WAGENINGEN WORLD

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Wageningen wants to improve life for refugees

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A greener IJsselmeer

Many interests converge at the Blue Heart of the Netherlands

WAGENINGEN UNIVERSITY & RESEARCH

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The mission of Wageningen University and Research is 'To explore the potential of nature to improve the quality of life'. Under the banner Wageningen University & Research, Wageningen University and the specialised research institutes of the Wageningen Research Foundation have joined forces in contributing to finding solutions to important questions in the domain of healthy food and living environment. With its roughly 30 branches, 5,000 employees and 10,000 students, Wageningen University & Research is one of the leading organisations in its domain. The unique Wageningen approach lies in its integrated approach to issues and the collaboration between different disciplines.

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FEATURES

Dealing with extreme weather

'The serious floods in the Indian state of Kerala in mid-August were the result of extremely heavy monsoon rains. Five hundred millimetres of rain fell in one week. If that much water comes rushing off the mountains, there is no way you can hold it back. There is hardly even time to warn people: the narrow coastal plain is close to the mountains. That much water is unmanageable. In India, making "space for the river" (something we have projects for in the Netherlands) happens spontaneously, whether you like it or not: the rivers regularly burst their banks. Especially in the north, it is common for hundreds of square kilometres to be inundated. There is a positive side to that too, though: the rivers bring nutrients down with them that make the soil fertile. But the flooding in Kerala was an exceptional case, with hundreds of casualties.
You can't directly link this kind of disaster with climate change, but it does fit the hypothesis that the wet regions of South Asia are getting wetter, and the dry regions drier. For a long time we have gone by weather averages based on historical records, but they are no use now. That raises huge questions. Where can you still build houses, where can people escape to, how do you steer the unbridled growth of Indian cities to keep it within safe limits?
It was an unfortunate coincidence in Kerala that the dams were as good as full towards the end of the monsoon. They had to discharge water unsystematically, which some say exacerbated the disaster. In Wageningen we are trying to identify the critical moments for dealing with extreme weather.
The climate research agenda has long been set by climate scientists, who have their heads in the clouds, as it were. But how do farmers experience it? When are they vulnerable? A heat wave in northern India might cause the most problems if it occurs just after crops have been planted. Food security depends partly on those kinds of details.'

Christian Siderius, researcher at Wageningen Environmental Research and the Grantham Research Institute, the climate studies institute at the London School of Economics

EDUCATION

PHOTO MARTE HOFSTEENGE

Inspiration for school assignments on food

In April, Wageningen launched a new project for schoolchildren, the Wageningen Borlaug Youth Institute. The project aims to inspire schoolchildren to work towards enough healthy food for everyone in the world. Secondary school pupils can go there for assistance with their specialist subject assignment. If they turn that assignment into an advisory report, they are in with a chance of being able to present it at the ceremony for the World Food Prize in the United States.

The Wageningen Borlaug Youth Institute is responding to a broader challenge: getting more attention paid to sustainability in education. The project is named after the agronomist Norman Borlaug. He received the Nobel Prize for Peace in 1970 and initiated the World Food Prize in 1986, which is known as the 'Nobel Prize' for food and agriculture.

At the SDG conference (Sustainable Development Goals) in Wageningen at the end of August, the five best teams of schoolchildren presented their recommendations to a jury and debated them with Agriculture minister Carola Schouten. The winners will be able to attend the three-day meeting of the Global Youth Institute at the end of October in Des Moines (Iowa, USA). *Info: simone.ritzer@wur.nl*

RESEARCH PRIZE

Spinoza Prize for CRISPR-Cas founding father

The Wageningen professor of Microbiology John van der Oost received the Spinoza Prize worth 2.5 million euros in June. This is the biggest prize in Dutch science.

PHOTO RAFAËL PHILIPPEN

Van der Oost is one of the founding fathers of the groundbreaking CRISPR-Cas technique, which lets scientists remove, add or modify genes very precisely. Van der Oost discovered how the CRISPR-Cas system contributes to the bacterial resistance to viruses. The system can be used to make crops stronger and to tackle hereditary diseases in animals and in principle even in humans.

Van Der Oost sees the Spinoza Prize as a particular honour, not just for himself but also for his Microbiology research team. 'Because the people in the lab, the staff and the PhD candidates do the real work.'

He plans to spend the prize money on further research into bacterial resistance systems. 'We have identified a couple of systems that are comparable to CRISPR-Cas but do something just a bit different. I'd like to explore and improve that further.'

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100 YEARS

King plants tree for university's anniversary

PHOTO ANP

On 23 June, King Willem-Alexander planted a rubber tree (*Eucommia ulmoides*) on Wageningen Campus. The tree is one of the UniversiTrees that are being planted around the world in this anniversary year to symbolize unity. The king used the same spade as his late father, Prince Claus, when he planted a tree in 1991 in front of what was then the new head office at Duivendaal.

