companies	5.671
Arable farms	10.979
Dairy farms	14.923
Other grazing livestock farms	10.083
Intensive livestock farms	5.730
Combined companies	3.147

Table 5, Number of farmers in the different agricultural sectors (van der Meulen, 2020)

It is expected that 60% of farmers make use of independent advisors (Paree, 2021). In addition, virtually all farmers make use of product related advisors for their business, such as a feed advisor.
The clients do not only require technical and financial/economic advice, the role of advisor has changed more and more to sparring partner. This is partly due to the rapid technological innovations and the higher education of farmers in Netherlands, that facilitate farmers nowadays to know day-to-day what the state of affairs is on the farm (Backus, 2020). For strategic decisions they need extra support.

4.4 Human resources and methods of service provision

Human resources

Most advisors have a MSc or BSc grade; secondary vocational education or PhD are rare. Most advisors did their training in Agricultural Educational Institutes: (See chapter 2.3). Wageningen University is the largest Dutch agricultural university and nine connected institutes. Wageningen trains for a MSc degree. In three Universities of Applied Sciences: HAS Hogeschool, van Hall Larenstein, and Aeres; students finish their studies on Bsc level, but MSc courses are available as well.
In recent years, fewer people choose trainings in primary agriculture. A trend in recent years is that more side entrants are entering the agricultural market. They have not completed any agricultural training. They enter from their current financial / economic job or are retraining. (Paree, 2021)
The VAB is one of the largest, most well-known independent agricultural advisory organizations. The VAB has a network of experienced, qualitative advisors who assist entrepreneurs in agriculture and horticulture with strategic decisions and optimisation of business operations.
The VAB is recognized as a professional association by the European Agricultural and Fisheries Policy and Food Safety Department (E.L.V.V.) of the Ministry of Economic Affairs. The VAB stands for recognized quality. Only VAB members can be included in the RVO Farm Advice System, which provides access to European agricultural subsidies (CAP related projects). To improve the quality of agricultural services and support the implementation of the CAP, certification of agricultural advisors is carried out. The VAB offers certification to agricultural business advisors (AB).
Currently there are about 492 advisors affiliated with the VAB. About 12% of these are women and 88% are men. 84 advisers have obtained the 'AB' certificate.
Alfa Accountants en Adviseurs is, with 39 members, the organization with the most VAB advisors. The (Z)LTO, Countus Accountants en Adviseurs, ABAB, Delphy and PPP-Agro Advies West BV follow hereafter with their independent advisors.
Advisors can find support and knowledge at advisor associations. Independent advisors can connect to the VAB, who supports knowledge exchange and enables advisors to be recognized on a European level. This recognition makes it possible to access certain grants. Agribusiness advisors can gain support and deepen their knowledge through AgriVakNet.

Methods

Now that we described the clients/target group and message/topics (chapter 4.3) In this chapter we distinguish activities and channels in relation to the objective of an advisory action.

There are various activities that enable advice to and share knowledge with an agricultural entrepreneur, e.g.:

Methods / Media mix	Limited exposure	Paper	Telecom	Conference Centre	Office	I nearby	More intense kitchen table	In Field/ Demo
	Individual advice	x	xx		x		xxx	xx
	Study group	x	x		x	xxx	x	xx
	Regional/ sectoral group	x	xxx	x	x	xxx		x
Bigger audience	Mass communication	xxx	xxx	xxx				

Table 6, Methods & Media mix

Table 6 shows the different ways of communication between farmer and advisor and the ways of contact. The X's in the table are an indication of how often this way of communicating is used (Paree, 2021). One X means that this way of communication is relatively rare, more X's mean it is used more frequently. The red X's indicate that this way of communication is now more common due to the corona pandemic.

Figure 9 shows the different levels of learning. There are also different levels of advice that can be linked to this figure.

