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AGRIFOOD - GREENPORT NHN

Key
performance
indicators
agrifood
complex

stec
groep





08 - 20

GreenPort Noord-Holland Noord

Key performance indicators agrifood complex

32 - 48

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Colophon

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GreenPort Noord-Holland Noord
Key performance indicators agrifood complex
August 2019

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AgriFood

Facts

A DIVERSITY OF CHAMPIONS

Greenports can best be compared with logistics 'mainports', such as Schiphol and Rotterdam. A Greenport is a spatial-economic cluster of national importance to which the entire agrifood chain contributes from seed to consumer. In a Greenport we find growers, auctions, trading companies and horticultural suppliers together.

A diverse region, a champions region: a **Greenport to be proud of**

Often there are also plant breeders and propagators seeds to be found. Knowledge institutions that are active in horticulture are also included. Because all the important partners are so close to each other, there is an intensive exchange of knowledge and there is mutual collaboration in numerous areas. In this network, companies and knowledge institutes encourage each other to deliver excellence.

When the government designated five Dutch regions as Greenport areas in 2004 the surprise in North-Holland was particularly great.

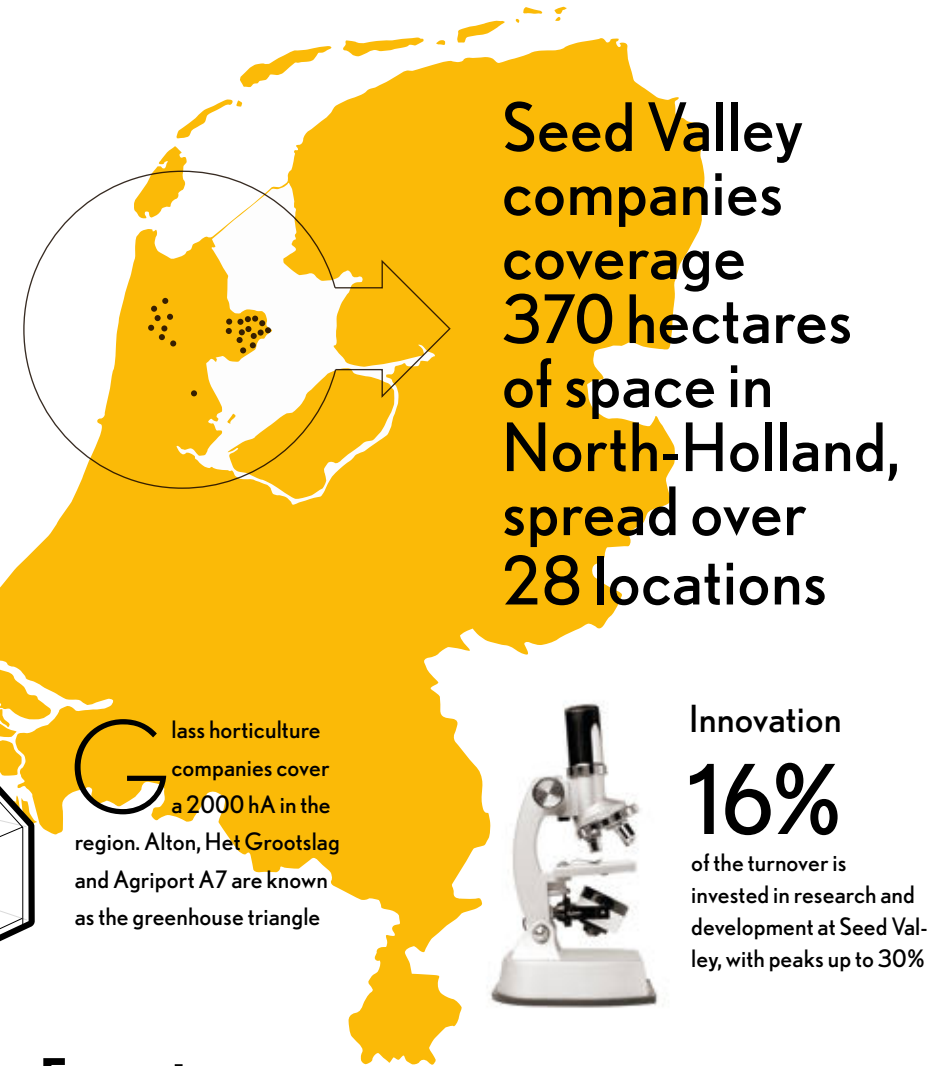
The most versatile agricultural concentration area North-Holland did not receive that status. A successful, intensive lobby ensured that the region was nevertheless designated as a Greenport.

The Greenport status is not hard to argue for the region North of Amsterdam. Which region has such

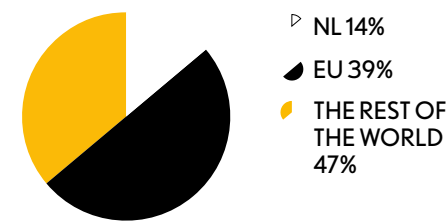
a diverse range: large-scale and innovative greenhouse horticulture, the largest bulb area in the world, Seed Valley with its international partners, the open-field vegetable production area and large-scale arable farming are all represented here. The sector is extensive in the region. With 14% of jobs, it is a key employer and the added value of the sector is also exceptionally high.

We can identify many champions within the various sectors. Vezet, Helsing, Syngenta, Enza, Agro Care Wieringermeer and Dekker Chrysanten are good examples. It's not just about becoming the champion. The challenge to remain a champion is potentially much greater. To this end, we see a great willingness to innovate in the region. Companies in the seed sector in particular invest a lot in R&D. Major investments are also being made in sustainability. The greenhouse horticulture areas Alton, Agriport A7 and Het Grootslag are an example for the whole of the Netherlands in this area.

The Netherlands is the second largest food exporter world and leaves only the US behind (almost 300 times larger than the Netherlands)



Seed Valley Exports



Export is the foundation. Sales growth outside Europe (2015 +18%) is currently stronger than within Europe (2015 +3%)



40%
GREENHOUSE HORTICULTURE



40%
TEST FIELDS

“They even know Seed Valley in China”

LARA TIMMERMAN *director Pop Vriend*

The green beans that are in the supermarket always look like a green bean. But the beans that are now on the shelf are different from those of previous seasons. The spinach?

Tastes the same and looks the same as usual, but comes from a variety that did not exist last year. At Pop Vriend in Andijk new, improved vegetable varieties are constantly being bred.

Pop Vriend Seeds is a key supplier of vegetable seeds for a range of major brands. Anyone who opens a jar of green beans, a can of corn or a pack of spinach in the kitchen is likely to encounter vegetable varieties from this company. In addition to an office, laboratory, greenhouses, breeding gardens and a distribution centre in Andijk, there are sales offices in various countries. In Andijk, seeds are bred for spinach, green beans, carrots, beetroot and chard. The seeds are exported to more than 100 countries, says director Lara Timmerman. Together with her cousin Arwin Vriend, she is the third generation working within the family business that was

recently taken over by the German breeder KWS. That strives for continuation and expansion of all activities from its location in Andijk.

Silicon Valley

After all, Seed Valley, in which Pop Vriend is located together with other breeders, is the birthplace of international seed breeding. Seventy percent of the seeds used on earth have their origins in the Netherlands and the vast majority of them come from Seed Valley, Timmerman says. “Wherever I am in the world, when I say that I’m from Andijk, colleagues know exactly where that is. Even in China. Seed Valley is for breeders and growers worldwide what Silicon Valley is for technologists. Everyone knows us. That can only lead to further growth.”

Drones and DNA

The vegetable varieties of Pop Vriend are being further developed every year. “For example, we make them disease-resistant so that fewer crop protection agents are needed, ensure that a higher yield is achieved with less input, make seeds heat-resistant, drought-resistant, ensure that the vegetables have a longer shelf life, a better colour, an improved taste and so on. A great deal is being innovated in our sector. We are used to coming up with new products every year. We use a wide range of new technology to achieve this.

For example, we fly drones over the trials fields in the summer to measure the growth rate of plants every day. We then know how fast the different varieties grow. And thanks to DNA technology it is becoming increasingly easier to discover how the genes of the plants work and which gene is responsible for which trait. We can already read properties from the DNA, without having to wait until the plant is fully grown. That is one of the opportunities for enabling us to speeding up our breeding process.

The sooner we can come up with better varieties and the cheaper we can do that, the more access there is to material that benefits a grower.”





Tiny mini heroes

Pop Vriend has 25 hectares of trial fields for testing the seeds, Timmerman explains. “In addition, we do trials in collaboration with our customers in fields worldwide. Ultimately, we need to know how our varieties are doing at their destination. They also need to grow well in very hot or dry areas and be resistant to diseases and fungi that we do not have here. The stronger a seed is, the better it will last under stress. The seeds are in my opinion tiny mini-heroes. They have to do it.”

New technology

A major advantage of the recent acquisition by KWS is that Pop Vriend Seeds now has faster access to their new technologies, Timmerman explains enthusiastically. “It’s fantastic to know that our company now has access to a candy store full of technology and expertise at KWS. And it’s nice to see what opportunities and possibilities arise and how we can apply the new potentials of data informatics, biotechnology and artificial intelligence in the future. Thanks to these new technologies, research projects will certainly be shortened in time.”

Top 3 in the world

Trial fields are also located at industrial processors, such as Bonduelle, Iglo and Delmonte. “These are important customers for us. We do trials at their locations to determine what does or does not work for them. Africa and Asia are also important markets for us, just like the Middle East. We are already the world market leader in spinach and chard. Our ambition is to be among the top 3 in the world with all the crops we breed. That’s a question of time.”

Green high-tech jobs

That does not mean that jobs will disappear, Timmerman emphasises. “On the contrary, new jobs are being created that do not yet exist. We operate in a very fast-growing sector. There is a job with us in Seed Valley for every student from Clusius College, HAS University of Applied Sciences or Wageningen University. You are given responsibility with us fairly quickly and if all goes well you can travel around the world almost immediately, from Chile to New Zealand or, for example, America. It is green high-tech. It is interesting and very socially responsible work. You contribute to ensuring that every person in the world can eat in a fair way and that there is enough for everyone.”

INTRODUCTION REGION NORTH OF AMSTERDAM AND GREENPORT NHH

Questions about nutrition, sustainability and a green living environment are high on the social and political agendas. How do we feed the ever-growing world population in a sustainable way? How do we improve the health of the aging population? How do we ensure that our cities remain attractive and liveable? an ever changing climate?

From the region North-Holland, we provide consumers in the Netherlands and around the world with starting materials, flowers and bulbs, bell peppers, tomatoes and countless other fresh produce items. That makes Greenport NHH the Garden of Europe!

With the knowledge and skills of our companies, research institutions, education and government, an excellent climate has arisen for entrepreneurs in North-Holland in

GreenPort
NHH
the garden
of Europe!

Agrifood. North of Amsterdam has an extensive and close-knit network, in which innovations arise naturally and find a healthy breeding ground. From the breeding of starting material to the refining of the products on the consumer's plate: our entrepreneurs work to achieve this every day. And with success!

