TOP DUTCH

A good place to be great

REDESIGNING THE AGRIFOOD INDUSTRY

For a sustainable global diet

Early this year, medical journal The Lancet presented to the world the challenges of the future food supply. We have to eat less meat, more fruit and nuts, and we must radically change our agriculture to make it more sustainable. What does that mean for food security, food safety and the AgriFood economy of the future? Two experts, Dr. Doede Binnema and Dr. Esther Nederhof, paint a hopeful picture of the future.

REDESIGNING THE AGRIFOOD INDUSTRY FOR A SUSTAINABLE GLOBAL DIET

Autarchy - this is what Dr. Esther Nederhof strives for at her farm in village of Norg, in the TopDutch region. It's an experiment - as a doctor of movement sciences, she has been studying the impact of food and food supply on the human body for many years. She is currently a lecturer of 'Safe and Sustainable Food' at the Van Hall Larenstein University of Applied Sciences in Leeuwarden. Dr. Doede Binnema, a guest at Nederhof's farm, is a lecturer of 'Biobased Economy' at the Hanze University of Applied Sciences

in Groningen. He grew up in the Frisian countryside in the village of Vrouwenparochie, on a mixed farm, that in the seventies grew into an arable farming company due to reallocation and upscaling. For both Binnema and Nederhof, the question is not whether agriculture must change, but how.

Dr. Doede Binnema, lecturer of 'Biobased Economy' at Hanze University of Applied Sciences
Dr. Esther Nederhof, lecturer of 'Safe and Sustainable Food' at Van Hall University of Applied Sciences

1.

THE MAJOR GLOBAL FOOD TRANSITION

Many challenges are in store for agriculture the world over. Every year, there are nearly 85 million more mouths to feed, while at the same time more and more agricultural land is being urbanized. People are leaving the countryside that is not being urbanized. This is very clear in large parts of Europe and China. Nature is suffering greatly from the decades of unilateral agricultural methods, intensive livestock farming is under pressure and soil quality is decreasing.

The use of pesticides is limited more each year - many chemicals are either prohibited in the Western world or the supplier takes them off the market. And we haven't even begun to talk about climate change and the demands placed on the agriculturalist sector to reduce their levels of dangerous emissions. All of this has consequences for food security and food safety. TopDutch spoke to both experts about the future - with all its opportunities and challenges.

Q. How certain are we that we will be able to feed everyone in the future?

Nederhof: 'Food security is the theory that there is sufficient high-quality food to feed the entire population. Many scientists believe that there is not enough agricultural land available worldwide to feed the world's entire population in the long term. But that is disputed. There is, for example, enough land that is currently considered unsuitable but that could be used for production.'

'Short-term food security may not take precedence over long-term security. We will pay the price in soil quality.'

Dr. Doede Binnema

"Famous ecologist and livestock farmer Allan Savory claims, for example, that large herds could turn deserts into arable land. It's possible as long as you allow for resting periods between grazing so that the land can flourish. That would add a huge amount of food potential to our current food supply. At the same time, I see that nature is being threatened - even in a fertile country like the Netherlands. The forests here were established in the nineteenth century because up until then the sandy soil was overgrazed by sheep. Sandy soil appeared between heather fields due to grazing and which began to form drifts. In short, in the nineteenth century, the low lands were almost becoming a desert - almost like a European Dust Bowl. It was not until the government planted forests on a large scale in the nineteenth century that this desertification was interrupted.
The Netherlands is not naturally safe when it comes to food security. Large-scale measures were needed to prevent impoverishment.'

Binnema: 'Everything starts with food security. In the 1950s, Dutch agricultural policy was based on the last years of WWII when the occupied Holland was plagued by a winter of famine. Post-war Minister of Agriculture, Sicco Mansholt, had one single point on his agenda: ensuring the food supply. Never another Dutch famine - there must always be a sufficient food supply in stock. In the 1950s and 1960s, food security was the top priority here which gave free rein to intensive agriculture. But short-term food security may not take precedence over long-term security. We will pay the price in soil quality.'

2.

