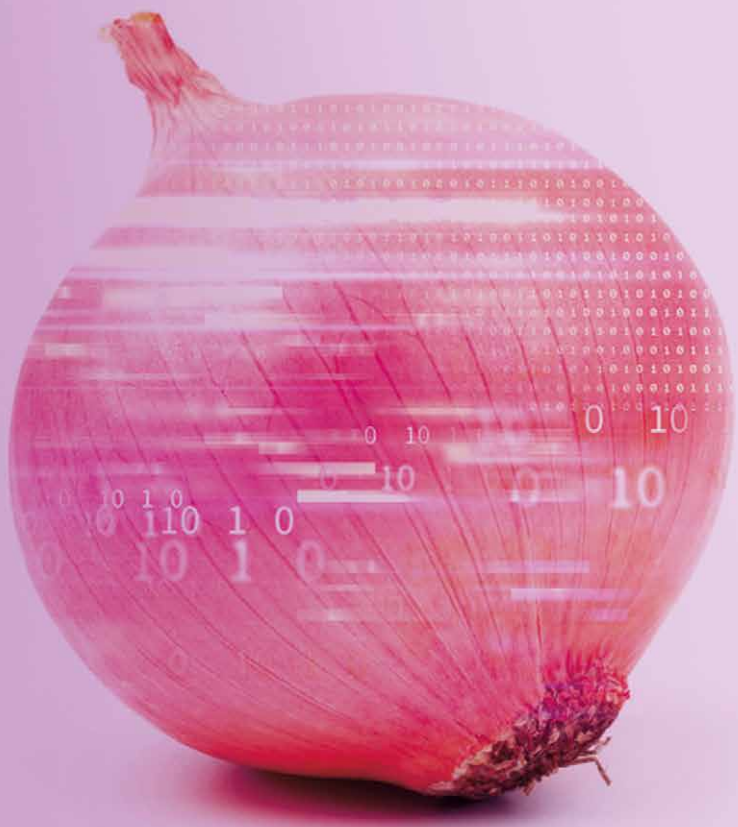
TOP DUTCH

A good place to be great



AGRIFOOD IN 2070

A look into the world of AgriFood in fifty years' time

The world is rapidly changing. As new global challenges such as a growing population and climate change are combined with new green and digital innovations, we can but hazard a guess what the world will look like in 50 years' time. How will we leverage scientific and technological applications to feed the world in 2070? We asked three visionaries their opinion & how the future of AgriFood, and the role the TopDutch region will play in the food revolution.

A LOOK INTO THE WORLD OF AGRIFOOD IN 2070

THE FUTURE OF AGRIFOOD IS TAKING SHAPE IN THE TOPDUTCH REGION

It's a lovely day in the early summer of 2070. The sun shines over the green polder landscape of the European delta. Here, where the world's cleanest rivers, the Rhine and Maas, flow into the North Sea, lies the Netherlands, one of the richest states in the United States of Europe. Its wealth owes much to its historically strategic location: near the sea, with plentiful fresh water, in one of the richest and most densely populated tourist areas of the Old World, and at the same time with a very fertile soil full of useful nutrients. Because of its place in history, this area, famous for its low-lying wetlands known as polders and for its distinctive Holstein-Frisian cattle, has only rarely suffered from famine.

The country is also a knowledge hotspot - with Wageningen University as a global laboratory in the development of the food revolution that changed the world in the twenties and thirties. All the global food giants have their laboratories in the low countries and all the new innovations - the virus-eating plant, the crops of healing flowers, the nano-pollination drones and the cultured meat udder - were developed here. 'We feed the world': this is what the Dutch agri-pioneers have been rightly claiming for decades. Since the great famine of the early 2030s, they can now add: 'We save the world from famine.'

The future of farming is green & digitized

Although the sun shines on the grassy polders, where flowers grow abundantly between the cattle that graze to their heart's content, drink from the fresh water and are occasionally heard mooing contentedly, the Dutch agricultural landscape has become a huge data factory. Everything is digitized - from the cow's digestion to the potato crop protection. This data means that cultivation and growing operations here produce strong, nutritious and healing crops that are in demand all over the world. Armed with the transparent source data provided by farmers in the TopDutch region, consumers know in which field or meadow all their vegetables, meat and dairy products have been produced.