North of Amsterdam is a test bed for making the global food system more sustainable. Sustainable cultivation techniques, processing and logistics are developed, tested and optimised in practice here to arrive at workable solutions for the food system of tomorrow.

The Agrifood sector is an extremely important economic factor. The figures presented in this report show this once again. It is good to keep in mind that Behind these figures, flesh-and-blood entrepreneurs are. Almost every day I discover entrepreneurs who prove to be important partners in the national and international market. They provide the added value for the Dutch economy and the employment of many people. Above all, they ensure that you have a fresh, healthy, sustainably produced meal on your table every day. Or a beautiful bouquet of flowers. And all at an affordable price. As programme manager at GreenPort NHH, I am proud of the innovative entrepreneurs in this region! hiding with a common culture. They are all driven, well-educated people with a passion for their profession and product. Together they work in a culture of rolling up their sleeves and doing. In North of Amsterdam we do not repeatedly talk about problems. We get to work and solve them!

Breakthrough cultivation on water nearby

JAN BOTMAN *Botman Hydroponics*
MATTHIJS BLIND *Proeftuin Zwaagdijk*

Growing crops in soil. This is all we have ever known. But climate change, more extreme weather and increasingly stringent requirements for emissions, quality of groundwater and crop protection agents are making agricultural entrepreneurs look for other solutions. Growing in water may be the clean alternative.

The benefits of cultivation in water are countless, according to entrepreneur Jan Botman from Botman Hydroponics (L) and researcher Matthijs Blind from Proeftuin Zwaagdijk (R), where this innovation has been tested for years. “Instead of reaching into the ground with their roots, crops grow in water that is enriched with nutrients. This saves on weeds and the risk of disease, plus the product is sand-free. Moreover, you are more attractive as an employer, because people no longer want to work on the land,” Blind concludes. “The importance of hydroponics in horticulture is therefore enormous. The possibilities are being fully investigated and developed. Provided the conditions are good, it is amazing how many plant species can grow roots in water. It is now a question of scaling up this approach to cultivation and making production cost-effective as well. And that is less easy than it sounds.”



We'll achieve that in a few years

Jan Botman has been working on that mission since 2007. "Hydroponics fascinates me. I'm an entrepreneur, not a researcher. It needs to be objective and neutral. Sometimes I go against the grain. Only then will you achieve innovation." Proeftuin Zwaagdijk gave him the space to do his own research. "Before we started we thought: we'll achieve that in a few years. We are now twelve years further and many different versions have been examined. Each time, we ran into new things. How should the system look, what is a good floater, how should the water be treated? Logistically there is a story behind all of it. It turns out to be very complex. We have only had models that we want to continue with for the past two years

Aeration and flow

Proeftuin Zwaagdijk has demonstrated in various tests that proper aeration and flow of the nutrient solution are essential. At Botman this aspect receives a lot of attention. "I have developed a completely new system that creates good flow through the entire basin and supplies the plant roots with oxygen, at very low costs and with minimal energy consumption. Stress periods do not occur, so that a healthy, strong plant grows."

Albert Heijn

Lettuce is the most important first crop where hydroponics is now being used on a large, commercial scale. A number of companies in North Holland and elsewhere in the country are satisfied with this cultivation method, says Botman. "Our customer B4Hydrogrow in Warmenhuizen is growing six lettuce varieties on water for Albert Heijn under contract by vegetable processor Vezet. I myself am behind the scenes working on demos in Germany where commercial projects are expected to ensue."

Cut flowers pose the next big challenge

The next big challenge is growing cut flowers such as chrysanthemums and Lisianthus on water. "We encounter entirely different things with these cut flowers than with lettuce. Flower growers in the south of our country have spent years researching hydroponics, but have thrown in the towel. Too complex. Together with companies in our region, we have taken up the challenge here. The first year all kinds of things also went wrong for us. The second year we realised where the most important problem was for cut flowers. We are now building on this. We will succeed in finding the solutions. In parallel to this, we are also conducting research into automation for cultivation and harvesting. The techniques are already there, but we are experimenting how we can integrate them specifically with this method of growing."



Fraught with anticipation

Botman is convinced that the major breakthrough for hydroponics is closer than ever. "By working very hard, convincing others and persevering with enthusiasm, we have achieved a lot in recent years. Confidence from the sector is starting to emerge. Several agricultural companies are fraught with anticipation. We now have to make it a reality and show that we can create systems that are a fully-fledged or even better alternative to soil cultivation. This is only possible in collaboration with the entire chain. All parties must commit. That starts with the breeders, who have to start selecting and breeding for hydroponic suitability. Because I may be stubborn and think I can work faster on my own, but together you achieve more."

Column

CAROLIEN WAGENAAR

Program manager,
Seed Valley

70% OF ALL VEGETABLES IN THE WORLD ORIGINATE FROM SEED VALLEY

The plant breeding sector is regularly referred to as an instrument and solution to issues regarding the evergrowing world population and climate change. The challenge is to achieve increasingly higher yields using fewer crop protection agents, square metres, water and minerals. In addition to new cultivation methods, resistant crops with high yields and a good flavour, offer a solution.

Seed Valley is located in North of Amsterdam. The definitive knowledge centre when it comes to developing new vegetable and flower varieties. More than 40 companies work on new plant varieties every day and the associated technology, such as machines and robots. Major market leaders are based there.

**On average
16% of their
turnover is
invested in
R&D**

They invest on average more than 16% of their turnover in R&D, with offshoots for individual companies to 30%. Compared to the national average of around 2%, this indicates that innovation is crucial. The technical developments in the sector are moving at a rapid pace. Plant cultivation is no longer possible without climate control and sensors. And traditional breeding is assisted by the latest techniques, which look at the properties of plants right down to the DNA.

This requires employees who are capable of driving and applying these developments. Every year the companies in Seed Valley collectively have around 300 vacancies at various levels and within various disciplines, from Practical education to university and from research & breeding to sales and data analysis.

The ecosystem of companies in Seed Valley is one of the key Agrifood clusters in the North of Amsterdam region. The seeds, cuttings and machines from these companies are exported all over the world. To make it concrete: 70% of all vegetables in the world originate from Seed Valley. The same applies for the other sectors, such as flower bulbs and fresh produce. It illustrates the impact that the region has on the provision of healthy food and flowers throughout the world.

A photograph of Petra Barendse, owner of Barendse-DC and founder of Bezoek Agriport, speaking into a microphone. She is wearing a green blazer and an orange scarf. The background is a blurred indoor setting.

Greenhouse horticulture area Agriport attracts international attention

PETRA BARENDSE owner of Barendse-DC
and founder of Bezoek Agriport

In the reception area of Barendse-DC in Agriport Middenmeer there is a map on which visitors mark with stickers which country they come from. With the exception of the uninhabitable areas, the entire world is covered. Asia and America in particular have many stickers.

The guests (often simply from the Netherlands) come out of curiosity to look at the high-tech greenhouse of the largest orange bell pepper grower in the world, says Petra Barendse, co-owner of Barendse-DC and founder of the company Bezoek Agriport. “Whether it concerns the automatic mobile harvest trolleys, the water supplies or the way in which we use geothermal heat, all of which helps us make our greenhouse horticulture increasingly more sustainable: many people want to know how we do it. Moreover, people are also more conscious about their health. They want to know where their food comes from.” Every year about 7,000 people visit our greenhouses. “When we moved here in 2007 from Westland, we could never have imagined that we would become a tourist attraction. We now work together with tour operators and other attractions in the surrounding area, allowing us to offer tourists an inspiring day programme.”



King Willem-Alexander

Visitors experience the daily routine of large-scale greenhouse horticulture with their own eyes. The size is particularly impressive. “We have 20 hectares of bell peppers and in the greenhouse next door there are 10 hectares of tomatoes. Our main product is orange bell peppers. The colour goes down especially well with tourists. As do the bikes that our employees ride through the greenhouses due to the large distances. You can’t get more Dutch!” Not only tourists come to Middenmeer. Making the greenhouse horticulture area more sustainable is attracting international attention. “We are seen as an example for the rest of the Netherlands and the world. Since 2017, six wells have been drilled in the area, which private network operator Energie Combinatie Wieringermeer (ECW) uses to supply geothermal heat for greenhouse horticulture at Agriport A7. This makes us the largest geothermal location in the Benelux. Even King Willem-Alexander has paid a working visit to the new ECW location in Andijk. That really says something. The creation of these geothermal sources was possible because we joined forces as entrepreneurs on this site and took a firm stand. We would never have succeeded alone.”

Important visitors from South Korea

Other important visitors came from South Korea “Last year I received a call saying that the prime minister had a 4-hour stopover at Schiphol and wanted to see modern greenhouse horticulture. Before I knew it, a convoy of tinted-glass cars arrived. He turned out to be a very nice, approachable man. They are working on a project similar to Agriport in South Korea. He had many questions, also very diverse. He wanted to know all about the energy supply, smart farming, measurement techniques, the use of water and CO₂. He was noticeably impressed. I was told beforehand that he had a maximum of an hour, but he left after an hour and a half.”

Always a new story

Thanks to all the changes and innovations in the area, giving excursions is always incredibly enjoyable, according to Petra Barendse. “I am benefiting enormously from the developments. My story is constantly changing. The data giants are now appearing with their impressive buildings. I get more and more curious people who want to know what is happening here and why those data centres are next to the greenhouses. I am very proud of what is literally and figuratively growing in this area, so it is no effort for me to speak about it with enthusiasm. Gardeners are very proud of their products, but do not always show it. By offering these excursions I aim to give greenhouse horticulture a positive image. The opportunities for mutual synergy between the entrepreneurs are fantastic. What one company is talking about, the other can use. For example, it would be nice if we could use the heat from the data centres for all the greenhouses in the area in the future. We want a circular economy. Then you can really start talking about the future of our children.”

Professional visitor centre

Petra Barendse has another big wish. “A professional visitor centre, where I and my team of 6 guides can act as ambassadors for the entire Agriport site, including the data centres. What happens here is so huge. That story needs to be told. A reception building like this would not only provide an even warmer welcome for all our guests, but would also be the place where we could receive ministers, heads of state, television journalists and other interested parties from all over the world. I take this work very seriously.

We are not traditional gardeners any more: we are entrepreneurs. You won't see me walking around with a red handkerchief around my neck and clogs on my feet. I'm a modern farmer's wife. Nowadays, the sector is cool, modern and comprehensive. I want to show that to the world.”



Harvesting heat from the tulip greenhouse

SAM RUIJTER Owner Ruijter Bloembollen

Bloembollen
www.ruijterbloembollen.nl

Every summer the greenhouse of bulb grower Sam Ruijter from Slootdorp is empty. When the windows are closed the temperature can rise as high as fifty or sixty degrees. Heat that can be used perfectly well in winter for heating the greenhouse. But how do you store that heat? His daughter's inflatable swimming pool gave him a simple but bright idea.

Ruijter Bloembollen is a growing and forcing company for tulip bulbs and gladiolus. "From October to April we force around 10 million tulips in our greenhouses. The tulips are planted in bins in the autumn and grown in the greenhouses until they are bunched between December and April and end up at consumers' homes in vases. The greenhouses are empty or used for storage from May to October. In the warmest period of the year, we actually do nothing with the greenhouse, while in the winter months we need a lot of heat to make the tulips bloom," Ruijter explains. The solution for storing

the heat he found by the swimming pool in the garden. "I discovered mats that could be used to heat the water. The water runs through the mats and the sun heats it. That was my eureka moment. Could we also use that principle to store the heat from the greenhouse?"