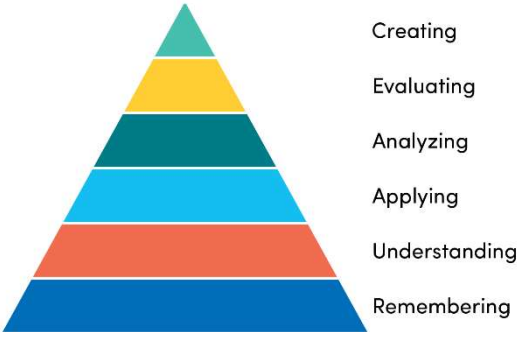


Figure 9, Levels of learning (Buffalo, sd)

The larger the group of entrepreneurs, the less intensive the advice. That is, one of the lowest levels of learning in the figure could include group demonstrations or mass media advice. One level higher, there is individual contact. Farmers prefer individual advice (van Esch, 2021). This can be done in a physical way, but due to the corona pandemic, this is currently taking place by telephone or by video calling. It is expected that more use will be made of this in the future. The highest level is personal coaching, this looks at the entrepreneur himself on a personal level. An example of this is the development of personal skills under the guidance of a coach.

4.5 Programming and planning of advisory work

Commercial farm advisory companies and organisations often have their own training and coaching programs for both new employees and settled employees. For independent advisors, such an education programme is often not available, because advisors can only earn their costs if they get all hours paid. Currently the government is steering independent advisors towards licensing that would acknowledge them as capable of their advisory work. As of now, this certification will be included in the BAS register. Licensing of accredited advisors would automatically ensure the credibility of these independent advisors.

Generally speaking, advisors will approach topics that need addressing at that moment on the farm. For product related advisors this means for example the development of the animals on a certain feed regime, or the effectiveness of certain fertilizers or pesticides. Independent advisors should help the farmer with best products and strategies. In that context they will explain their advice with a more long-term vision, as well as steering the company towards conforming to the guidelines of the EU and Dutch regulations.

Agricultural advisory organisations usually work with back-office employees, who handle any type of questions or issues that can be mended from the office, and front office employees or representatives who regularly visit the farmer and the farm in order to carry out a more precise advice. Advice service from front office employees is mostly arranged and scheduled directly with the farmers. Account managers of advisory organisations have the task to acquire new clients, and therefore will contact farmers that are not yet part of their own client base.

4.6 Linkages with other AKIS actors/knowledge flows

The AKIS diagram and innovation project diagram in Chapter 2 shows how advisory service providers are connected within the Dutch AKIS.
For advisors, the interaction with research and education is essential. The biggest actor in Agri agricultural academic education, science, and research is Wageningen University and Research. The WUR is a very strong brand. Wageningen University is one of the top universities in the world, and the Research activities are successful in acquisition and operation of basic and applied research. Apart from that, WUR is making a strong network with Agri industries, linking many AKIS actors together. WUR not only delivers research, it also enhances innovation processes, produces policy recommendations, creates appealing scenarios, etc. Since this is often done in collaboration with partners, the multi actor approach is in the nature of Wageningen Masters and graduates.

Within the four agriculture orientated Universities for Applied Science students are closely linked to farmers and agribusiness. In the past five years this relation is deepened with the appointment of lectors that have time and budget to tackle challenges from practice. Hall van Larenstein has twenty professorships, Aeres has eighteen, and HAS University of Applied Sciences has thirteen. These professorships have a very diverse spread of topics, mainly focusing on innovation and sustainability. Future Food Systems are an important topic at Universities.
The advisory services also play a very important role in innovation projects, and often form the link between these projects and farmers. Linkages between research & education on one hand and advisory services and innovation groups on the other hand, always need a lot of attention. For that reason, last year the Top sector Agri-food launched a subsidy track on interaction between these stakeholders.

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

The privatisation of the Dutch agricultural advice system has led to as skewed position. As farmers relied more on the advice services of sales-driven organisations who are also their suppliers for feed, pesticides, machinery, etc., these, usually big, companies gained a significant market base over their independent advisory colleagues. Farmers preferred advice from these organisations, because they offer their advice for free as form of service for their clients, and because in the frequent visits they build a good relation. However, as previously mentioned, these organisations still largely focus on production quantity and daily management. Currently a focus on attaining the goals of the AKIS and the goals of the Dutch government to implement a circular agricultural system is needed. To implement these plans, independent advisors that can create an overview of the entire system should be enabled to share their ideas and advice with the farmers and other actors in the agricultural playing field. In order to create a gateway for the independent advisors to do so, and to provide farmers with the means to access independent advice, the Dutch government implemented a voucher system that supplies farmers with the funds to use the knowledge they need. The vouchers are not only applicable on advisory services from licensed independent advisors but can also be used for research and education. It should be duly noted that the independent advisors do not solely advice on FAS guidelines, but implement FAS advisory in the advice on their personal area of expertise (Bulten, 2019).
Wageningen and Universities of Applied Science play a role in both, research processes and (technological) innovation, and carry their findings out to the advisory world as well as to the farmers themselves. They hold a strong position