Fast underground connections are used to transport the residual flows from arable farming to the nearby micro-organism industry. Energy-neutrally, of course, because that is what this region is known for. No waste is left unused - everything is returned to nature or processed into natural, useful products.

Most farmers in the TopDutch region have a share in these production processes through cooperative associations. Their crops carry the TopDutch label, which has been noted for its high-quality dairy products and its crops since the thirties. The products have generated above-average margins since blockchain-based pricing became commonplace. Thanks to the many flourishing cooperatives, Dutch horticulturists, arable farmers and dairy farmers are succeeding in conquering the world with their high-quality products. Many farmers have invested their profits in agricultural businesses all over the world. The farmers and cooperatives from the TopDutch region have subsidiary activities in Asia, Eastern Europe and Africa, where the same innovative processes are applied as those here.

Still in the distant future? Here you can read how in the heart of the Top-Dutch region the world of agri, dairy and food was radically changed. And what steps were taken in the early twenties to make that success possible. Three visionaries explain this look ahead to the next half century.

1.

BIOLOGICAL SOFTWARE

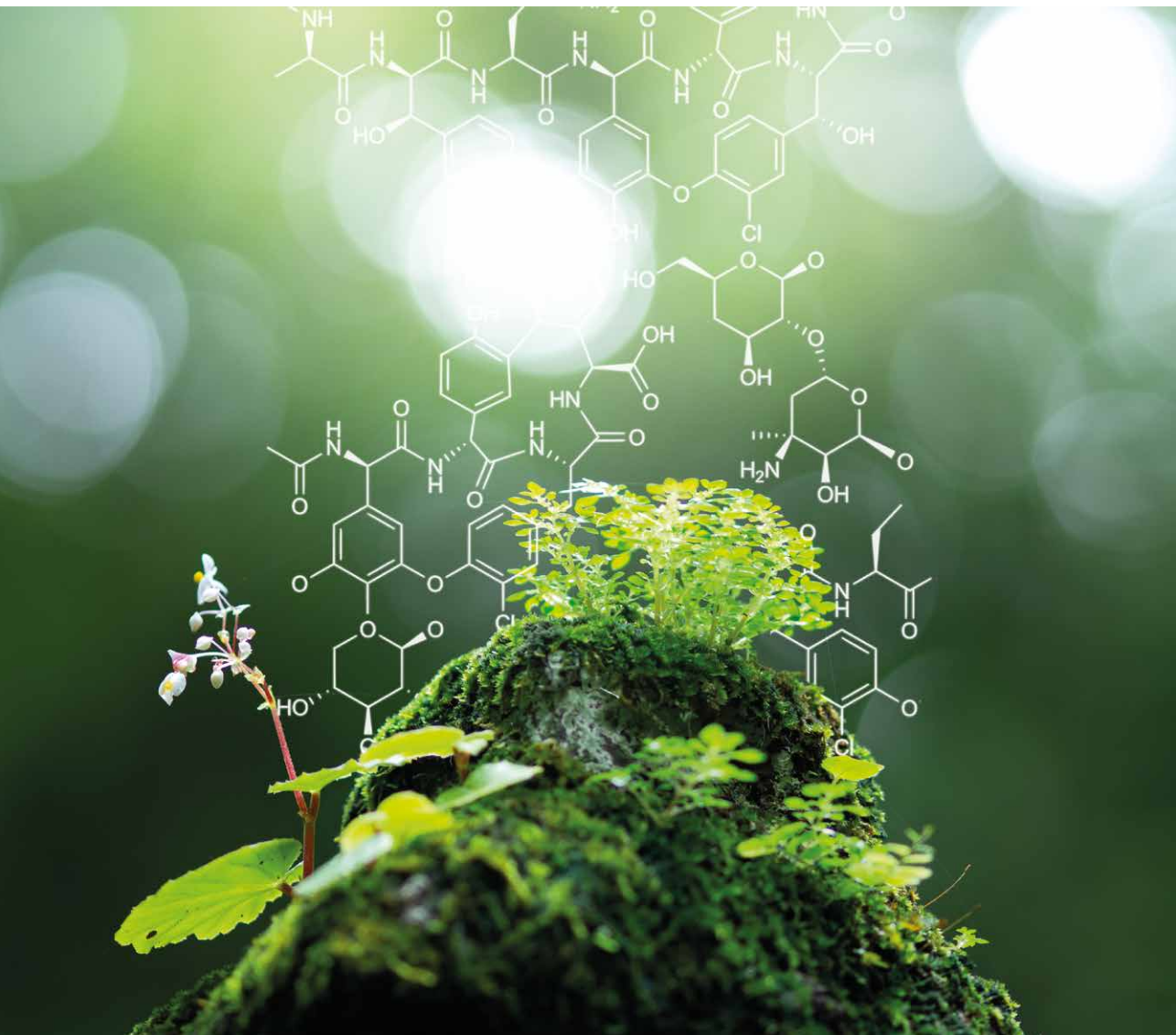
The year 2070 according to Linda Dijkshoorn:
By 2070, the entire biological infrastructure will be digitized