Experimenting

Ruijter has been busy experimenting for the past two years. In collaboration with TNO and Wilms Installatietechniek from Den Helder, he devised a system that harvests heat in the greenhouses and stores it in water. After a number of successful tests, the grower will use it on a large scale for the first time this summer, with the help of a grant from the University of Wageningen. The system is surprisingly simple and inexpensive, Ruijter says.

"In the summer, the greenhouse is full of empty crates that we grow the tulips in during the fall and winter. We place them upside down on the roller tables, creating large basins, as it were. On the upturned crate, we put a double layer of foil and run water through it. The sun heats the water to 40 degrees. We then store the hot water in a large 350-cubic-metre silo for direct use.

We store what is left in the soil and pump it up again in the autumn to heat the greenhouses. We also store the heat released when the cells are cooled in the water. We save an enormous amount of energy this way."





Impact

Ruijter is extremely aware of the impact that his company has. “I try to adjust my business operations accordingly. On my land, nature is given free rein. Suddenly, there are more hedgehogs and butterflies and more and more birds, such as great tits and goldfinches. I can really enjoy watching my daughter running after the butterflies.” Ruijter also puts sustainability first in his product. “My goal is to put a bunch of tulips on the table in people’s homes with the lowest possible CO2 footprint. We sell those flowers under the name ‘Tulpen van Sam’. We try to sell our sustainable story under that label, following the example of Tony Chocolonely and Arla milk.”

Good for the sector

Ruijter hopes that his pilot will soon be taken over by the several hundred peer companies in the sector. “Nearly all tulip greenhouses are empty in the summer. This is a good development for the entire sector. By using it, we can make enormous progress as tulip growers in the area of CO2 emissions and sustainability. We have to. The current method of growing bulbs can no longer be sustained in the long term.”

Pride

Ruijter’s goal is to make his company energy-neutral, although the benefits go further. “By doing this we will cultivate better bulbs. In the future energy will no longer be an issue for us. It will almost be free for us, so we won’t need to haggle. That improves on the quality of our product.” He is proud of his system. “It’s wonderful how an idea that used to be just in your head and that no one else has ever thought of is now a reality.”

Accountability

For Ruijter, saving energy and reducing CO2 emissions fits in with a broader picture of making his company more sustainable. “For me, it includes sustainable soil management and limiting the use of pesticides, which I find extremely important. The fact that natural gas is becoming more and more expensive is okay with me. Things could be much more difficult for us as growers. Then the need for innovation is greater. I believe that as entrepreneurs we have a responsibility. Agriculture plays a major role in the increasingly poor quality of the environment. We have done a lot of damage to nature. There are fewer insects, the number of butterflies is declining and birds are struggling. Agriculture could certainly be more accountable. Occasionally, I get irritated by the Calimero attitude of our sector. But the consumer also plays a role in this. Sustainable cultivation is slightly more expensive, after all.”

Key performance indicators agrifood complex

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Introduction

The North-Holland region is the garden of North-West Europe. Many innovative and leading companies from different agrifood sectors operate in North-Holland. On the basis of various key performance indicators this report shows the importance of the agrifood complex in North of Amsterdam for the Netherlands and Europe. The complex is understood to include all companies that work on products 'from seed to consumer'. The key performance indicators are divided into four categories:

- **Economic** key performance indicators
- **Upscaling key** performance indicators
- **Sustainability** key performance indicators
- **Social-cultural** key performance indicators

They each highlight a different aspect of the high-performance agrifood sector in the North-Holland region. The most recently available figures were used for all analyses.

The region is demarcated as COROP regions Alkmaar and Kop van Noord-Holland. This therefore also includes the Seed Valley in West Friesland.

Sources & important definitions

For this study, existing research has been used where possible. Among other things, the strategic exploration area demand for greenhouse horticulture (Arcadis and Stec Groep commissioned by NHN and province). Several other important sources include:

- Source of employment figures and locations: LISA, 2019
- Source of agricultural figures (except greenhouse horticulture acreage): CBS agricultural census, 2018.
- Source of agrifood complex: CBS top sectors monitor (top sector Agri&food), 2018.
- Vastgoeddata.nl

With regard to employment figures, the definition of jobs used is in line with LISA. The figures mentioned include full-time employees, part-time employees and temporary employees (Source: LISA, 2019).

In this report, the period under investigation is 2013-2018 unless otherwise stated. The previous report with KPIs for the NHN Development Company was from 2013 and included figures from 2012 and older. LISA 2019 is the most current version and contains data for 2018.

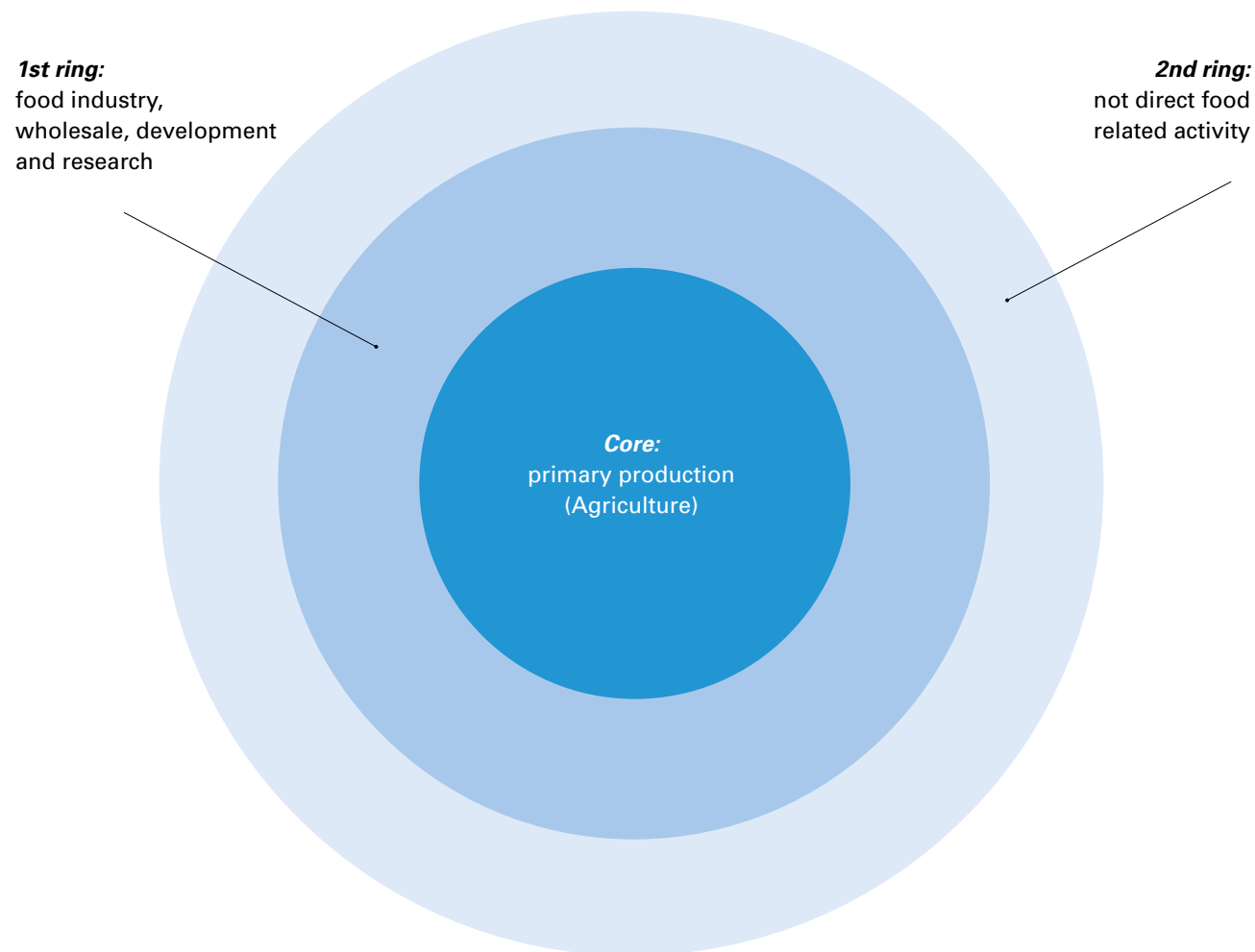
Economic KPI's NoA

Size of agrifood complex in jobs and locations, top 15 largest companies and top 15 growing companies, growth area, production figures, growth-share matrix, added value, investments and R&D

Conclusions of economic KPIs NoA

- The contribution of the agrifood sector to the economy in North of Amsterdam is approximately **38,500 jobs (14%)**, agriculture generates a lot of additional turnover and employment.
- Large companies in the agrifood sector of NoA are not only national, but also global players in their field of expertise.
- The number of jobs in the agrifood complex has decreased slightly since 2013 by 550 jobs. The number of locations has declined since 2012 by 180 locations. A trend of **upscaling is visible in the agricultural sector**. Automation and robotisation of agrifood production companies can increase employment in other sectors.
- For many sectors, the added value per employee in North-Holland is lower than in the Netherlands. However, the added value per employee in the core of the agrifood sector in North-Holland is rising above average compared to the Netherlands.
- The **strong increase in added value** may be an indication that the agrifood complex is strengthening. Traditionally, primary production (agriculture) has had relatively low added value.
- The flower/bulb production, vegetable processing and seed sectors are growing fast and have a large share in the agrifood sector. Greenhouse horticulture shows a trend towards significant upscaling. This is reflected in a decrease in (direct) employment and fewer greenhouse horticulture locations. But the **acreage demand for greenhouse horticulture** is significant. For the three concentration areas, a requirement of around 200-250 hectares is estimated until 2030 (Stec Group and Arcadis, 2018). Greenhouse horticulture is therefore a definite growth sector.
- Agriculture is innovative: **with 3% of jobs, farming companies account for nearly 10% of the total annual R&D** investments in the Netherlands. Companies in the seed sector in particular invest significantly in North-Holland in **R&D, on average around 15-20% of turnover**.

What do we mean by the agrifood complex?



WHAT TYPE OF COMPANY FORMS **THE CORE** OF THE AGRIFOOD COMPLEX?

Examples...

- Companies that produce food directly, both in open field and under glass
- Seed breeding companies
- Companies that breed and keep animals

EXAMPLES OF LARGE BUSINESSES IN NORTH-HOLLAND AT THE CORE OF THE AGRIFOOD COMPLEX:

Company	Description
Agro Care Wieringermeer	Large-scale tomato cultivation under glass
Dekker Chrysanthemums	Cultivation of ornamental flowers
Bayer (formerly: Monsanto*)	Large-scale seed distribution
Koolen Champignons	Cultivation of mushrooms and other fungi
Syngenta Seeds	Large-scale seed distribution

*LISA 2019 (with data for 2018) still contains the company name Monsanto

WHAT TYPE OF COMPANY FORMS **THE 1ST RING** OF THE AGRIFOOD COMPLEX?