The king also opened the worldwide alumni day. One event was the WURld Dialogue about providing food for the world's growing megacities. For this, Wageningen was linked up via a live stream to alumni and experts in China, Ethiopia, Colombia and the United States. The biggest problem now turns out to be not hunger but obesity, and the availability of fresh fruit and vegetables rather than processed food.

The WURld Dialogue can be replayed at *https://youtu.be/rCdePkzs63k*.

NATURE MANAGEMENT

North Sea gets oyster beds again

An oyster bed is being built at a depth of 20 metres in the North Sea, north of Schiermonnikoog. The aim is to encourage the restoration of nature. The first larvae have now been observed.

Up until the start of the 20th century, about 20 percent of the North Sea bed was covered with flat oyster beds. They have since largely disappeared due to overfishing, disease and cold winters. Experience shows that shellfish beds do not return of their own accord. 'If there are too few oysters, the chance of successful reproduction is too small,' says shellfish expert Pauline Kamermans.
That is why a collaborative venture between Wageningen Marine Research, WNF, ARK, Bureau Waardenburg and Sas Consultancy is currently reintroducing oysters in various places to find out what the success factors are for active restoration. They are also looking at the effects on biodiversity and the presence of young fish.
Coral and oyster beds around the world are being restored and protected because this improves the production of fish, the water quality, seabed stability and coastal protection. The beds are also hot spots for biodiversity and serve as an important breeding spot, source of food and shelter for marine creatures.
In the Borkumse Stenen restoration project, oysters were stuck onto an artificial reef using a kind of epoxy clay that is also used for coral restoration. Furthermore, 6000 kilos of oysters were scattered around and empty mussel shells were dumped as a substrate for the oyster larvae to attach onto. The one-hectare test location near the Borkumse Stenen area of sea was chosen in consultation with fisheries, who voluntarily agreed to avoid the area.
At a second test location, in the deep part of the North Sea at the Gemini wind farm near the Borkumse Stenen, 1000 kilos of oysters have been deposited in the first attempt to start an oyster bed at a wind farm in the North Sea.
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PHOTO ROB BUITER

PHOTO WNF

PHOTO ANP

WAGENINGEN ACADEMY

Online learning for professionals

In addition to the free MOOCs (massive open online courses), Wageningen is offering an increasing number of full programmes and individual modules online. Online learning can be a good solution for professionals who have to combine studying with a job: they can study when, where and how they want. The online programmes are often 'blended', meaning that part of the programme is online and part is on-site; this allows knowledge and experience to be shared and lets students do group assignments and practicals. Wageningen Academy already offers modules on subjects such as plant breeding, plant entomology and pathology, and more are planned. A course on 'Food Technology' will start this autumn and a 'Principles of Sensory Food Science' course is scheduled for early 2019. The online programmes are usually in English. For more information, see *www.wur.nl/academy*.

PHYSICS

Friction affects swarm behaviour

PHOTO SHUTTERSTOCK

Using an air hockey table, Wageningen researchers discovered that friction between particles influences their behaviour. That helps understand the swarming behaviour of birds and fish.

'Our outcomes suggest that air and water flows can be a mechanism directing a swarm of birds or fish,' says Joshua Dijksman. Dijksman studies spontaneous behaviour in complex systems, for example granular materials like coffee and sand. Their flow behaviour is unusual: sometimes the grains flow and at others they stall.

'American colleagues used air hockey tables to study the interaction between these particles,' explains Dijksman. Air is continually pushed through holes in the table, making the particles float just above the table without friction, just as ice hockey pucks do. 'We wanted to use this to explore how the collective behaviour of the particles emerges and how the swarming is influenced.'

Using a 3D printer, the researchers made discs containing small ventilation channels. Those ventilation channels made the discs rotate. 'They had rotational energy but no lateral kinetic energy. They only moved after a collision,' says Dijksman.

If there were only a few discs, they rarely collided with one another and only occasionally with the edge of the table. The discs then moved overall in a clockwise direction, the researchers noted. Interestingly, as more discs were added, the communal direction of motion above the air hockey table eventually reversed spontaneously, with the discs moving anticlockwise.

The observations show that individual particles in the model (birds in a swarm or fish in a school) demonstrate swarming behaviour purely on the basis of their interaction with one another. They adjust the direction of their flight or swimming when they sense fellow creatures of the same species near them based on the air or water movements.

The publication appeared in June in *Soft Matter*. *Info: joshua.dijksman@wur.nl*

NUTRITION

PHOTO'S WORLD FOOD DAY

World Food Day in Den Bosch

This year, Wageningen University & Research is once again co-organizing World Food Day, which will be held in Den Bosch on 13 October. The festival features workshops, talk shows, films, a local farmers' market and excursions to show people where our daily food comes from. Who produces it? What innovative techniques are used? What impact does our diet have on the planet? And how can we get a fair distribution for everybody? The festival has a programme that will appeal to young and old alike.