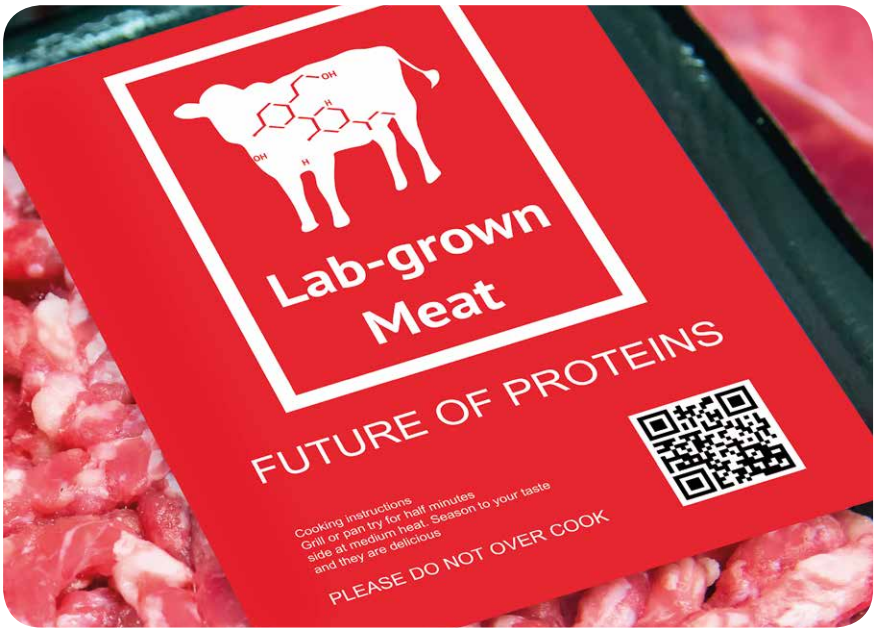
If it were up to Linda Dijkshoorn, our increasing knowledge of biological systems and DNA - 'the biological software' - would be the big disruptor of food production. Linda Dijkshoorn is currently CEO of EV Biotech, an innovative company that produces raw materials such as vanilla using vegetable waste streams and micro-organisms. The company makes use of biotechnological knowledge, digital technology and chemical expertise.

‘In fifty years’ time, the world will be a natural ecosystem with a strong technological infrastructure. The technology will be seamlessly able to simulate and predict the complex natural processes. We now understand only very little about everything that nature takes care of. By 2070, computers will be so powerful that we’ll be able not only to understand nature, but also to correct the processes that we can’t yet control.’

Ingredient #1 Digital ingenuity

'Consider what microbiological processes, or the development of fungi and some creepy-crawlies - insects, worms, single-celled creatures - bring about in the soil. Ingenious technology will make it possible to predict all the processes at once. This isn't yet possible. We're able to correct one problem at most - such as the formation of fungus on crops - by means of crude measures. But everything we do has side effects, which often have a negative impact on the environment. Chemical pesticides cause the soil to deteriorate, for example.'





'The models and scenarios that were made up until recently to predict the future are still very rough. Models for super-complex systems have not been possible. With the steady increase in computing power, it is becoming possible to build digital models that can predict and imitate complex biological and chemical processes, as well as calculate the side-effects and the mutual impact of processes. This is happening now at academic level, but one day it will be common practice. That will radically change agri- and food production. 'Biologists still often say that biology is so complex that it cannot be modelled. That's true right now, but it will no longer be so in the future. We're getting to understand biological systems better and better.'