in carrying out knowledge to the professional field, and delivering young professionals that are up-to-date on the latest developments in the agricultural sector (Visser, 2019). Education is the only part of the agricultural education, research and advice system that ’asn't privatised in the nineties of the last century (Bulten, 2019).

As of now, the retraction of the govern’ent's interference in agricultural advisory and extension services, caused the privatisation of the Dutch AKIS (Bulten, 2019). Farmers in the Netherlands take responsibility for their own farms and reach out to advisers as they see a good fit. Due to little government involvement in the AKIS system, there is a wide variety in businesses and business management support, and the EU-FAS is implemented through existing companies and organisations within the agricultural advisory sector (Bulten, 2019).

Similar to the many different types of farms and farm management, the choice for type of advisors also varies between entrepreneurs. Some farmers prefer advisors that do not know their farm and can give a clear insight in its process from an outside viewpoint. Others want to build up trust between them and the advisor. According to Jan van Esch of the Dutch agricultural ministry, farmers that use the SABE voucher system primarily use the vouchers for technical advice. However, those that use the vouchers for coaching advice appear to be very content with that type of advisory service. Van Esch foresees a shift from the primarily use of technical advice to coaching advice.

5. Summary and conclusions

5.1 Summary and conclusions on section– 1 - 3

The Dutch agricultural sector is distinguished by, among other things, the intensity in agriculture. This means that a relatively large amount is produced per hectare of land. The favourable location and the Port of Rotterdam and the densely populated NW-Europe provides good export opportunities. Flowers and plants make up the major part of agricultural exports, followed by meat and dairy. The number of agricultural businesses in the Netherlands has almost halved over the past 20 years. This while the economic size of the companies has almost doubled. The agricultural sector has several challenges. For example, there are various climate objectives that must be achieved, there is currently insufficient business succession and it is a challenge to meet the needs of the consumer. Climate change also poses some sustainability challenges.

The Dutch AKIS is very strong, got fragmented and is now moving to an integration of networks. The Netherlands has been a frontrunner in terms of innovation and input efficiency. This strong system was able to develop due to collaboration and investments made by the government, industry, civil society organisations and knowledge institutes. In the 90s, the government decided to reduce public spending related to the Dutch AKIS, which shifted knowledge from a common good to a marketable product. This has caused fragmentation in the AKIS system, which lacks unity. Many small AKIS sub-systems are formed, which are very efficient but a common vision over these systems was lacking. The government's aim to shift to a circular agricultural system has also led to an increased gap between public and private interests. Supported by EU policy, the government takes action to integrate the different networks, in a way that fits to the diverse types of Dutch agricultural entrepreneurs. One action is the voucher system with which farmers can receive advice and training. It has been proved to be a very successful policy that has been enthusiastically been taken up by both farmers and advisors.

Possibilities for a national agricultural extension service was discussed since late 19th century. It was not established until after 1945. During the first years after the second world war the extension, education and research service focussed mainly on the increase of production. From 1950 on farmers started to look outside of the farm and established cooperation between third parties within the produce network. Sicco Mansholt stood at the base of the national agricultural extension service. He focussed on the eradication of hunger and building a self-sufficient agricultural sector that would be able to rely less on government subsidies. Later, when his policies became a success, he steered for a strong position on the global trade market through specialisation, upscaling, and the reduction of cost prices.

From the ’980's on nature, environment and ecology became focal points and started to gain their influence on agricultural policies. At the end of the eighties neo-liberal market thinking changed knowledge from a common good to a product. Agricultural extension services became more privatised. At the end of the nineties the Dutch national agricultural extension, education and research service was privatised. The government became a client to the research facilities. Representatives of suppliers, but also of banks and other parties became advisors. In a research among farmers it became clear that current bottlenecks are lack of funding and time for advisors, lack of well-educated advisors and a lack of generalist advisors. Due to the important role of the advisory services in the implementation of a circular agricultural sector, the Dutch government has set up a voucher system that enables the farmers to gain independent advice directed to the FAS guidelines.