Info http://wereldvoedseldag.com/

NUTRITION

Duckweed veggie burger

Wageningen researchers have developed a burger made of water lentils, also known as duckweed. This plant is rich in protein and grows incredibly quickly. The research is focusing initially on the acceptance of this vegetable burger and how humans digest it. 'The plant is perfectly edible but our enzymes seem to have trouble accessing all the proteins,' explains Jurriaan Mes of Wageningen Food & Biobased Research.

In addition, a company is looking into the options for extracting the proteins from the water lentils. The municipality of Lingewaard is also collaborating in the project as the cultivation of duckweed could be a new function for currently unused greenhouses. In May, the first plants went to a grower involved in the project for cultivation trials.

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PHOTO ANP

ECOLOGY

PHOTO SHUTTERSTOCK

Cows don't have a compass

Cows do not prefer to stand or lie down along a north-south axis. Wageningen University & Research performed field studies to test this, prompted by small-scale observational studies that suggested that cows respond to the magnetic north in a similar way to migratory birds, fish and bats. All the researchers found in cows was a slight preference for a position with the head facing southeast. This is in line with the position of the sun and helps prevent overheating. 'We also see this in wildebeest and impala in Africa,' says ecologist Ignas Heitkönig. A study at night, when the sun is not a factor, will give final confirmation. The research was reported in April in PLoS ONE.

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GENETICS

New reference genome for the rose

Wageningen researchers and international colleagues have created a new reference genome for the rose: an example genome that lets pieces of DNA that have been found be put in the right position quickly. 'This study will let plant breeders develop new rose varieties faster, resulting in roses with lots of petals, no thorns and that bloom longer – properties that are important to consumers,' says René Smulders of Wageningen Plant Research. 'The similarities between the rose and the strawberry, to which it is related, are also clearer now, which is useful for building in resistance to diseases such as mildew.' *Info: rene.smulders@wur.nl*

PHOTO SHUTTERSTOCK

EDUCATION

Extending teacher training

As of this academic year, Wageningen Master's students studying Earth and Environment or Molecular Life Sciences can obtain a certificate for teaching physics or chemistry in senior secondary education as part of their Master's course. Wageningen is starting a three-year trial for this with Radboud University in Nijmegen. There is a lot of demand for science teachers. Students were already able to earn a certificate for teaching the lower classes in secondary schools.

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INNOVATION

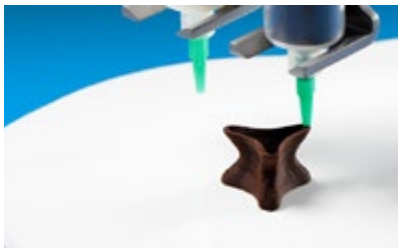

PHOTO WUR

Turn the printer on for dinner

Wageningen University & Research, TNO and Eindhoven Technical University have set up a research programme for the 3D printing of food. Printing can be used to give food new taste sensations, textures and creative shapes. The technology also offers new options for food tailored to meet individual needs, for example with precisely the right proteins and vitamins for athletes or seniors. It is also possible to create meals for patients with difficulty swallowing that look normal but are still easy for them to eat. Further development of the technology can help the food industry to redesign production processes.

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FOOD SECURITY

Aid extended for agriculture in Ethiopia

The bilateral partnership for food, income and trade between Ethiopia and the Netherlands (BENEFIT), coordinated by Wageningen Centre for Development Innovation, is being extended with a fifth programme, REALISE. In addition to the existing programmes in what are termed food-secure regions in Ethiopia, this will focus on improving agriculture in areas that lack food security. The budget for this is 8 million euros over four years. The other BENEFIT programmes helped more than 2.6 million farmers improve their productivity in 2016 and 2017, while 1.3 million farmers gained better access to markets.

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AQUATIC ECOLOGY

Wrong sun cream damages coral off Bonaire

A UV filter from sun cream is found in the coastal waters off Bonaire that is probably damaging the coral. Ecotoxicologist Diana Slijkerman of Wageningen Marine Research is advocating a change to the cream.

The biggest known threats to coral are climate change, overfishing and eutrophication. In 2015, a team of international researchers also saw negative effects in a lab study from the UV filter oxybenzone on the health of coral. Oxybenzone affects the water quality and therefore the coral's resistance.