'In the coming decades, we'll learn how to use biological processes. Now we have to make an educated guess about the development of an entire organism, such as a head of lettuce in the ground. Each season you can try to improve the soil quality, conditions and variety of the crop and after years you might make some progress. This process of trial and error will no longer be needed in the future - complex digital models will replace this

process and make it possible to carry out 1,000 tests in one day using digital tests to optimize the plant's environment immediately based on the results. By 2070, we'll be able to bend biology to our will.'

Ingredient #2 Micro-organisms

'A large part of our food will no longer come from plants, but from micro-organisms. A lot of protein-based medication is already cultured with micro-organisms. Cultured meat will one day be commonplace.
Not everything we eat will need arable farming in the future. Vitamins, flavorings, aromas and chemical compounds that are now extracted from plants will be produced by micro-organisms.'

'The chemical industry will be totally clean by 2070. The TopDutch region, which is already at the forefront in this area, will have its entire production climate-neutral and circular by 2050. High-quality chemical products, such as extracts and raw materials for the beauty industry, will be produced entirely organically, through the fermentation of agricultural waste streams by micro-organisms, for example. Micro-organisms are carbon-neutral, but they do need sugars as food - and for that they need crops.'

Ingredient #3 Genetically Modified Organisms

'In fifty years' time, the world's population will have grown so much that there won't be enough suitable arable land to grow all the food we need. Fortunately, mankind will be saved by genetically modified organisms (GMOs). This technology facilitates the production of climate-friendly biological pesticides. By using geno-mining from public datasets, we'll discover interesting molecules that act as de facto pesticides. That will produce stronger, more resistant crops that we will use to feed the world.'

Genetic modification has a bad name. But the method of crossing and selection has been used in agriculture for millennia. Cattle, fruit, vegetables, cereals - everything we consume now has been crossed so many times that it has become better flavored, richer in nutrients and more resistant to disease and drought. Genetic modification is in fact a means, just like a pencil. With a pencil you can write a hateful letter, but you can also use it to create a work of art. It all depends on what the user wants to do with it. The restriction in the European Union on the genetic modification of food and crops is now being circumvented, for example, by bombarding plants with UV radiation in the hope that it will produce useful mutations - a shotgun method, if not worse than genetic modification.'

'Mankind will be saved by genetically modified organisms.'

Linda Dijkshoorn

'This controversy can also be seen as an opportunity: it is precisely by combining the pioneering approach to GMOs with an ethical discussion that we can achieve controlled innovation in the TopDutch region. For example, you have to extensively test GMOs for harmful side-effects. We can outline a picture of the future, but if politicians fail to inform themselves about the prospects offered by this technology, we can seize this opportunity.'

Linda's vision for TopDutch

'Milk is still a unique product, for which we need cows. Vegetable milk substitutes lack the essential properties that cow's milk possesses. You can't make cheese out of oat milk, for example. In the TopDutch region I see opportunities in the development and application of tech dairy, such as sustainable synthetic milk, with a lower carbon footprint than cow's milk. In the production of cow's milk, I see an agricultural sector in the TopDutch region that produces even higher quality delicatessen products. Specialized farmers produce the best premium milk and milk products in a balanced way in their own ecosystem.'

'In the foreseeable future, arable farming will use all its residual flows for high-grade production purposes. Pure residual streams are becoming the hallmark of the agri sector in the TopDutch region. The chemical industry will be characterized by total transparency about the production processes. This will establish close cooperation between the agricultural sector and the chemical industry. If they buy products from the TopDutch region, global consumers will know how they are produced and what impact this has had on the environment.'

Linda Dijkshoorn is CEO and founder of the biotech company EV Biotech.

She's an entrepreneur and PhD candidate at the department of Pharmaceutical Biology at the University of Groningen in the group of Professor Wim Quax.

EV Biotech uses innovative technology to create micro-organisms that can produce high-quality molecules.

2.

FARMS AS DATA FACTORIES

The year 2070 according to Sener Celik: All biology will have become data

According to Sener Celik, all production in the agri sector will be based on data. 'A data factory with the farmer at the helm - that's what dairy farms and arable farmers will be in 2070. The data flows on the feeding of livestock - tailored to the animal on the basis of data on genetic composition, hormone balance, blood sugar level and physical health - are the main assets of the agri-entrepreneur.'

Ingredient #1 Real-time data

'Most food in 2070 will be produced by industrial units made to measure for the consumer. Agri-processes will be simulated and analyzed in real time by means of digital data flows. Based on that data the healthy growth of each crop will be optimized, diseases will be nipped in the bud, and it will be possible to predict the best time to harvest. This digitization will result in the quality of agricultural production being considerably higher than it is today.'