5.2 Summary and conclusions on sections 4

In the Netherlands agricultural advisory service suppliers are split in two types: product related advisors and independent advisors. Independent advisors are paid by the farmer or the government. Sales-driven advisors are paid through a margin on the sold goods. With exception of the veterinarians, independent advisors are consulted less than product related advisors. Independent advisory services in the Netherlands include farmers organisations LTO-Noord, LLTB and ZLTO, veterinarians, former state advisory services DLV and Delphi, independent specialists, and accountants. Product related advisory services include dealers of supplies and account managers of industry research centres.
Currently independent advisory services versus commercial advisory services have grown in a skewed position, in which commercial advisory services hold a much greater market position. For the transition to a circular agricultural system the government wants to secure the position of independent advisors. Research published and financed by the Ministry of Agriculture, Nature and Food Quality is majorly carried out by Wageningen University & Research. This research centre specialises in six areas of expertise, of which one supports policies and decision making in regulations. The Dutch government offers at least four types of subsidies tied to the AKIS: advice, project, education, and policy subsidies.
Independent advisors taken up into the system of the association of agricultural advisors (VAB) cover twenty different topics. Famers can use vouchers provided by the government to pay the advisors. To use the vouchers it is mandatory that the consult covers one of the following topics: technical advice on nitrogen emission and reuse of nutrients, healthy soil, water and cultivation, resilient cultivation systems and crop protection, circular use of crops, raw materials and new vegetable protein sources, nature-inclusive agriculture, or precision farming, advice on personal development on horizontal collaboration or business takeover,

or advice on EU regulations on the topics preconditions (Cross Compliance) and the standards for good agricultural and environmental conditions of land (GAEC), the greening conditions and conservations of the agricultural area, measures from the rural development program (RDP3), or requirements for the implementation of the Water Framework Directive. Customers of agricultural advice are the entrepreneurs. Advisors have become more of a sparring partner for the farmers. In 2019 the Netherlands registered a total of 53,235 farmers. It is estimated that 60% of these farmers consult independent advisors. All the farmers consult sales-driven advisors.

The Netherlands has various courses that train its students to become agricultural advisors. Wageningen University is the largest with nine different institutions. There are also four universities of applied sciences that provide courses focussing on the agricultural sector: HAS Hogeschool, Hogeschool Van Hall Larenstein, Aeres Hogeschool and Hogeschool In Holland. A current important development is the transition from a general study direction to specifications towards the agricultural sector. The VAB is the largest, most well-known independent advisor organisation. The association has a network of experienced and qualitative advisors. It is recognized by the European Agricultural and Fisheries Policy and Food Safety Department (ELVV) of the Ministry of Economic Affairs. The VAB offers certification for agricultural business advisors (AB). There are currently 492 VAB members, 12% are women, 88% are men, and 84 of these advisors are AB certificated. Advisors share their knowledge and advice individually, in groups are approached through demonstrations and on-company meetings. The mass population can give access to the knowledge through different types of media.

The VAB enables independent advisors to exchange their knowledge as well as enabling them to become recognised by the European Union, which creates access to EU grants. AgriVakNet specifically supports agribusiness advisors. The biggest Dutch actor in agricultural academic education is Wageningen University & Research (WUR). The WUR is one of the top universities globally and is successful in acquisition and operation of basic applied research. The university enhances innovative processes, creates policy recommendations, and supports the agricultural sector in many other ways. The university creates a multi actor approach in its students by its collaboration with partners. The four universities of applied sciences hold strong links between the schools, farmers, and agribusinesses. The past five years the relationship between these three actors have deepened through supply of lectors. Van Hall Larenstein provides twenty, Aeres eighteen and HAS thirteen lectors mainly focussing on innovation and sustainability. Future Food Systems is another important topic. Advisory services often hold an important link between innovation projects and farmers. To enable collaboration between advisory services and innovation groups, Top sector Agri-food launched a subsidy track.