Slijkerman found this compound in worrying concentrations in the Lac Bay lagoon on the southeast side of Bonaire, where there is a lot of recreation. Via interviews, her research team discovered that sun cream containing this substance is mainly used by American tourists visiting on cruise ships. She organized a stakeholders meeting with the local organization Boneiru Duradero, supported by the Dutch branch of the WWF. At the meeting, an agreement was made to call on tourists to spare the coral by choosing a different sun cream or wearing clothes that shield the sun, for example. Educational posters and a video should also help. Slijkerman is now doing tests on oxybenzone with Wageningen colleagues in a Dutch lab to get a more precise picture of the risks to coral.

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PHOTO ANP

INNOVATIVE RESEARCH

Three Vidi grants for Wageningen

In June, three experienced Wageningen researchers were awarded Vidi grants worth 800,000 euros each by the Dutch Organization for Scientific Research (NWO). This will let them spend the next five years developing their own innovative line of research and setting up a research group. One of the three lucky recipients is environmental philosopher Bernice van Bovenkerk. She looks at human-animal relationships and investigates how we could put fewer restrictions on animals' behaviour and do more to meet their needs. The chemist Maarten Smulders works on the development of polymers that respond to their environment, and the entomologist Eveline Verhulst looks at how the big differences between male and female insects arise.

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NEUROBIOLOGY

Responding to odours without a sense of smell

PHOTO SHUTTERSTOCK

The brain still responds to odours even in people who are no longer able to smell. This is promising news for the treatment of a damaged sense of smell. These findings come from research by the Smell and Taste Centre, run by Wageningen University & Research and the Gelderse Vallei hospital, in partnership with Austrian colleagues.

In the study, subjects without a sense of smell were given odours and pure air to sniff via a small tube attached to their nose. Their brain activity was measured using functional magnetic resonance imaging (fMRI), which gives a three-dimensional image of the blood perfusion in the brain.

When odours stimulated the nasal region of people without a sense of smell, the brain area responsible for smell turned out to be active but so did the parts used in seeing and in sniffing air. And brain activity in the olfactory area was seen when sniffing odourless air.

That had never been shown before in people without a sense of smell, says project manager Sanne Boesveldt of Wageningen University & Research.

The results suggest that the nerve pathways that report the presence of the odours in the nose to the brain are still functional in these patients. That could pave the way for a treatment for a damaged sense of smell. At present, patients with a partially affected sense of smell sometimes receive training in which they smell different odours twice a day. That is a treatment that requires a lot of patience, because it may take six months before you see any progress, says Boesveldt. 'The data we have now will let us figure out which categories of patients with no sense of smell would benefit from training.'

Around 250,000 people in the Netherlands have an olfactory disorder. The findings were published in *Human Brain Mapping* in late March.

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ENTOMOLOGY

Mosquitoes prefer malaria patients

People with malaria get bitten more often by malaria mosquitoes, making them a source for the further spread of malaria parasites. Wageningen scientists and international colleagues have discovered why that is. In the phase in which the disease is transferable, patients turn out to secrete more of the odour compounds heptanal, octanal and nonanal, which are aldehydes. 'These are quite normal odours that are often described as fruity or grassy. They are particularly appealing to malaria mosquitoes,' says the Wageningen researcher Jetske de Boer. After infection, the proportion of aldehydes in the total set of odours rose from 15 to nearly 23 percent. Researchers also found that the more parasites in the blood, the greater the secretion of the three aldehydes. This knowledge can help improve odour traps and develop new, simpler methods for detecting the disease. The study appeared in April in PNAS.

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PHOTO GETTY IMAGES

Looking after

More and more people are fleeing wars and natural disasters. Wageningen is doing research on the background to migration and the reception of refugees in Jordan, the Congo, Lebanon, Bangladesh and Uganda. As well as trying to improve the living conditions of both refugees and local people.

TEXT ALEXANDRA BRANDERHORST **PHOTO** BRAM JANSEN

displaced people

Zaatari refugee camp in Jordan.

'What strikes me again and again is the contrast between refugee camps and the surrounding area. Refugees often end up in areas where the local population is hard up too. In the camps there is food, there are hospitals and schools, and sometimes it is safer there too,' says Bram Jansen, a researcher at the Wageningen Sociology of Development and Change chair group. He is specialized in refugees and migration, and regularly visits refugee camps. This summer he was in Zaatari, a large camp for Syrian refugees in Jordan.

'It is high time Wageningen expertise was deployed for migration-related issues'

For his PhD in Wageningen (2004-2011), he stayed two years in Kakuma, a refugee camp in Northern Kenya that houses refugees from South Sudan, Ethiopia, Somalia, the Congo and Uganda. 'In Northern Kenya, a lot of people live in poverty, suffering recurring food shortages and having to deal with violent cattle rustlers,' says Jansen. 'The refugees in Kakuma get protection, healthcare and education. There are facilities such as a braille school, wheelchair basketball and a safe house for women. Of course, nobody stays in a refugee camp for fun. But sometimes families from the area move to this camp so their children can go to school.'