'The protein and fat content, and the cell count of the milk per cow are already measured by milking robots. In the future, everything will be tracked by sensors. Cows will eat microsensors in their feed to monitor the entire digestive process, repair damaged cells and help fight diseases. Because the technology is able to penetrate into the cells up to nano-level, animals themselves will form a data factory. All those nanochips will be able to make autonomous decisions inside the cow. The same goes for crops. In 2070, data will be used to monitor and adjust the growth of crops. The entire agricultural production is based on data. However, the skills of the farmer and the horticulturist remain vital to the value of the data and farm management.'

Ingredient #2 On-farm data intelligence

'While the robot will become an increasingly advanced artefact, the possibilities of the data they generate will become more and more promising. The intelligence of technological development is applied more and more on-farm, at the farmer's own premises. With super-fast network connections and extreme connectivity, the farm is plugged into the cloud, and everything can be shared with tech partners.'

‘As more and more devices plugged into the farm communicate with the consumer’s devices, the end-user of food products will be able to make more targeted choices. The consumer - or his smart fridge - will buy and consume on the basis of his own calorific needs, based on quality.
The farmer of the future will be in digital contact with the consumer, and the supply chain will become shorter and shorter.’

Ingredient #3 Total transparency

'That has consequences for the farmer. Whereas these days his main assets are livestock, meadows and fields, in 2070 his business will be guided by the source data. This source data makes the agricultural sector a completely transparent chain. In the time to come, consumers will demand this transparency. The retail sector will also want to have an insight into the farmer's source data. Retailers let their own algorithms loose on the producer's source data.'

'The source data also determines the value of his products. At the same time, this makes it possible for the farmer to conduct his own marketing. Every consumer can find out which agricultural company his glass of milk or vegetables come from. In 2070, a standard will be developed for the source data, which will make it possible to price all economic activities on a data-driven basis. This also has implications for quality assurance. The milk processor will also demand high quality. The business model of the agri sector of the future is a close fit for this total transparency.

'In 2070 a farmer's business will be guidedby the source data.'

Sener Celik

Agricultural entrepreneurs will work closely together in the chain to finance the use of technology and to meet the high demands placed on the food supply. Cooperatives will be well prepared for that future. The future is looking rosy for cooperatives in this region, which has traditionally been developed along those lines.'

Sener's vision for TopDutch

The TopDutch region could become a worldwide quality hallmark in food production. By developing the standard in source data, the Netherlands could find itself at the cutting edge when it comes to setting global food quality requirements. Transparency is an opportunity. With Wageningen University & Research (WUR), the Netherlands is the knowledge center for the AgriFood sector. It is from here that the world is already being fed - and this is where the food of the future is being developed.'

'The future consumer will decide what he or she eats, using real-time analytics and targeted advice. This calls for transparency. Developing a culture of openness is a great opportunity that waiting to be seized for the Netherlands and the TopDutch region'

Sener Celik is CEO of JoinData.

JoinData is a non-profit cooperative that facilitates safe and transparent data distribution in the Food & Agri sector.

JoinData brings together agricultural entrepreneurs, data suppliers and application builders for simple, clear and honest data distribution. Before joining JoinData in 2017, Celik was responsible for data and analytics at Rabobank.

3.

ONE COOPERATIVE

The year 2070 according to Janny Peltjes:
The TopDutch region will develop into one large cooperative

If Janny Peltjes of the agricultural research company HLB Research has anything to do with it, the arable farmers of 2070 will look far beyond the boundaries of their own land. Intensive cooperation between arable farmers themselves, and also with livestock farmers is needed to protect crops against crop diseases more naturally and with more green and organic means. In the future, farmers in various sectors will cooperate with each other, in cooperatives and at regional level in order to achieve healthy arable farming. Certain diseases and pests are easy to control if everyone in the area cooperates.

Ingredient #1 The end of chemical crop protection

'Transparency is also something that characterizes the future of arable farming. That certainly applies to crop protection. Since the post-war years, when the crop protection industry was emerging, the production capacity of the Netherlands as arable land has increased fivefold. Chemicals have been very effective in combating multiple crop diseases simultaneously. But those chemicals are now increasingly being banned or withdrawn from the market because of social unrest and in some cases also because of the harmful effects on people and nature.'