Examples...

- Companies that manufacture a wide range of food and beverages
- Vegetable cutting companies

EXAMPLES OF LARGE BUSINESSES IN NORTH-HOLLAND THAT FORM THE 1ST RING OF THE AGRIFOOD COMPLEX:

Company	Description
Lays	Crisp manufacturer
Hessing	Vegetable processing
Vezet	Vegetable processing
Deen Supermarkets	Retail supermarkets
Incotes	Seed growing supplier

WHAT TYPE OF COMPANY FORMS **THE 2ND RING** OF THE AGRIFOOD COMPLEX?

Examples...

- Logistics companies that also transport agrifood products
- Companies that provide administration/accounting
- Companies that facilitate IT solutions for the agrifood complex
- Repair and maintenance companies

These companies cannot be directly linked to the agrifood complex via their main activity, but an estimate can be made of the number of companies in the 2nd ring. See page 14.

Core agrifood relatively large share in NoA economy

Total North-Holland locations:
54,800 companies

Locations core agrifood complex NoA:
4,000 companies
(7% of NoA)

Total North-Holland jobs:
266,000 jobs

Locations core agrifood complex NoA:
14,900 jobs
(6% of NoA)

Locations in the Netherlands:
1,630,100 companies

Locations core agrifood complex in the Netherlands:
76,100 companies
(5% of NL)

Jobs in the Netherlands:
8,651,800 jobs

Locations core agrifood complex in the Netherlands:
221,350 jobs
(3% of NL)

Note: The number of jobs relates to the total number of full-time, part-time and temporary employees. Source: LISA, 2019

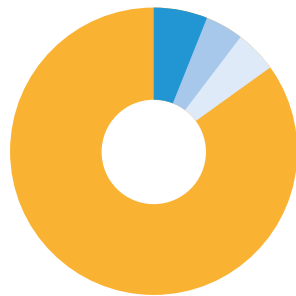
Decreasing employment and locations since 2012, but increasing added value in the agrifood complex

- A long-term trend of declining employment in agrifood is visible in the Netherlands, and this is also reflected in North of Amsterdam (source: LISA, 2019). In Holland Above Amsterdam in the agrifood complex the employment since 2013 with around 550 jobs.
- In North-Holland the number of locations in the agrifood complex is declining faster than the number of jobs, in other words: an increase in scale is visible in the region. In North of Amsterdam, the number of locations has been falling since 2013 by around 190 locations.
- However, the added value per company is increasing in the Netherlands: in North-Holland we see that the added value per employee in the core of the agrifood complex is rising rapidly (see page 37). The added value per employee in North of Amsterdam is € 82,700: we see a 46% increase in added value per employee between 2011 and 2016 (Source: CBS, 2017).

Agrifood is more than just primary production, however.

Jobs

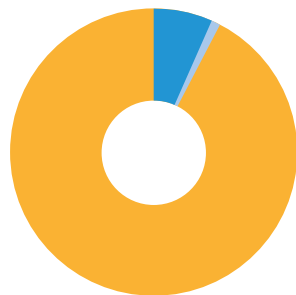
- Core
- 1st ring
- 2nd ring
- Other



Jobs total NoA: **266,000** Agrifood
core jobs: **14,800 (6%)**
1st ring agrifood jobs: **10,700 (4%)**
Estimation 2nd ring agrifood jobs:
Approximately 13,000 (5%)
Jobs total agrifood complex:
Approximately 38,500 (14%)

Vestigingen

- Core
- 1st ring
- Other

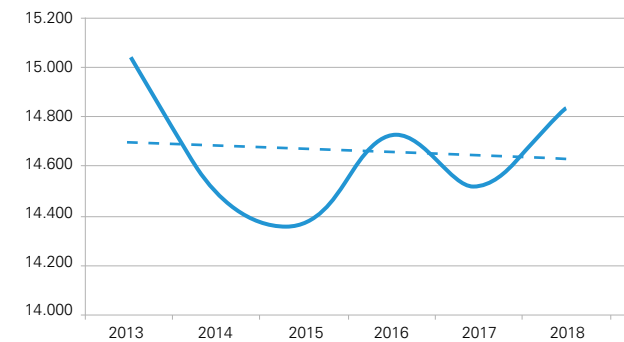


Total NoA locations: **54,800**
Core agrifood locations: **4,000 (7%)**
1st ring agrifood locations: **900 (2%)**

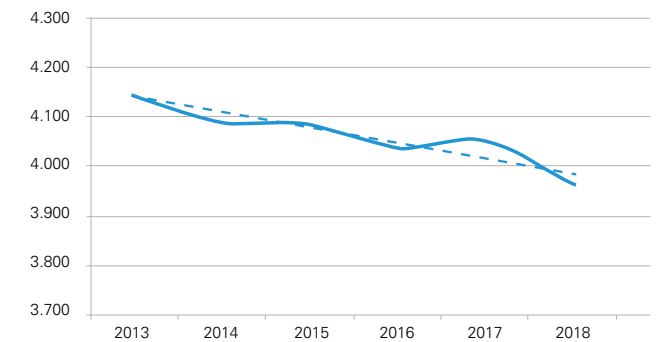
Note: See Appendix B for further explanation on the estimation of the number of jobs in the 2nd ring of the agrifood complex of NHN. Source: LISA, 2019

Employment in core agrifood shows a decrease of around 200 jobs

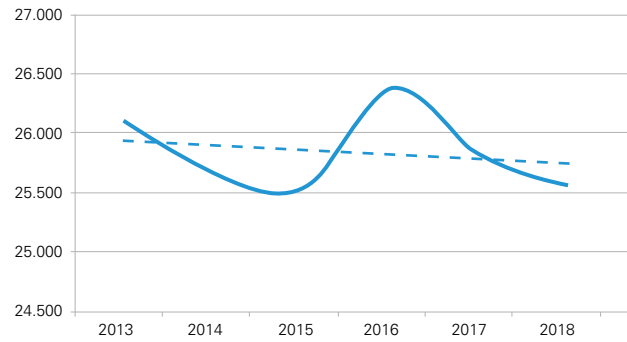
Strong upward trend since 2015



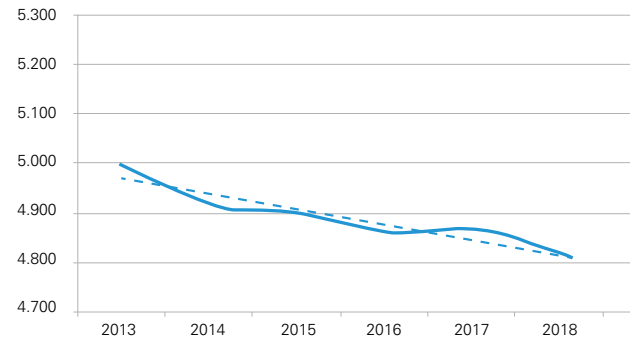
Around 180 fewer locations in the agrifood complex



Employment decrease in total agrifood by around 550 jobs



Approximately 190 fewer locations in the total agrifood complex

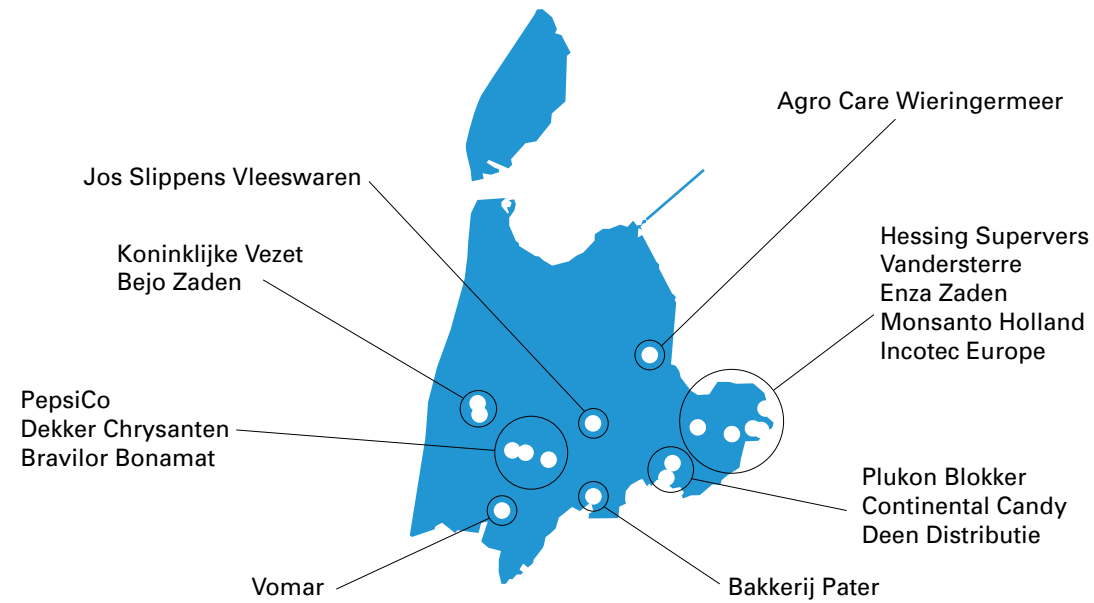


Top fifteen largest agrifood companies NoA (source: LISA)

#1 Koninklijke Vezet	1.375 jobs	(+3%)	Processing of fruit and vegetables
#2 Deen Distributie	874 jobs	(+20%)	Wholesale of foodstuffs
#3 Syngenta Seeds	550 jobs	(-14%)	Treatment of seeds for propagation
#4 Vomar Voordeelmarkt	433 jobs	(-3%)	Wholesale of foodstuffs
#5 Plukon Blokker	324 jobs	(+20%)	Poultry slaughterhouses
#6 Bejo Zaden	324 jobs	(+2%)	Treatment of seeds for propagation
#7 Hessing Zwaagdijk	323 jobs	(+17%)	Processing of fruit and vegetables
#8 PepsiCo Nederland	295 jobs	(+2%)	Potato products manufacturer
#9 Agro Care Wieringermeer	289 jobs	(+31%)	Outdoor vegetable grower
#10 Jos Slippens Vleeswaren	269 jobs	(-9%)	Wholesale of meat and meat products
#11 Bravilor Bonamat	254 jobs	(+12%)	Manufacturer of machines for the production of foodstuffs
#12 Dekker Chrysanten	207 jobs	(+2%)	Grower of cut flowers and shrubs under glass
#13 Enza Zaden R&D	*199 jobs	(+35%)	Research/development work in the field of agriculture
#14 Bakkerij Pater	185 jobs	(-3%)	Manufacture of bread and fresh pastry
#15 Vandesterre Groep	175 jobs	(+11%)	Wholesale of dairy products