FLOWER BED IN THE DESERT

Jansen is primarily interested in the way a refugee camp develops. In the course of time, more and more shops spring up, as well as roads, schools, hospitals, sports fields and sometimes even universities. Jansen talks about how power relations, judicial structures and a youth culture emerge. 'In Kakuma, which has existed for over 25 years, a second generation has already been born. The camp was intended as an emergency facility, but it has turned out to be less temporary than that. People are building a life there.'

By way of illustration, he describes a refugee who had fought in South Sudan. 'In Kakuma he became an English teacher, and earned a pittance teaching at one of the four secondary schools. He had a wife, a child and two cats, and he watered his garden every day, a tiny flower bed in the desert. The temporary situation had become normalized for him.'

Jansen is working for the Association of Dutch Municipalities, which is involved in Zaatari with the municipality of Amsterdam, on an evaluation of their projects in refugee camps such as the development of the public spaces by creating a park and a nature trail. 'Public space could be planned better in order to meet the needs of people in normalizing camps. Aid organizations often see that as a luxury, besides necessary facilities such as food, water and medical care. But a park is more than just a green place where people can meet up and where new initiatives are launched. It also offers possibilities for harvesting and storing water to cope with droughts and flooding. So aid in the form of urban planning contributes to the development not only of the camp but also of the region.'

OVERLOADED RECEPTION REGIONS

According to UNHCR estimates, as of 2018 there are more than 68 million people who have been displaced by war or natural disasters. This figure covers both internal refugees and those who have fled abroad. As many as 85 percent of all these refugees are put up in developing countries. 'Many regions are becoming overloaded,' says Marian Stuiver, Metropolitan Solutions programme leader at Wageningen Environmental Research. 'There is not enough food, the diet is not varied enough, there is not enough work, and water and firewood are scarce. There is environmental damage, natural resources are being depleted, and there are no waste disposal systems, for instance.'

It is high time, in Stuiver's view, that Wageningen expertise was deployed for migration-related issues. 'It is one of the biggest problems of our time. There is growing urgency and therefore also political pressure in the West to help make regional reception possible.'

In 2017, Stuiver took the initiative of organizing the annual Changing Routes event.

At this day event, scientists, policymakers and people from aid organizations can discuss the developments around migration flows, make new plans and form new collaborations. 'We hope to work out the mechanisms

PHOTO WUR/CAROLINE VAN DER SALM

One of the five demonstration greenhouses for tomato cultivation in the Beqaa Valley in Lebanon. The greenhouses save water and create work for local farmers and Syrian refugees.

that cause migration.' Stuiver emphasizes it is in everybody's interests that projects have real impact because there is a lot of money involved in aid to refugees – governments and other organizations often pump millions of euros into it,. She is working on a broad research agenda on refugees and migration, and on various projects such as the development of a sustainable campus for both Jordanians and Syrian refugees in Jordan (see inset).
In the same region, Wageningen is involved in projects related to water management and horticulture. Last spring, the ministry of Foreign Affairs funded the building of four demonstration greenhouses for growing tomatoes in the Beqaa Valley in Lebanon, with the aim of saving water and creating jobs for refugees.

HELPING WITH THE HARVEST

Horticulture experts at Wageningen University & Research developed low-tech greenhouses that enable local farmers to manage with less water. About 15 enthusiastic farmers are involved in the project, and their colleagues are being introduced to the new methods in the demonstration greenhouses as well. 'The idea is that these farmers will hire refugees to help them with the harvest,' says team leader Caroline >

CAMPUS IN JORDAN

GreenfieldCities wants to build a sustainable campus in the city of Mafrak, close to Zaatari refugee camp in Jordan. This campus will provide jobs, housing and training programmes – in IT for instance – for about 1500 Jordanians and Syrians. Early in 2017, the Wageningen Ambassadors donated 30,000 euros for the preparatory phase. Now GreenfieldCities is carrying out a feasibility study with the help of Wageningen and with funding from the ministry of Foreign Affairs. 'The local governments are responding positively and property developers in Jordan are keen to build on the campus. Dutch companies are showing interest as well,' says Joris Benninga, the founder of GreenfieldCities. 'The support of Wageningen University & Research has certainly helped. It made the Dutch government take us seriously as a player.' Looking ahead to the future, Benninga expects that Wageningen researchers could help to develop an agricultural cooperative and training courses for farmers, as well as to monitor and evaluate the project.