The skewed position between independent advisors and sales-driven advisors needs to be addressed in order to move the Dutch agricultural system to a circular system. With the use of the voucher system the Dutch government wants to enable and secure the position of the independent advisors, as well as steer the sector towards implementation of the new standards. Education and universities hold a strong position in agricultural research. As the only aspect of the national agricultural extension service that was not privatised, education can play an important role in working towards a more solid Dutch AKIS. Due to little government involvement, there is a lot of variety of farms. Farmers seek out advisors as they see fit. Like the wide variety of farms, farmers hold different views on which type of advisors to consult. Currently the vouchers within the voucher system still go to technical advisors more often than to coaching type advisors. However, the farmers that have consulted coaching advisors, were satisfied with the result.

From "At a glance: THE NETHERLANDS' CAP STRATEGIC PLAN":
The Netherlands has a well-structured approach to fostering knowledge and innovation in agriculture and rural areas implemented by private parties. This approach will however be changed to an impartial advisory system providing training and advisory activities for farmers to help them address new challenges. Innovation plays an important role in the transformation to sustainable agriculture, which is why innovation projects, such as the ones under the European Innovation Partnership (EIP), will play an important role and will be supported by the Plan.

- *Each farmer will receive a voucher for a fixed amount of EUR 1 750 for training. Around 56 000 persons will benefit from advice, training or knowledge exchange, or from participating in European Innovation Partnership operational groups supported by the CAP related to environmental or climate-related performance.*
- *About 2 100 advisors will be supported in their work to make innovation available to farmers, for example crop production on wet soils.*

6. Discussion and Reflection

In the last 4 years, different aspects of the Dutch AKIS are described and visualized, every aspect has it's rationale to draw the AKIS structure and contributes to the general insight about the AKIS performances.
We conclude that diagrams of the AKIS are very supportive in the ongoing discussion on how AKIS should develop (beter dan designed, it changes permanently) to enhance Knowledge exchange and Innovation.

To the opinion of the author, strong points of the Dutch AKIS are: it has all the relevant players to cover the functions needed; and there are advisors, farmers representatives, researchers and teachers that are willing to facilitate the operational groups.
Weak points are : complex subsidy administration; lack of clarity about who should take the final responsibility to manage this complexity in such a way that the innovation proceeds optimally.

The experience of the author is connected to all the stages and networks in the report: in 1983, he worked in the extension services that were 100% financed by the government. In the 90s he co established a project department in the farmers organization in order to keep ways to fund support of farmers by their own organization, instead of opportunist organisations that came in when all funding was project based. Because the projects were in different subjects and sectors, he joined the different networks that are mentioned before.
This report pleads for intensification of the integration actions between networks. This will not only come from the institutions that are assigned to do so, but also comes from the 'free actors' that know the people in person, share ambitions, and establish collaborations that last longer than a project period.

7. Acknowledgement of partners, information sources and gaps

The content of this report has been based on literature sources and consultations of industry experts. Chapter 4 is not based on the survey, developed for i2connect, because there was no support of the AKIS organisations to fill it at this stage. The content is based on the knowledge and network of the author (experience of 40 years in the AKIS network).
This report has been established in close collaboration with commissioner Peter Paree, project leader at ZLTO. We would like to thank him for his dedication and support. Furthermore, we would like to thank Eelke Wielinga, PhD and retiree with many years of experience working within the Dutch AKIS, whose insights were of great value. Annick Spaans, project expert Food Security and Health at the ZLTO, for her contribution to the SWOT analysis. And lastly Jan van Esch, senior policy officer within the Ministry of Agriculture, Nature and Food, who was able to provide insights into the reality of Dutch agricultural advisors.