TOPDUTCH IN TRANSITION

Thanks to the post-war agricultural transition, the Netherlands has gained a position as a large agricultural producer. In 2018, the Netherlands exported €496 billion (USD 558 billion) worth of goods and services. Nearly one fifth (€90.3 billion, USD 101.7 billion) of these were agricultural products. That makes the Netherlands, after the United States, the world's largest agricultural exporter. In a nutshell, the country is an AgrifFood powerhouse.

That is thanks to its favorable location - the Netherlands is historically the trade center of Europe, nearby a sales market of hundreds of millions of people - but also thanks to its moderate maritime climate and more than ample availability of fresh water in the delta. Historically, times of famines have been scarce in the region, and food has traditionally been cheap, plentiful and available. That is a blessing, say Dr. Nederhof and Dr. Binnema, which is not a certainty in the rest of the world.

Q. What can we learn from how the Netherlands deals with these challenges?

Dr. Nederhof: 'By diversifying, we can show the world what the future will look like. Hunters and gatherers did not suffer famines. Their diet consisted of a hundred different animals and two hundred different types of plants. Farmers today specialize in just one, or a small handful, of plants or animals.

"By growing multiple types of plants, you spread the risk of a bad harvest. The losses from one bad harvest can be recuperated by another. In a western country like the Netherlands, we get an average of 38% of our energy from grains and sugar, 15% from dairy and 4.5% from potatoes. So more than half of our energy comes from just five basic plants: wheat, potatoes, corn, cassava and rice. That makes our food supply extremely vulnerable.'

Dr. Binnema: 'Agricultural production used to be local, but now products are transported and traded worldwide, which is why mono-production in AgriFood is a problem on a global scale. Therefore, the challenge is on what scale the variation will be realized. Must it occur locally, regionally or globally?'

Dr. Nederhof: 'If we grow apples in Europe and nuts in North America, then the global agricultural system remains just as vulnerable. I believe that we have to diversify worldwide because different plants have different functions in systems. It is a complex whole, and it is good that we are rediscovering that cohesion. That fits in well with the Northern Netherlands where agriculture is a traditional part of our bocage landscape. So cultivated land can be found between rows of fruit trees.'

3.

BOCAGE AGRICULTURE

Surrounded by a few pecking chickens looking hopefully at the grain kernels in her hand, Nederhof shows us how she has divided up her land. The former pasture in front of the farmhouse, where one of the chickens has built a nest, has been divided into five equal plots and separated from one another by young fruit trees. **Her sheep are grazing in one of these bocages**, and every time they've finished eating everything they are moved to the next plot, so they always end up at the first plot again.

Dr. Nederhof: 'By alternating, the soil gets enough time to recuperate. The surrounding trees ensure higher soil quality. And the extensive root network of perennials helps store CO_2 in the soil. By planting shrubs under the chestnut tree, even more CO_2 can be stored in the soil. In comparison: fields that are plowed every year emit CO_2.' 'Moreover,' says Dr. Nederhof, 'if you leave the leaves on the ground in the fall it creates all sorts of life under the soil - large animals defecate there and worms, beetles and other insects move it into the ground. And we know that fungi communicates with plants. They transport nutrients from one plot of land to another. Nature has all kinds of useful systems that you don't use if you only plant annuals.' And, adds Dr. Nederhof, 'if you plow a plot of land every year, you use diesel.'

Q. That is fantastic on a small scale, but is this type of arable farming and livestock breeding a blueprint for agriculture worldwide?

Dr. Binnema: 'Your environment has a strong influence on how you live and what you eat. It's only when we're able to change our consumption that we can also change our range of products and our production methods. The push has to come from the consumers, they have to want to change their habits. Those habit changes are in turn determined by what the consumer is willing to pay.

Dr. Esther Nederhof

'Yesterday I learned about how biodegradable plastic cups are produced. Someone there told me they were prepared to pay double the price for a biodegradable cup. Why is that? Because you need a good reason as to why it's a good thing. The agriculture of the future needs a good selling point.'