PHOTO ALAMY

Zaatari refugee camp in Jordan has grown into a city with its own shops, roads, schools, sports fields and hospitals.

van der Salm. She works in Jordan too, on a similar project: here, medium-scale horticulture businesses in the Jordan Valley are themselves investing in slightly more advanced mid-tech greenhouses. Half their costs are refunded on the condition that they employ refugees. The project will generate 600 jobs, two thirds of them for Syrian refugees.
Wageningen is also working with aid organization ZOA on setting up two training centres for flower cultivation, for Syrian refugees in Jordan. This project is financed by Australia. 'The training courses will mainly be for women refugees and refugees with a disability, to increase their chances of getting work,' says Van der Salm. Het team advises on how to set up the centres.

MOSQUITO NETS AND MATTRESSES

Thousands of kilometres away, in the Democratic Republic of the Congo, the Wageningen development economist Maarten Voors is studying whether aid really works – in this case, basic emergency aid for the people in the east of the country who have fled in the face of violence by rebel groups. These refugees usually take shelter with family, friends or strangers in villages one or two days' walk from home, explains Voors. They have had to leave everything behind and their host families are often extremely poor. So the United Nations hands out vouchers to the poorest refugees, with which they can buy things like mosquito nets, mattresses, buckets and soap at a special market. Only the poorest 10 percent of the villagers get these vouchers. 'We are studying the impact of this emergency aid,' says Voors. 'That is incredibly relevant; after all, we are talking about millions of people every year. The non-profit organization International Initiative for Impact Evaluation is funding the field experiment. A random selection of 70 people get the extra aid, and 70 others, who are equally poor, do not. A mobile research team questions and studies both groups straightaway and then again six weeks later. They look at mental and physical health and social integration. 'You might wonder, for instance, whether the goods cause conflicts, or whether people in fact share them,' explains Voors.
The study has been going for a year and has covered 31 villages. The provisional results suggest that the health of the people who got the goods is no better, and infant mortality has not gone down. 'Perhaps six weeks is too short to see changes in that,' says Voors.

> ‘People build up a life in the refugee camp’

The emergency aid does mean the recipients have more to eat. ‘That could be because they can spend more of their budget on food,’ explains Voors. ‘It also seems as though the emergency aid has a positive effect on social integration. But the biggest positive impact was on the mental stability and resilience of the people who received the aid.’

CLIMATE MIGRATION

It is not just war and violence, as in the Democratic Republic of the Congo, that force people to flee their homes. According to the Internal Disaster Monitoring Centre (IDMC), in 2017 there were nearly 11.8 million new refugees displaced by conflict and violence, and nearly 18.8 million displaced by natural disasters. Ingrid Boas of the Wageningen Environmental Policy chair group studies the interaction between migration and climate change. ‘Most studies show that climate change is not a primary motive for large numbers of people to trek long distances, and that climate migration is largely local,’ says Boas.

She was awarded a Veni grant by the Netherlands Organization for Scientific Research in 2016 for her research on climate-related migration and the influence of modern communication technology. In 2017, Boas spent five months in Bangladesh, which suffers from rising sea levels and flooding caused by increasingly powerful cyclones. She spoke to residents of affected areas about their decisions to stay or to leave, and mapped their escape and migration routes. When the danger subsides after a cyclone, people usually return and rebuild their houses, Boas tells me. ‘Whether people migrate depends on their social networks, how much money and resources they have, and other factors such as environmental and political problems. A lot depends on the local government, and on questions such as whether the money for repairing dykes disappears or whether a better dyke does actually get built. When flooding leads to salinization and erosion, local residents can be forced to leave.

Boas: ‘In such cases, a lot of people gradually move away from the coast, sometimes just a few metres at a time. Others move to another island or a nearby city.’

Modern telecommunications play a role in this. ‘On their mobile phones, they ask family or friends who already live in the city to look out for housing or work for them.’

Wageningen researchers want to gain a broader understanding of the motives of people who end up packing their bags. ‘When ecosystems change in an area, or there is not enough water or food, crises can blow up, conflicts escalate, or people may move away,’ explains Bertram de Rooij of Wageningen Environmental Research. With a view to being able to predict refugee flows better and perhaps to influence them, he and his colleagues have been asked by the ministry of Agriculture, Nature and Food Quality to develop a new methodology. They are going to see how they can link data about conflicts, climate, water and natural resources with existing economic and agrarian models for harvest forecasting, food security, production and trade. ‘Once we have a better understanding of the interactions between the various factors, governments and organizations such as the United Nations can intervene more effectively in regions that are under pressure. Then you could perhaps make sure that people are directed towards places that have been designated and prepared in advance. And maybe sometimes you can even prevent people needing to migrate.’ ■

www.wur.eu/migration

CREATING GARDENS IN UGANDA

Uganda is hosting more than a million refugees from neighbouring countries. In the West Nile region in the north, most of the refugees are from South Sudan, but there are some from the Congo too. The Dutch ministry of Foreign Affairs wants to help these people by teaching them how they can boost their incomes and vary their diets at the same time. Wageningen is contributing to this project, which is likely to start this autumn. ‘Most of the refugees are put up in existing villages. The local communities are poor themselves and they need just as much support, and we don’t want to create tension between the refugees and the villagers. So the project targets both the refugees and the host local population,’ says Katherine Pittore, Food and Nutrition Security advisor at the Wageningen Centre for Development Innovation. The participants learn to create gardens where they can grow their own vegetables and even ornamental plants. This provides their families with a more varied diet, and they can sell part of the harvest. ‘In this way the refugees are equipped for a longer stay. And if they should go back to their country, they will take new skills back with them,’ says Pittore.