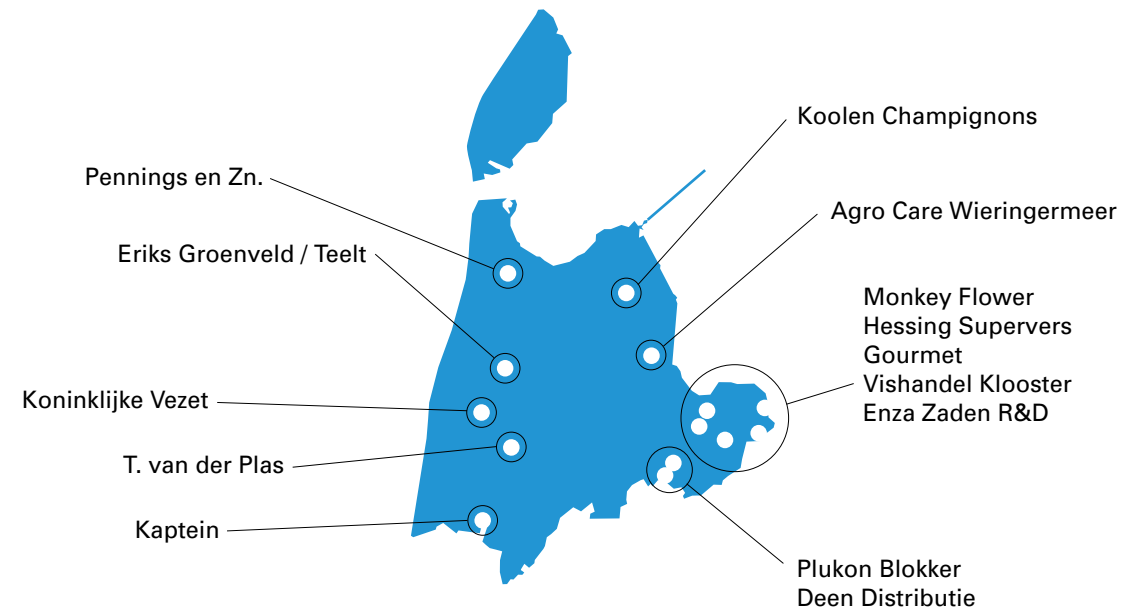
*The company website states that it employees 650 people at its head office in Enkhuizen. These are probably subdivided in LISA into different operating companies/ company names.

Largest agrifood companies NoA (in jobs)



Source: LISA, 2019

Top 15 largest growers agrifood companies (in absolute number of jobs)



Note: Increase in individuals employed between 2013 and 2018
Source: LISA, 2019

Top 15 largest growers agri-food companies with more than 100 jobs (source: LISA)

#1 Deen Distributie	878 jobs	(+144 jobs)	Wholesale of foodstuffs
#2 Plukon Blokker	406 jobs	(+76 jobs)	Poultry slaughterhouses
#3 Agro Care Wieringermeer	151 jobs	(+69 jobs)	Outdoor vegetable grower
#4 Enza Zaden Seed Op.	151 jobs	(+65 jobs)	Wholesale of seeds, seed potatoes and legumes
#5 Kaptein	100 jobs	(+56 jobs)	Wholesale of dairy products
#6 Koninklijke Vezet	1.375 jobs	(+55 jobs)	Processing of fruit and vegetables
#7 Enza Zaden R&D	99 jobs	(+52 jobs)	Research/development work in the field of agriculture
#8 Helsing Zwaagdijk	323 jobs	(+46 jobs)	Processing of fruit and vegetables
#9 Gourmet	106 jobs	(+38 jobs)	Wholesale of fruit and vegetables
#10 Koolen Champignons	100 jobs	(+30 jobs)	Mushroom cultivation
#11 Bravilor Bonamat	254 jobs	(+27 jobs)	Manufacture of machines for the production of foodstuffs
#12 Vandersterre Groep	175 jobs	(+17 jobs)	Wholesale of dairy products
#13 PepsiCo Nederland	295 jobs	(+15 jobs)	Manufacture of potato products
#14 Versunie	295 jobs	(+10 jobs)	Wholesale of dairy products
#15 Bejo Zaden	324 jobs	(+7 jobs)	Wholesale of seeds, seed potatoes and legumes

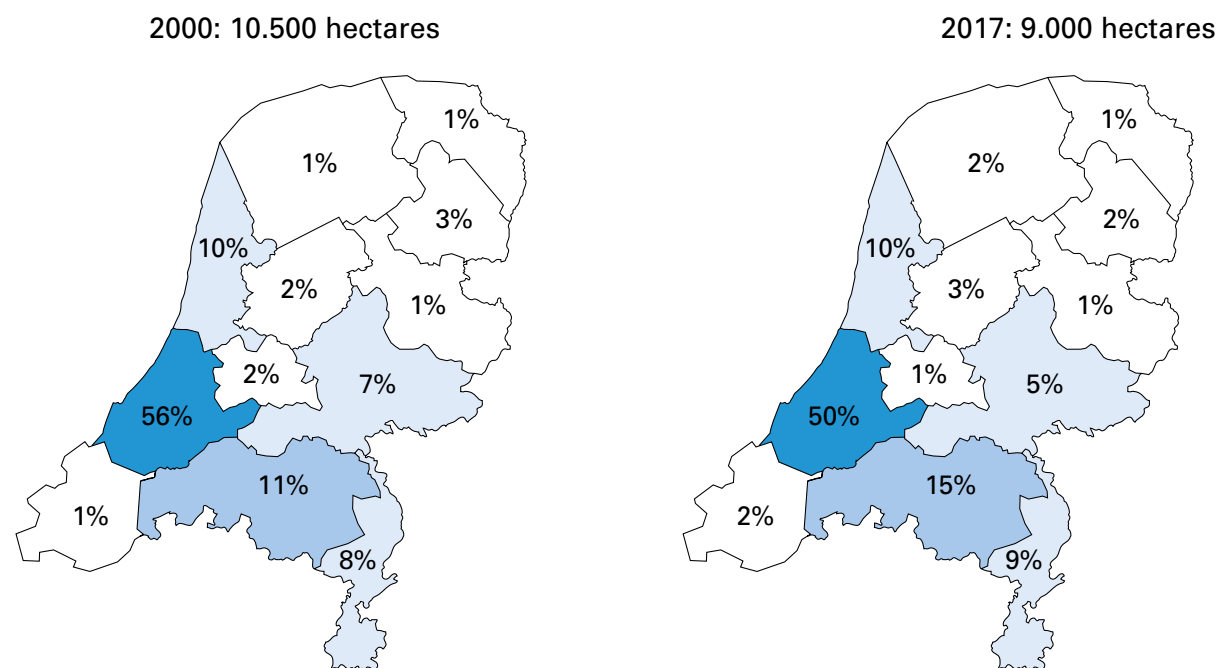
In this report we use greenhouse acreage figures held by Ontwikkelingsbedrijf NHH

The Central Bureau of Statistics (CBS) has figures on greenhouse acreage in the Netherlands, but these statistics are considered to be structurally too low for North of Amsterdam. We are therefore using the figures for greenhouse acreage in North-Holland held by Development Agency NHH.

“The CBS agricultural census is based on a declaration of the cultivation area by all greenhouse horticulture companies in theory. But in practice, this information is reported carelessly. The regional classification of the Agricultural Census is furthermore based on the main business address. This means that the region, to which the agricultural activities are attributed, can deviate from the place where these activities actually take place.”

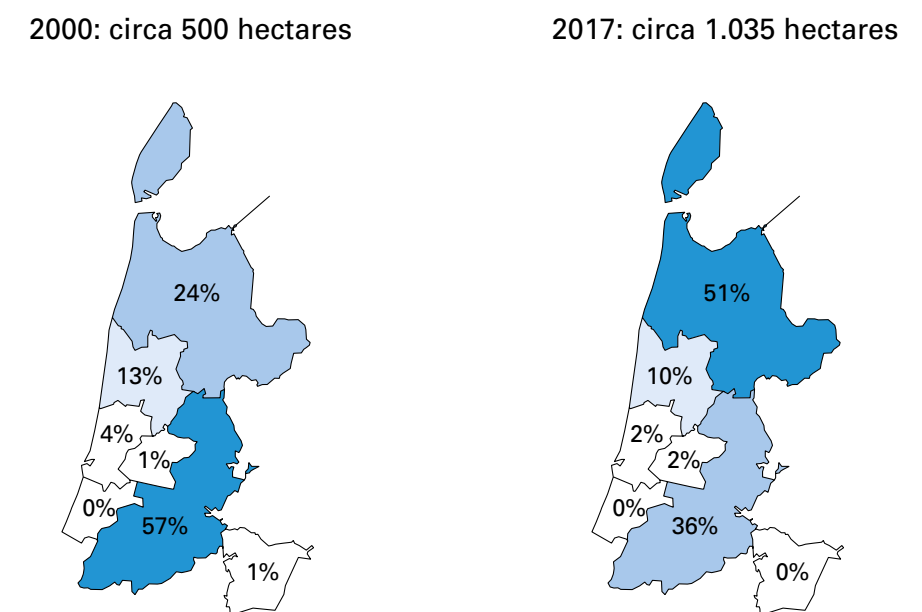
Source: Bureau Buiten commissioned by the Province of North-Holland, 2014.

Percentage of greenhouse acreage in North Holland compared to the Netherlands stable...



Source: CBS, 2018; Development Agency NHH, 2019. Percentage of greenhouse acreage per province compared to the whole of the Netherlands

... but increasing substantially in North of Amsterdam

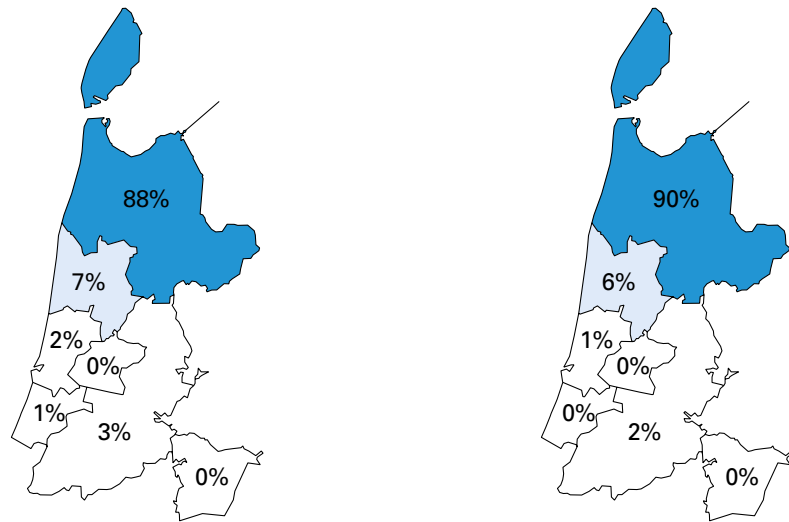


Source: CBS, 2019. Percentage of flower bulb growing acreage per COROP region of North-Holland.

North of Amsterdam maintains a strong position in flower bulb cultivation

2000: approximately 12.300 hectares

2017: approximately 12.800 hectares



Source: CBS, 2019. Percentage of flower bulb growing acreage per COROP region of North-Holland.

NoA is the bearer of NH's strong position in Dutch flower bulb cultivation (LISA)

North Holland accounts for more than half of the total NL acreage. Strong growth is visible in 'non-traditional' horticultural provinces such as Drenthe, Flevoland and Overijssel but the total percentage of these provinces is small (together <25%).