Dr. Nederhof: 'Part of that selling point is the underlying cost calculation of sustainably cultivated crops. With true pricing, you can compare the true price of an organic cauliflower with that of a regular cauliflower. The regular cauliflower is cheaper in the store, but in reality, it costs more than the organic one. As a consumer, you don't feel the true price, because society pays for it in the form of a water purification plant that purifies the surface water. There are many more of these collective costs that are included in products.'

Dr. Binnema: 'I totally agree. I'm convinced that society will calculate these invisible costs in the future. That starts with providing insight into those costs. I predict that companies will start doing this more. Transparency throughout the entire production chain will become more important for product sales. That means that some food sources will be able to start a new, sustainable life. Unilever sold a margarine factory in Rotterdam in 2017. It is still making margarine, but it is now being marketed as a plant-based product. Same product, new marketing.'

4.

FOREST AS MICRO-FARMLAND

Four chickens, three sheep and two pigs forage around on Nederhof's arm just outside Norg in the **Northern Netherlands**. She walks barefoot among her small group of farm animals. Past the vegetable garden and the pond, barely visible behind all the reed, to her tiny **food forest** at the back of the plot. She points to the part of her land that is kept cool by the shade from oak trees. Butterbur is folded out over the forest floor.

The plant's flowers have already been eaten. 'Delicious and nutritious,' says Dr. Nederhof. Adjacent are Ostrich ferns - 'you can eat the tips' - chocolate vine and Japanese Angelica. Those fruits, called 'schijnaugurk (fake pickle)' in Dutch, look like pickles, but they taste like watermelon, and if you eat the Japanese Angelica root shoots, you'll almost think you're eating asparagus. There are chestnut trees in the forest that produce lots of nuts every fall. 'We try to sustain ourselves year-round with what nature provides. That also applies to the eggs and chickens, the lambs and pigs - although the pigs rooting around in the sandy soil don't know this.'

Q. Is agroforestry a solution to the current challenges facing the agricultural sector?

Dr. Nederhof: 'I believe it's one of the solutions. I've been intrigued by the phenomenon of agroforestry since I first learned about it. I'm also chairman of Ancestral Health, a foundation that researches the relationship between lifestyle diseases and food.'

"A growing group of doctors and scientists theorize that the incidence of common diseases, mainly in the Western world, is related to the mismatch between our current lifestyle and our eating habits. Therefore, one of my colleagues wanted to set up a food forest in Maastricht. When I started to look into it, I found out that a forest is a really sustainable source of food. The food that a forest produces fits in perfectly with the eating habits that I think will be successful in the future: nuts, fruit, but also mushrooms, vegetables and animals.'

Dr. Binnema: 'Many lifestyle diseases are related to eating habits that consist mainly of products in which large amounts of sugar are processed. That has a historical reason - for centuries, sugar was a scarce commodity. Cheap sugar is now always available to be added to products as a preservative. You can fight lifestyle diseases with other eating habits, more sustainably-produced food. It will be interesting to see if a food forest can do that.'

Q. Does your food forest produce enough food to feed your family?

Dr. Nederhof: 'We'll have to see. We only started last year with dividing up the land. And it isn't really clear just how much land is needed to grow enough food for people. There are people - like Madelon Oostwoud, who wrote a book about this - who estimate that a 1 hectare size food forest can provide a dozen human beings with vegetables and fruit all year long.

Food forests are a type of field with multiple layers: roots and tubers in the ground, mushrooms, water plants and ground cover plants above ground. Herbs and vegetables grow in the soil - like in my vegetable garden. And then there are shrubs and climbing plants, and the fruit and nut trees. You can survive with each season, the whole year round.'

Dr. Binnema: 'One of the big challenges for the next decades is getting enough food from a food forest like this. Because it is perfectly clear that we need to update the agricultural system that was developed in the 1930s. At that time, farmers were forced, due to financial reasons, to cultivate crops that they could harvest quickly and earn a profit. Although the current agricultural sector does grow enough food, it is depleting the nutrients in the soil and is unsustainable for both humans and nature.'

5.