STARTUP A-MANSIA WANTS TO MARKET NUTRITIONAL SUPPLEMENTS

Eating bacteria to combat overweight

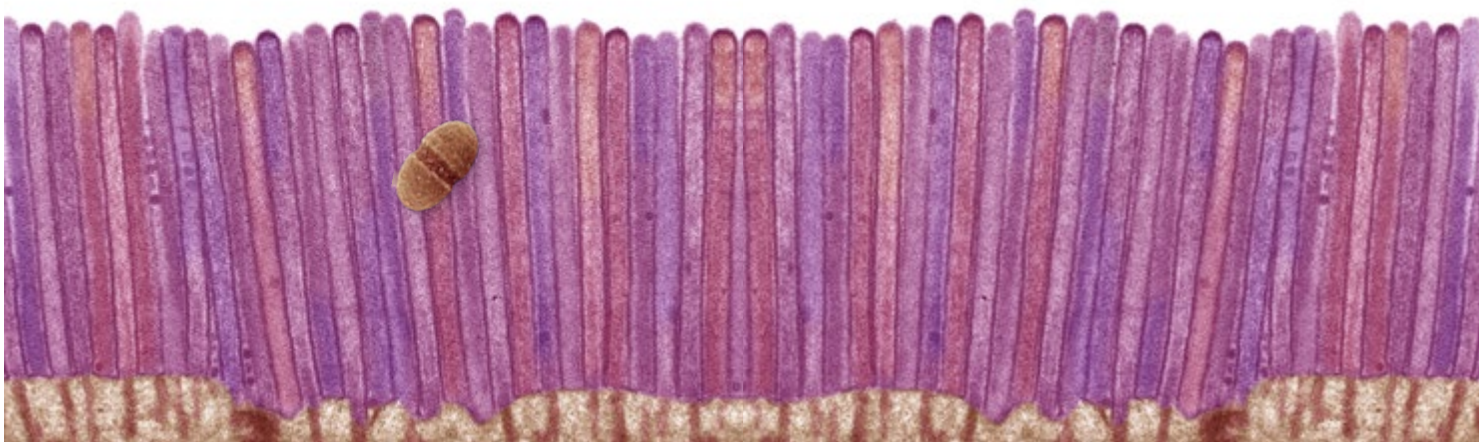
The universities of Louvain-la-Neuve (Belgium) and Wageningen are collaborating on a slimming bacterium. In three years' time, the startup A-Mansia aims to launch nutritional supplements or a yoghurt product with this bacterium to counteract overweight.

TEXT STIJN VAN GILS **PHOTO** GETTY IMAGES

The startup A-Mansia, a joint venture by Wageningen University & Research and the Université catholique de Louvain (UCL), has raised 13 million euros in initial capital. The new company will use this money to further refine a discovery made by Wageningen professor Willem de Vos. In three years' time, it hopes to introduce products such as nutritional supplements that can combat obesity. The company is using the bacterium *Akkermansia muciniphila* for this. This bacterium improves the intestinal barrier function, so that harmful substances that ultimately cause obesity are less likely to be absorbed by the body.
The ease with which the initial capital was arranged contrasts sharply with the problems De Vos had in getting funding for the research that led to the discovery of the bacterium. At the time, the Microbiology chair group professor wanted to look for bacteria that grow on materials our intestines produce themselves, such as mucus.
'I had a feeling there would be some useful species among them, but we had no evidence of this. That's why it was really difficult to find funding for this research on the digestive system. I submitted the research proposal three times.' It was only at the third time of asking that the funding was granted and his PhD candidate Muriel Derrien could get to work.
In 2004, this research resulted in the discovery of the bacterium *Akkermansia muciniphila*.

PREVENTING INTESTINAL INFLAMMATION

The *Akkermansia* bacterium produces a protein that other bacteria lack. This protein



improves the intestinal barrier function. After the bacterium has been administered, the intestines let through less of the toxic substances of the kind that ultimately cause obesity. It is not yet clear how strong this effect is. Administering the bacterium also helps prevent intestinal inflammation and may work against hepatic steatosis (fatty liver) too. The bacterium is found naturally in many people but overweight people often have a deficiency.