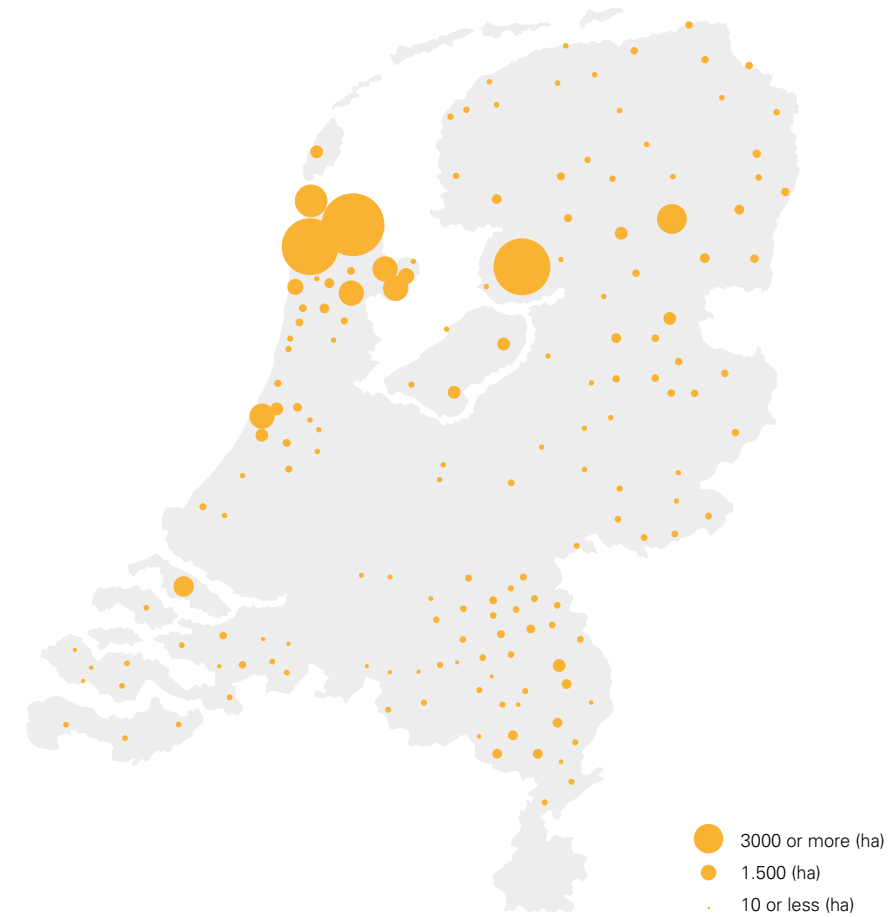
COROP-region	Acreage in hectares 2000	Acreage in hectare 2017
Noord-Holland	12.968	13.924
Rest of the Netherlands	9.545	13.430

97% of North-Holland acreage is in North-Holland. And this percentage is growing.

Kop van Noord-Holland	11.373	11.984	} North-Holland
Alkmaar and the surrounding area	902	857	
IJmond	256	148	
Agglomeratie Haarlem	78	34	
Zaanstreek	31	5	
Groot-Amsterdam	327	218	
Het Gooi en Vechtstreek	0	0	
Total	12.968	13.924	

Source: CBS, 2018. Percentage of flower bulb growing acreage per province and COROP region of North-Holland.

Flower bulb acreage in the Netherlands per municipality in 2018

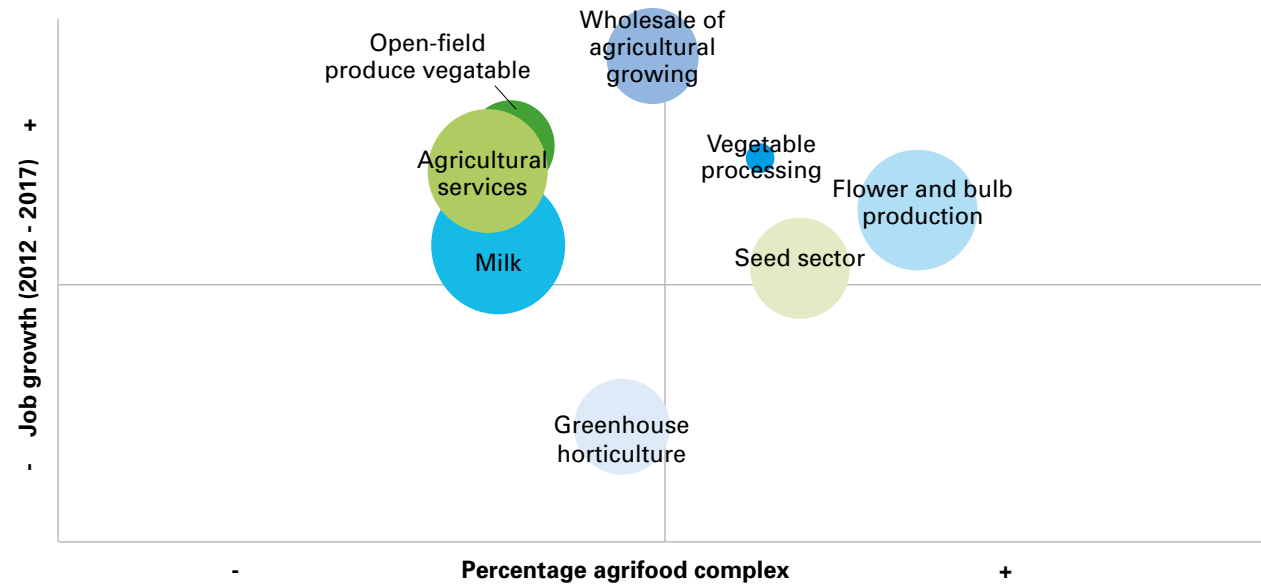


Source: CBS, 2018. Share of flower bulb cultivation area per municipality.

More than 50% of global tulip acreage is located in North- Holland

- In 2017, 80 to 90% of the world's tulip acreage was in the Netherlands, and more than 90% of it was in North-Holland, Flevoland and Zuid-Holland (Rabobank, 2018).
- More than half of the world's tulip area is in North-Holland, making the province - and Holland above Amsterdam in particular - a global player in tulips.
- We also see upscaling in the tulip sector: the number of companies is declining but the acreage continues to grow.

Vegetable processing, seeds and flowers/bulbs promising for the future: greenhouse horticulture in transition phase



Source: LISA, 2019. Note: Large sphere stands for number of subsector locations.

Vegetable processing, seeds and flowers/bulbs promising for the future: greenhouse horticulture in transition phase

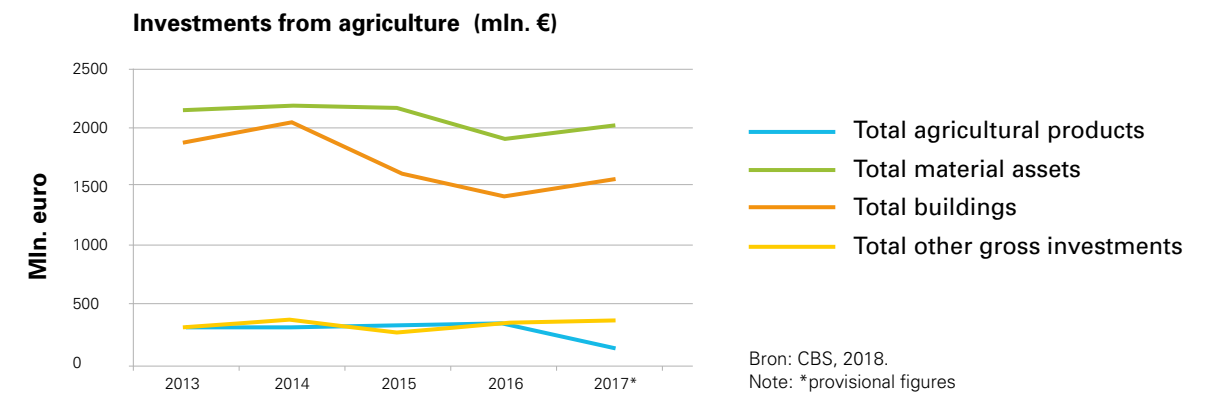
- Most subsectors in the agrifood complex show job growth
 - Greenhouse horticulture shows a decline in jobs: this is because glasshouse horticulture is a sector where significant upscaling is taking place. Using space more efficiently means fewer jobs are needed in greenhouse horticulture.
 - The sectors vegetable processing, seeds and flowers and bulb production have a relatively high percentage of employment for the agrifood complex
- also show a growing number of jobs. These sectors are taking off in terms of jobs and locations.
- It is striking that vegetable processing has a relatively high percentage of employment for the agrifood complex and more jobs are being added but that relatively few companies are active in this subsector. There are therefore only a few companies with a large number of employees per company.

Added Value per employee in agriculture is growing fastest in NoA: above average growth compared to NL

Sector	AV per employee (North-Holland, 2016)	Growth AV employee (North-Holland, 2011-2016)	AV per employee (NL, 2016)	Growth AV employee (NL, 2011-2016)
Agriculture	€ 82.700	+46%	€ 128.300	+30%
Industry	€ 75.100	+9%	€ 103.000	+13%
Construction	€ 93.600	+12%	€ 93.900	+12%
Trade	€ 53.500	+8%	€ 64.800	+10%
Transport & storage	€ 71.500	+34%	€ 84.800	+18%
Hospitality industry	€ 34.500	+19%	€ 33.000	+17%
Information & communication	€ 92.800	-10%	€ 122.800	+1%
Financial services	€ 114.300	-8%	€ 179.700	+20%
Real estate rental trade	€ 584.600	+27%	€ 633.500	+34%
Spec. business services	€ 88.000	+14%	€ 106.500	+12%
Rental & other business services	€ 35.900	0%	€ 41.100	+7%
Government	€ 102.400	+33%	€ 89.400	+8%
Education	€ 51.900	-3%	€ 61.500	+9%
Healthcare	€ 41.800	+25%	€ 45.000	+17%
Culture, sport and recreation	€ 40.500	-9%	€ 56.100	-1%
Other services	€ 45.900	+17%	€ 55.000	+15%

Source: CBS, 2018. Share of flower bulb growing area per province and COROP region of North-Holland.