'By 2070, crop protection will be an integrated system combining old-fashioned down-to-earthness with digital, biological and molecular precision.'

Janny Peltjes

Ingredient #2 Crop protection, but biological

'By 2070, chemical pesticides will have completely disappeared. The challenge for the agri sector is to manage diseases and pests in a different way whilst maintaining a decent income model. The use of chemicals has accelerated production in the past. The transition to crop protection through more green, biological means, through different rotations and through the cultivation of other crops in the crop plan takes time and costs money. The income model should also be maintained to prevent the agricultural sectors from being weakened.'

‘At the same time, systems from the agricultural past of the 1950s are being resurrected. They serve as the basis for new rotations and crop plans. Techniques such as sterile insects and control with natural predators are also commonplace. By 2070, crop protection will be an integrated system combining old-fashioned down-to-earthness with digital, biological and molecular precision.’

An onion fly

'In that future system, we will make maximum use of nature. We'll create a natural balance, using ample rotations, healthy crop plans, space for built-in resistance, natural predators of harmful insects, sterile insects and a mountain of data. The sectors blend together, creating integrated companies, cooperatives and fully cooperating regions that can integrate many links, including in the direction of retail and marketing.'

Ingredient #3 Partnership in cooperatives

'In the agricultural system of the future, the agri sector and nature will be more closely in balance. Farmers will be more engaged with the end consumer. In fifty years' time, through this intensive cooperative, farmers will form a new agricultural system that is in close contact with society. New forms of agriculture and nature conservation are emerging, which benefit from this cooperation. The use of all kinds of residual flows in the partnership also leads to the creation of new revenue models for agriculture. I expect cooperatives of farmers to play a major role in this and a holistic regional approach.'

'What happens with the neighbors is just as important to the effect as your own farm. A good current example is the control of the onion fly by means of the Sterile Insect Technique. Certain harmful insect populations are infiltrated by sterile insects, which keeps the pest under control. This fully organic technique only works if all growers participate in an area. Local authorities, too, will have to facilitate cooperation between sectors and not make it more difficult with excessive regulation.'

'A good example of this is the new role of marigolds. This plant, also known as tagetes, is used, for example, to control a common nematode that can result in the failure of crops - especially flower bulbs. Tagetes is now back in vogue as a replacement for chemical pesticides. Tagetes also ensures a healthier and better producing crop in the soil life in the subsequent crops.

The flowers also contain all kinds of important substances, such as lutein, which can counteract eye degeneration. This substance, which is still mainly imported from China, will be produced locally in the future. By 2070, this more holistic way of cultivating arable land will become more widespread.'

Janny's vision for TopDutch

'Without chemical pesticides, every agricultural entrepreneur is dependent on what his neighbor does. In the future, the agricultural sector will form one overarching economic system. These days, thinking stops at the boundary marking. In fifty years' time, how people think will affect the whole region.'

‘Our knowledge of the soil will be much greater in 2070 than it is today. The soil quality will be high and a fully circular system will be in place. The need for strong, healthy, insect- and disease-resistant crop varieties means that the Netherlands, as a developer of seed and seed potatoes, will be able to seize great opportunities. In the TopDutch region there are opportunities to excel in the seed material for onions, potatoes and sugar beet.’

Onion seeds

‘By taking a pioneering approach to the crop plan, the TopDutch region will achieve higher added value per square meter in 2070 than it does today. The Northern Netherlands has all the ingredients it needs to create new forms of arable farming.’

Janny Peltjes is a farmer and the founder and CEO of HLB Research & Consultancy.

The HLB Group conducts research and provides practical advice for the improvement of plant and soil health. In the laboratories and test facilities, researchers carry out tests and analyses on nematodes, fungi, bacteria and viruses in plants and soil. The company also documents soil fertility and nutrients in the soil and advises the agri sector on physical, chemical and biological parameters. One HLB Research’s special activities involves developing knowledge of biological crop protection. Anne Kippers, a student at the Aeres University of Applied Sciences and the daughter of Janny Peltjes, was also present at the interview.

JOIN TOPDUTCH

Want to find out more about what makes the TopDutch region a good place to be great, or view the digital edition? Head over to our website www.topdutch.com

Are you interested in exploring what your business possibilities could be? Connect with Joep de Vries, our AgriFood expert.

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