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9. Appendix

AKIS actors within The Netherlands		
Type	**Name**	**Description / Primary role**
International governing bodies	- European Union, OECD - World Bank, International trade organisations	Policy and regulation, research and innovation funds
National Ministries	- Ministry of Agriculture, Nature and Food Quality[1] - Ministry of Economic Affairs; - Ministry of Foreign Affairs; - Ministry of Education, Culture and Science - Ministry of Infrastructure and Water management	Policy and regulation, research and innovation funds
Regional and local governments	- Provinces - Municipalities - Water authorities	Policy and regulation, research and innovation funds
Top-sectors: public-private innovation programs	- Horticulture & Starting Materials - Agro & Food	Tripartite policy (government, business life and knowledge institutes), research and innovation funds, human capital agendas (education)
Public services	- Staatsbosbeheer (State Forestry Service, National Park service)	
Other National Policy Research Institutes	- PBL - Netherlands Environmental Assessment Agency - Netherlands Bureau for Economic Policy Analysis, Statistics Netherlands, - The Netherlands Institute for Social Research / SCP - RIVM –National Institute for Public Health and the Environment	Government agencies which conduct research in the social, environmental, and economic aspects of all areas of government policy. They officially resort under a Ministry, although they usually possess a large degree of independence
Independent and statutory Advisory Councils	- Advisory council for the Environment and Infrastructure (RLI) - Scientific council for government policy (WRR)	Independent advisory commissions for strategic policy for the long and medium term
Research Councils	- The Dutch Organisation for Scientific Research (NWO) - The Royal Dutch Academy of Arts and Sciences (KNAW)	Funds and steers research by means of subsidy programmes Acts as a management body for specific research institutes and advises the Dutch Government on matters related to science
Universities	- 14 Universities, of which - 3 Technical Universities (Delft, Eindhoven, Twente) - and 1 Life Science University (Wageningen)	Education and research Wageningen shifted from agricultural university to university of life sciences After WUR the University of Utrecht conducts most agricultural research
Research for applied agriculture science	- 9 Institutes of Wageningen Research - TNO NIZO, Louis Bolk Institute	Part of Wageningen UR, partly paid for applied research by the Ministry of Agriculture (TO2), partly commercially financed Partly publicly (TO2), partly commercial Commercial

[1] Including the Netherlands Enterprise Agency and the Netherlands Food and Consumer Product Safety Authority.

AKIS actors within The Netherlands		
Type	**Name**	**Description / Primary role**
Universities of Applied Sciences	- 3 green UAS (HAS Den Bosch, Aeres Van Hall Larenstein) - 1 UAS with a green department (InHolland)	Higher professional education (in Dutch HBO – BSc level)
Agricultural Vocational Education	- 12 AVE centres with various establishments at both pre vocational, vocational and post initial training level - 1 general regional vocational centre (ROC), including vocational green curricula	MBO: mid-level professional education geared towards the acquisition of vocational qualifications and training. VMBO: pre-vocational secondary education.
Farmer Unions	- Regional geographic distribution of unions: LLTB / LTO-Noord, ZLTO with LTO-Nederland as overarching organisation - Diverse branche and sector organizations	Apart from lobbying and the classic interest protection, farmer unions play an important role organising farmer networks
Food Chain Input industry Actors	- Seeds, fertilizers, semen, feeds, stables and machinery, veterinary products, contractors	Often coops. Provide specific advice to farmers on their own products; many have started their own research / or innovation centre
Food Processing and Outlet markets / retail	- E.g. Royal Friesland Campina, Cosun (Sugar), Vion, Unilever, Ahold, Auctions, etc.	Often coops. Financing research on product innovation and strategies, consumers, marketing, etc.
Independent NGOs	- Natuurmonumenten, Dierenbescherming, Wakker Dier, Natuur en Milieu, Oxfam Novib, Solidaridad, etc.	Represent of interests from stakeholders, lobbying, financing research
Chamber of commerce	- 19 offices	Trade register, service provision and advice for entrepreneurs
Farmers Cooperatives	- From large Friesland/Campina to small regional environmental farming cooperatives	Develop a shared vision, finance research and transfer knowledge to their members
Independent accountants and consultants	- 5 big agricultural accountancy offices (Abab, Flynth, Accon, Countus, Alfa); - Independent consultants have organised themselves in the Association of Agricultural Business Advisors (VAB); - land brokers and notaries	Provide information on commercial basis to farmers on specific topics: fiscal and legal issues, accountancy, environmental aspects, generational transfer.
Banks	- Rabobank is the most agro-minded bank	Financers / loans, financial advice.
Intermediary organisations	- Both Regional and national based organisations that often act as facilitators in innovation projects	Innovation brokers focussing on building networks