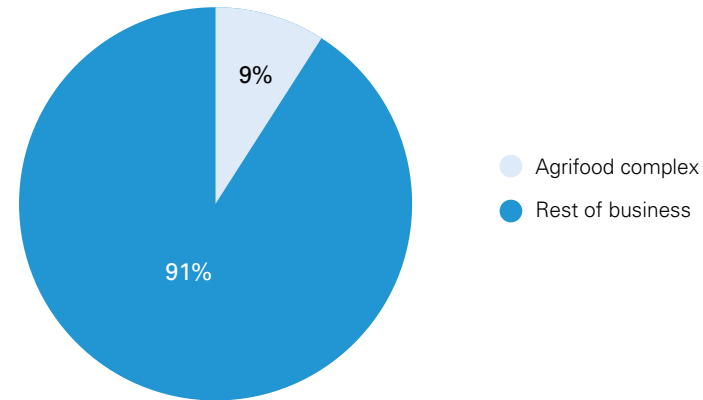
Investments from agriculture are picking up again in NL. Seed sector and greenhouse horticulture are an important source of these investments



Bron: CBS, 2018. Note: *provisional figures

Agrifood is innovative: with 3% of the number of jobs good for almost 10% of all investments in R&D

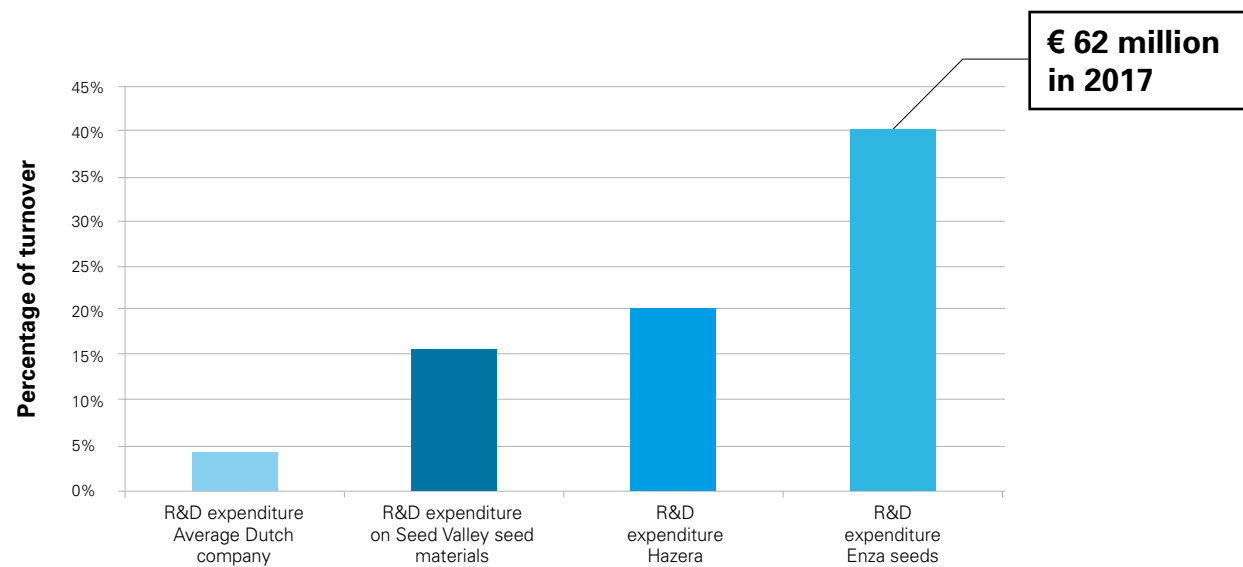
- Total R&D publications Dutch business € 7.7 billion.
- Total R&D issues Dutch agrifood companies approximately € 700 million.



Source: CBS, 2017.

R&D activities seed sector NoA are large

- Total R&D publications Dutch business € 7.7 billion.
- Total R&D issues Dutch agrifood companies approximately € 700 million



Source: Erasmus Universiteit, 2017; Provincie North-Holland, 2017; Hazera, 2018; Technisch Weekblad, 2018.

Upscaling KPI's NoA

Growth acreage per sector, growth greenhouse acreage compared to other greenhouse areas, greenhouse acreage growth from a spatial perspective

Conclusions upscaling KPI's NoA

"Post-war upscaling has transformed Dutch agriculture into a productive, internationally competitive and highly efficient sector." (PBL, 2018). NoA has a good spatial starting position for facilitating the upscaling of greenhouse horticulture compared to other greenhouse horticulture areas in NH and the Netherlands: see also the aerial photos on page 53. North-Holland is also the front runner for other forms of agriculture

on the scale of companies. The area of greenhouse horticultural companies in NoA is growing fast, the acreage of NoA compared to NL (3.8% to 6.1%) and to NH (37% to 60%) has almost doubled since 2000. This is almost entirely due to the growth of Grootslag and Agriport A7. The growth of the area per company in the glasshouse horticulture and flower bulb growing subsectors is significantly above average compared to the Netherlands.

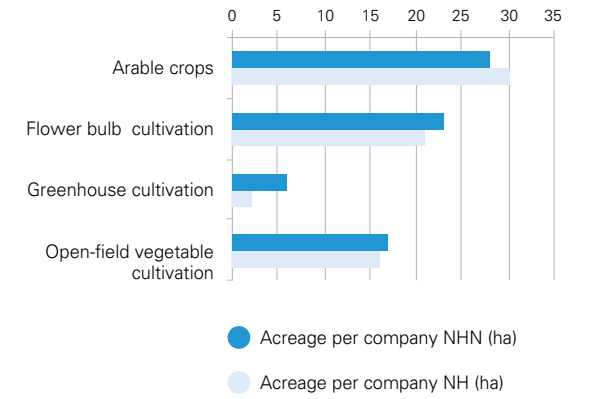
Biggest growth on average acreage/ company, primarily in greenhouse horticulture and flower bulb growing

Subsector and region	Acreage per company 2012 (hectares)	Acreage per company 2017 (hectares)	Percentage growth
Arable farming (NHN)	27	28	+4%
Arable farming (NL)	26	28	+8%
Flower bulb cultivation (NHN)	20	23	+18%
Flower bulb cultivation (NL)	15	16	+7%
Greenhouse horticulture (NHN)	4	6	+44%
Greenhouse horticulture (NL)	2	3	+25%
Open-field vegetable growing (NHN)	11	11	+2%
Open-field vegetable growing (NL)	11	11	+4%

Bron: CBS, 2018; Development Agency NHN, 2018.

NoA has relatively larger agricultural companies: good starting position for succession

Larger agricultural companies have a successor in mind more often when the farmer is older than than 50. In NoA, agricultural companies have an above-average acreage, both in comparison with NH and NL.



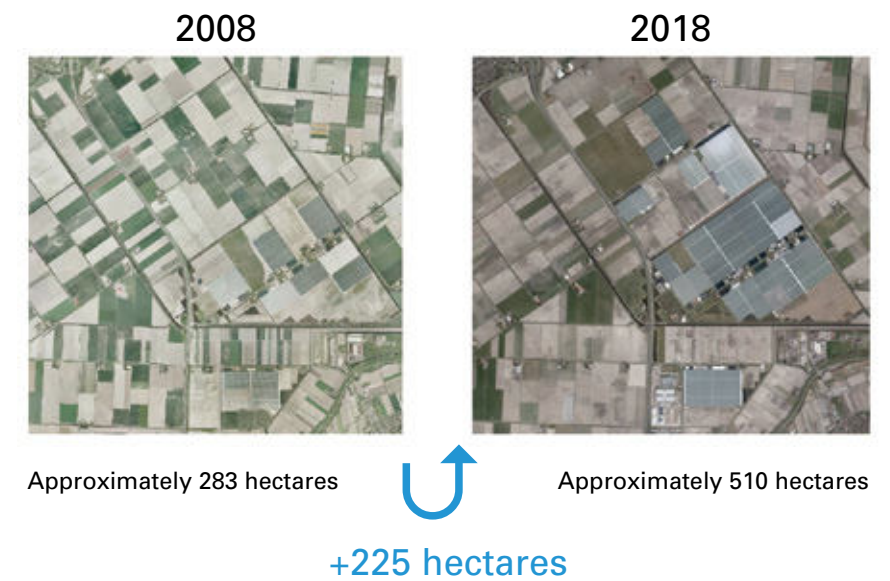
Source: Agrimatie, 2017.

Significant increase in greenhouse horticulture

Greenhouse acreage in the Netherlands is falling sharply. North of Amsterdam is completely going against this trend. Greenhouse acreage in North of Amsterdam has more than doubled since 2000 Agriport

A7 exemplary for this upscaling, as can be seen on the photos below. In the last two years alone, greenhouse acreage at Agriport A7 has increased by 60 hectares.

Growth of Agriport A7 greenhouse acreage from a spatial perspective



Source: Cyclomedia, 2008-2018

Sustainability KPI's NoA

Organic farming, geothermal energy and climate objectives agriculture

Conclusions Sustainability KPI's NoA

North Holland is one of the top 3 provinces with the largest share of organic farms. The area under organic farming in North Holland increased by 50% between 2011 and 2017 and is now almost 10% in total.

More than a quarter of Dutch geothermal capacity is generated by North-Holland. This illustrates that greenhouse horticulture in the region is well on its way to achieving its climate objectives.

North-Holland currently among top 3 organic agriculture provinces

Number of SKAL certified companies (2017)

1. Gelderland (780 companies)
2. Zuid-Holland (624 companies)
3. North-Holland (595 companies)

Organic acreage in hectares (2017)

1. Flevoland (10,342 hectares)
2. Gelderland (8,437 hectares)
3. Friesland (7,766 hectares)
4. North-Holland (7,331 hectares)

Number of SKAL certified companies active in trade and processing (2017)

1. Zuid-Holland (530 companies)
2. North-Holland (451 companies)
3. Gelderland (407 companies)

Relative growth organic acreage (2011-2017)

1. Friesland (+133%)
2. North-Holland (+50%)
3. Flevoland (+45%)

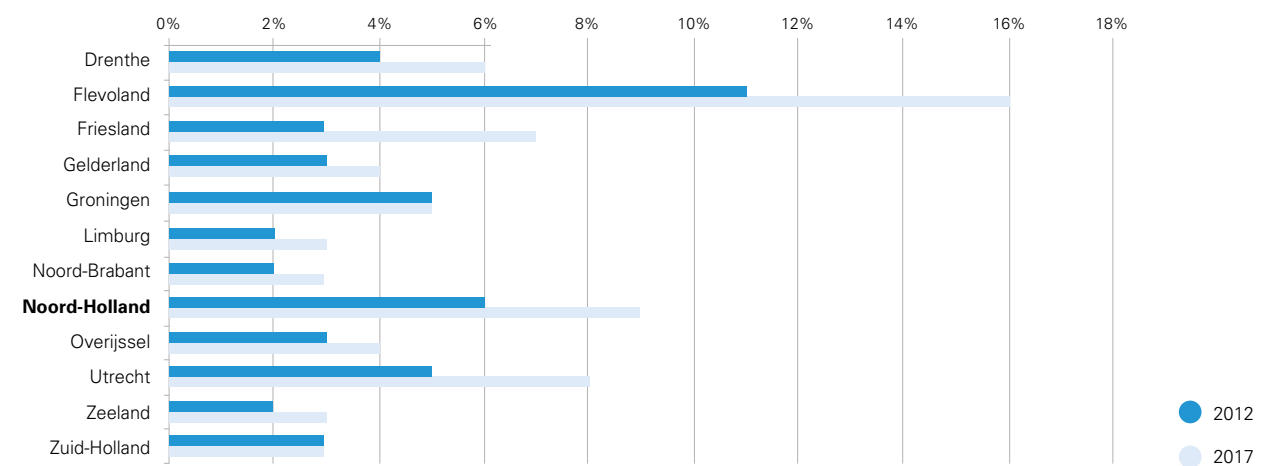
Percentage of organic farms (2017)

1. Flevoland (16%)
2. North-Holland (9%)
3. Utrecht (8%)

Source: Skal Biocontrole, 2018

Percentage of organic farming per province

Source: CBS via Waarstaatjeprovincie.nl, 2019.