THE NEW FOOD ECONOMY

In January, the EAT Commission from medical journal The Lancet published a report that has, since then, caused apprehension among nutrition specialists. The commission, which consists of 37 scientists from 16 countries, both physicians and sustainability experts, proposed a food prescription for the people of the future. That diet takes, on the one hand, our health into account and the available agricultural production methods for a greener world on the other.

The commission proposes that food production is the largest factor in the escalation of environmental tensions, and therefore the scientists argue that there must be a global change in our behavior and in our food production. Worldwide, we must consume less than half the amount of meat and sugar, and twice the amount of nuts, fruit, vegetables and legumes that we currently eat. The production must evolve with that transition, argues the commission. Production may not use extra land, must use water responsibly, and the environment may not be polluted with nitrogen and phosphor. Using chemical pesticides must therefore also be reduced. The recommendations are at odds with the current methods and the current AgriFood economy. One assumption, for example, is that the nutritional value of food is higher when it is produced sustainably.

Q. Do we have to produce less meat, in your opinion?

Dr. Nederhof: 'More vegetables and less meat? I don't agree with that. There's a reason why the World Health Organization (WHO) has distanced itself from the article in The Lancet. The argument, according to the WHO, is insufficiently substantiated and would also require too many major changes. I believe it is insufficiently substantiated: a simple calculation shows that you do not get a sufficient amount of nutrients with the diet in The Lancet. You will have a shortage of vitamins and minerals.'

Dr. Binnema: 'But the idea that eating habits worldwide must fundamentally change if we want to prevent production from becoming unsustainable - that is true. There are major incremental measures needed everywhere in the world in the next thirty years. Everywhere, those changes will be greater than what we are prepared to do now.'

Q. Is sustainably produced food more nutritious?

Dr. Binnema: 'For the majority of people, it is not clear what exactly the solution is. The question as to what you must eat to stay healthy depends on so many different factors. Take insulin resistance - how do you prevent that? And how do you prevent a sugar dip after eating carbohydrates? And lactose intolerance? A large portion of the world's population adapts their diet to this. The average person can't understand this.'

Dr. Nederhof: 'We currently know a great deal about vitamins and minerals in particular. But there is still a whole lot to learn in nutritional science. Right now, the smaller components in food - such as aromatic substances - are being examined. We don't really know much about the function of these substances. This type of research offers lots of possibilities. If we can find a simple way of measuring the nutritional value of food, we can start cultivating more purposefully. We can then process the food in a way that results in the highest nutritional value. In the future, it will probably be possible for farmers to gear their cultivation processes in such a way that they can produce broccoli with a higher nutritional value. Or bakers can bake bread with a higher nutritional value.'

Q. How can the AgriFood sector best respond to this?

Dr. Nederhof: 'By collaborating in food networks and agricultural production chains. Financing for this must be made easily available in the future. There are currently initiatives to fund these types of collaborations through crowdfunding. AgriFood sector of the TopDutch region, we are used to working together as chains, in cooperative associations, for example.'

Dr. Binnema:
'Here, in the Northern Netherlands, we are in the process of becoming a man-made blue zone - a region where you can grow old in good health. And healthy food requires a collective approach. Communities need to shape healthy eating habits collectively.'

Q. At the same time, personalized food is becoming more and more popular.

Dr. Nederhof: 'Yes. This is the trend of being able to eat a diet that is perfectly attuned to your body's needs and the amount of exercise you get. Because we know enough about you.

Theoretically, this can be done for the entire population, but in the Netherlands, we are currently experimenting with patients that receive a special diet before or after an operation, with the goal of faster recuperation. Athletes are also put on personalized diets to improve their performance.'

Dr. Binnema: 'We have a lot of knowledge about AgriFood and health in the TopDutch region. This is because we have an infrastructure of knowledge institutes, such as the university, the University Hospital and the Van Hall Larenstein and Hanze Universities of Applied Sciences.'

Q. What does the future of personalized food look like?

Dr. Binnema: 'Technically speaking, it would be possible to get weekly advice about the food package best suited to your body - based on many different factors, such as your body shape, your metabolism, the weather, your intentions to exercise, your planned vacation, etc.'