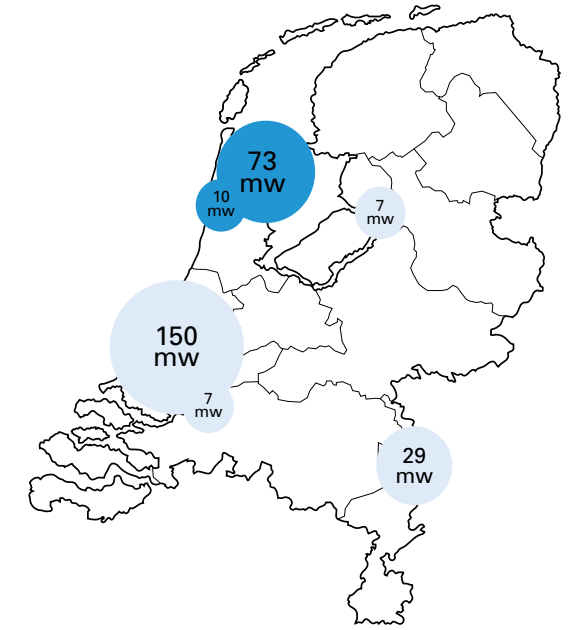
Geothermal energy and climate objectives for greenhouse horticulture

Greenhouse horticulture - as a major agricultural energy consumer - aims to reduce CO2 emissions in the sector to 2.2 Mton by 2030, which is a reduction of 3.4 Mton (3,400,000 tonnes) compared to the current emission level (Source: Contribution Sector Table Agriculture and Land Use for the Climate Agreement, 2018). Geothermal energy is one of the designated sources of green energy with which the climate objectives for greenhouse horticulture can be achieved. Geothermal energy is extracted at 23 locations in the Netherlands, including Agriport A7, Grootslag and Heemskerkerduin. The extraction wells at Agriport A7 and Grootslag are owned by Energiecombinatie Wieringermeer (ECW). At Agriport A7 and Grootslag

more than a quarter of total geothermal heat in the Netherlands will be extracted in 2019. Floricultura (producer of starting materials for orchids) in Heemskerkerduin has a geothermal well with a capacity of 10 MW. Agriport and Grootslag have a total of five extraction wells; these extraction wells supply an annual amount of geothermal heat comparable to 50 million m³ of gas (Noord-Hollands Dagblad, 2019). 50 million m³ of gas is equivalent to 90,000 tonnes of CO2 (Source: RVO, 2017). With the five extraction wells, ECW is already contributing approximately 3% to the climate objectives of greenhouse horticulture for 2030 (3.4 Mton).

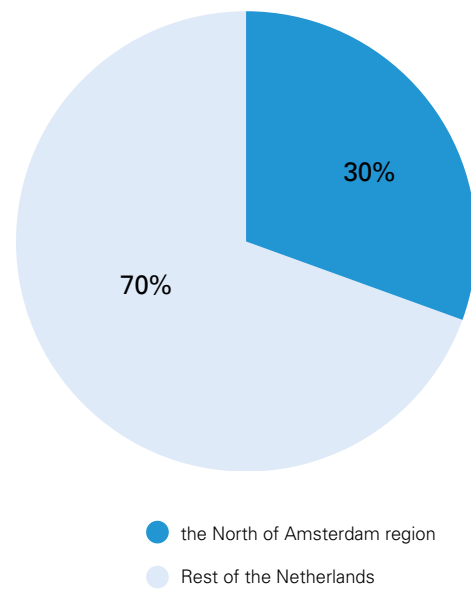
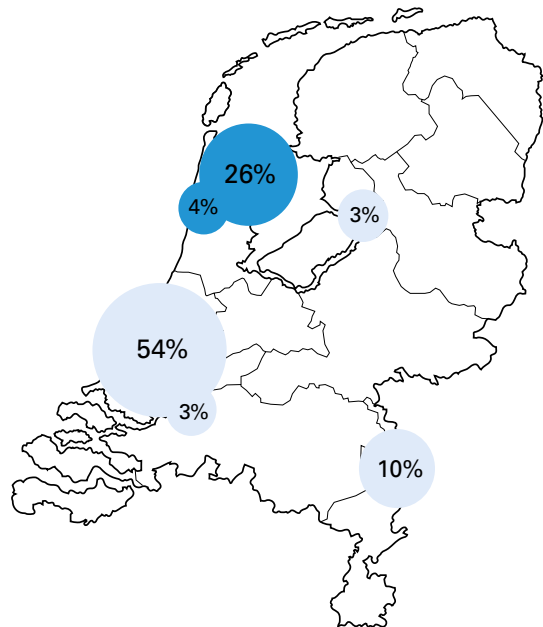
30% of NL geothermal energy capacity in the region North of Amsterdam

North-Holland is currently in the top 3 of provinces with the largest percentage of organic farms. The area of organic farms in North-Holland increased by 50% between 2011 and 2017 and is now almost 10%. More than a quarter of the Dutch geothermal capacity originates from North of Amsterdam. Among other things, greenhouse horticulture from the region is well on its way to achieving its climate objectives.



Source: Platform Geothermie, 2018.

Geothermal energy and climate objectives for greenhouse horticulture

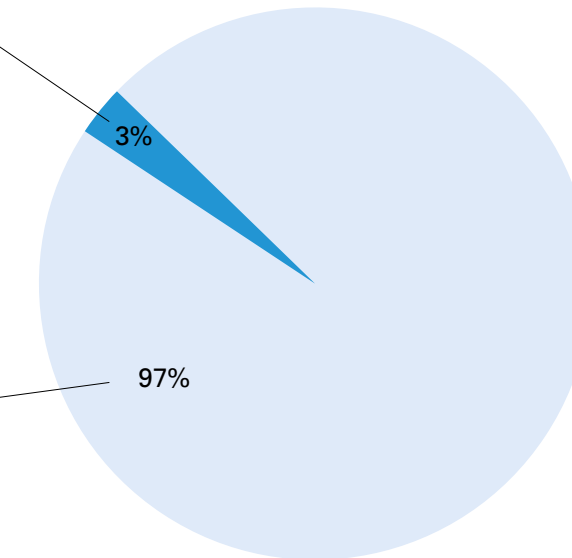


Source: Platform Geothermie, 2018.

Geothermal ECW saves 50 million m3 of gas annually. That is good for around 90,000 tonnes of CO2 per year.

Decrease in annual CO2 emissions through ECW savings: Approximately 90,000 tonnes

Objective to reduce annual CO2 emissions in agricultural sector The Netherlands: 3.4 Million Tonnes by 2030



An average home uses around 1,470 m³ of gas annually (source: NIBUD, 2019).

The annual saving of ECW is therefore equal to the gas consumption of all households in Hoorn (approximately 33,000 homes).

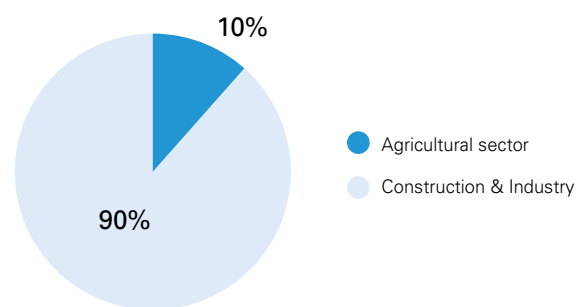
Source: RVO, 2017; Contribution Sector Table Agriculture and Land Use for the Climate Agreement, 2018.

Social-cultural KPI's NoA

Image and support, labour market shortage and foreign workers

Social KPI's

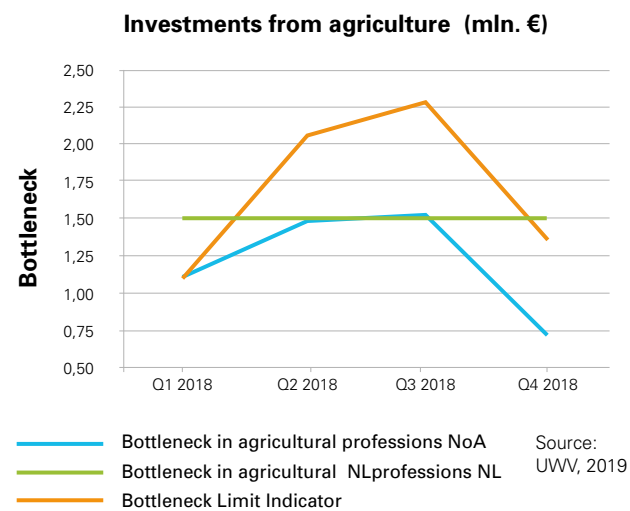
- Many farming companies known in the region, opportunities for greater recognition through the media.
- More than half of the farmers in North-Holland consider it important to produce sustainably.
- From complex and innovative companies in the agrifood sector in NoA there is a demand for highly trained agricultural workers. The UWV stress indicator shows the bottleneck in agricultural professions in NoA is lower than in the Netherlands.
- Approximately 6,500 foreign employees live in De Kop van Noord-Holland. More than 90% of foreign employees working in De Kop van Noord-Holland are active in the agricultural sector. 64% of companies with more than 10 employees in Kop van Noord-Holland employ foreign workers employees.
- An estimated 20,000 foreign employees are employed in the North of Amsterdam region. Approximately 18,000 of them are estimated to work in the agricultural sector.



Bottleneck in agricultural professions NoA lower than in the Netherlands

- UWV stress indicator shows the bottleneck between supply and demand on the labour market. A score higher than 1.5 implies that there is a bottleneck in a profession, meaning that the demand for employees is greater than supply.
- The number of vacancies for an agricultural position at a higher professional level has increased the fastest in the Netherlands in recent years by 125% between 2012/2013 and 2015/2016 (Source: UWV, 2017).
- Bottleneck in the agricultural profession in NoA is average to tight in 2018. Bottleneck in the agricultural profession in NL was predominantly tight in 2018 (Source: UWV, 2019).

Bottleneck in NoA agricultural professions lower than in the Netherlands



- Bottleneck between labour market supply and demand. A score higher than 1.5 implies that there is a bottleneck in a profession, with more demand for employees than supply.
- The number of vacancies for an agricultural position with a higher professional level has increased the fastest in the Netherlands in recent years by 125% between 2012/2013 and 2015/2016 (Source: UWV, 2017).
- The bottleneck in the agricultural profession in North of Amsterdam was average to tight in 2018. The bottleneck in the agricultural profession in NL was predominantly tight in 2018 (Source: UWV, 2019).

Region North of Amsterdam

the most beautiful region of the Netherlands where cities, villages, dikes and polders are steeped in rich history. Varied nature with the most beautiful, clean skies offering ultimate living pleasure, diverse recreational pleasure and a healthy business climate for many innovative companies. Surrounded by the North Sea and Wadden Sea World Heritage site, with expansive beaches, colourful bulb fields, endless polders, beautiful sailing routes and clear lakes: this part of the Netherlands is internationally renowned and loved by residents, visitors and business owners. Discover the endless possibilities of this abundant region.

Hope to see you again!