Dr. Nederhof: 'And knowing what your DNA looks like, which bacteria are present in your intestines. This means that, for example, when catering for an event, many preferences can be taken into account, many more than just the categories gluten-free, vegetarian and lactose-intolerant. A wider range of choices can only be made possible with custom-made production. As I see it, future catering services will offer you a basic dish, to which you as the consumer are able to select extras that are adapted to your personal diet.'

6.

THE PROTEIN REVOLUTION

The protein revolution is part of the transition. If it was up to the EAT commission of The Lancet, the average world citizen would eat no more than 14 grams of red meat per day in the future. Meat substitutes are gaining popularity for the Western consumer who is willing to adapt to this. To ensure they not only resemble meat in taste and structure but also in nutritional value, manufacturers are researching proteins that can replace the proteins present in meat. The food industry is also searching for plant-based proteins to replace the protein found in dairy products. A protein transition is currently taking place.

Dr. Doede Binnema, lecturer of 'Biobased Economy' at Hanze University of Applied Sciences

Q. What effect does the protein revolution have?

Dr. Binnema: 'It is quickly creating a whole new market for food products. There are plant-based proteins that closely resemble meat proteins, but milk substitutes are still problematic: their nutritional value is too low. Rice, nut and oat drinks have a much lower nutritional value than milk.'

Dr. Nederhof: 'Plus, humans can digest animal protein much better than plant-based proteins. The human body can absorb iron and vitamin A from meat much easier. Meat and dairy substitutes contain no vitamin B12, but they do contain sugar.'

Dr. Binnema: 'At the same time, digestibility has an effect on your health. The risk of intestinal cancer increases in people who eat a diet that includes a lot of plant-based protein and very little fiber from carbohydrates for a long time. There is still lots of research to be done regarding our changing diet.'

Dr. Nederhof: 'In my opinion, a large part of the challenge is also how we currently produce animal-based food products. I believe in a future for healthy meat production, in close collaboration with nature. If we let cows choose their own food, let them graze freely on grass growing on high-quality soil, with high-quality groundwater, in soil that retains CO_2, their milk and meat will taste much better than that from cows grazing on soy. This means opportunities for livestock breeding. Farmers that raise their cows exclusively on grass can significantly reduce their production price in comparison to farmers that raise their cows in stables and on animal feed. They don't pollute the surface water, and they don't need to have soy and animal feed delivered. Taking animal welfare into account will also benefit efficiency.'

Q. Lastly: what does a well-balanced AgriFood sector look like, in your opinion?

Dr. Nederhof: 'Imagine the Netherlands being a blank slate and we can redesign the entire country. What would that lead to? All of our future calculations are based on the current infrastructure, the current logistic services, and our current level of prosperity. But innovation only happens when you start thinking outside the box.

Local farmers here in the TopDutch region are doing just that. For example, Frisian farmers, Bartele Holtrop and Welmoed Deinum, are farming sustainably. They don't need to produce much to attain a good standard of living. And in Northern Groningen, Edwin and Petra Spa, sell so-called Waddenvarkens (Wadden pigs) - free-range pigs that lead sustainable lives. Consumers are willing to pay extra for the meat from these pigs - and their family can live comfortably on the profits. Edwin Spa also feeds his pigs vegetables he can't sell. So, when you collaborate locally in a clever way, it's suddenly all possible. This is an example for the entire sector: if we use all of the food waste in the Netherlands to raise pigs for their meat, we will cultivate 100 grams of pork per person per day, Dr. Emiel Elferink from University of Applied Sciences Van Hall Larenstein has calculated.'

Dr. Binnema: 'Here in the Northern Netherlands many entrepreneurs in the AgriFood sector want to produce real food again instead of just raw materials for the food industry. There are opportunities for the farmer who wants to become an entrepreneur.'

Dr. Nederhof: 'My farm is, to a certain degree, also a self-experiment, research into self-sufficient living. That research has, in some ways, been going on for forty years. That's how old that chestnut tree is. The previous owners planted it. And now I'm reaping the rewards.'

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T: +31 6 253 926 71
E: jdevries@nom.nl

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