SAFE FOR HUMANS

Four years after the discovery, De Vos started a collaboration with the Belgian professor Patrice Cani, now at UCL, to get a better picture of the bacterium's health effects. The bacterium turned out to reduce obesity and type 2 diabetes in mice after they had been dosed with it. Later, the Belgian research group found that the bacterium could be used safely in humans too. The bacterium did not work when sterilized, but it did when pasteurized. 'That's what made us realize a protein is probably causing the effect.' Proteins become denatured and lose their effect when exposed to high temperatures. De Vos is very pleased that the bacterium still works after pasteurization. The bacterium does not need to still be alive and that makes it much easier to use in food products. They are considering nutritional supplements and powders, for example, as well as yoghurt drinks, nutrition bars and personalized medicines. The first nutritional products based on the bacterium are expected to be ready for market in around three years, but that is far from definite.

There are still many uncertainties surrounding the conversion into actual products. For example, it is still not clear exactly how usable the bacterium is in people with medical conditions. 'We therefore deliberately looked for an investor who will be prepared to give the company more cash later on,' says De Vos. That was the French investment fund Seventure, which manages over 600 million euros for companies including Danone and Novartis.

The additional research will mainly be carried out in the vicinity of Brussels, where A-Mansia has its offices. That is because UCL in Belgium has more experience with preclinical trials and medical applications. 'Another part will probably be carried out in Wageningen and possibly the US as well,' says De Vos.

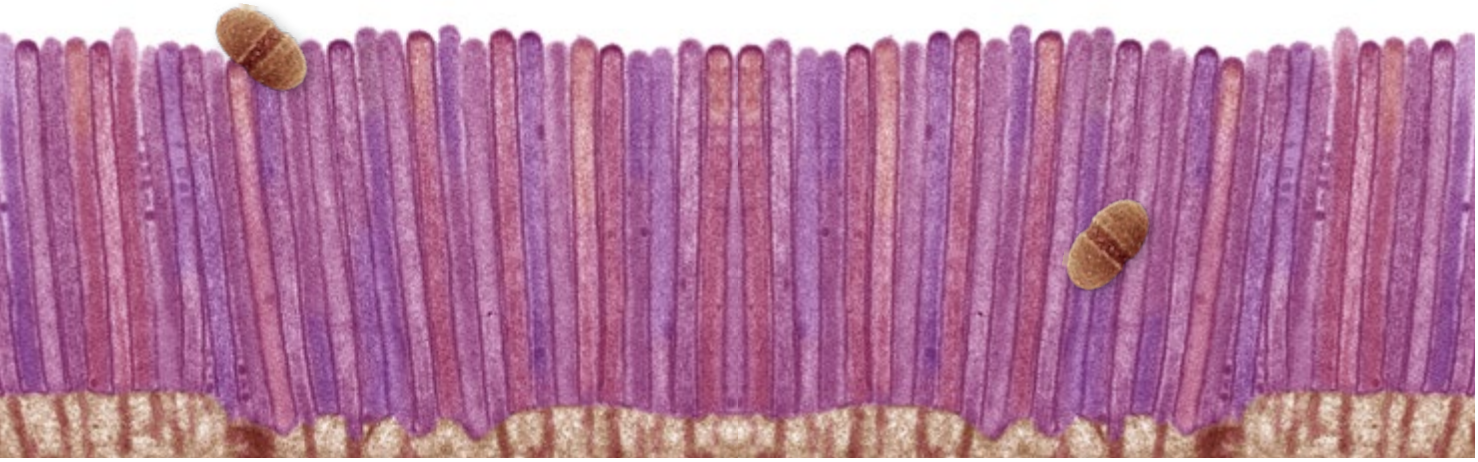
The potential target group for A-Mansia is huge. Being overweight is a significant and growing problem worldwide. Figures from Statistics Netherlands show that almost half of all adults in the Netherlands are overweight and almost 15 percent are obese. A-Mansia's future products combined with a healthy diet and more exercise could help fight the flab. ■

www.wur.eu/obesity

STARTING UP MULTIPLE COMPANIES

PHOTO BRAM BELLONI

Professor Willem de Vos will soon be semi-retiring from Wageningen University & Research, and working part-time. He wants to free up more time for his startups. He has already set up four different companies in the course of his career. Some were a success, others were not. 'We decided to ditch MicroDish after ten years,' says De Vos. This company developed and marketed a simple method for cultivating individual bacteria, which would enable faster diagnosis of pathogens. 'But the hospital sector is more conservative than we realized.' The company will be ceasing operations. 'That's the way it goes. We learnt a lot and various postdocs worked there.' On the other hand, Caelus Health in Amsterdam is doing well. This company, which commercializes discoveries at Wageningen and the University Medical Centre in Amsterdam, is developing bacterial therapies that could help tackle diabetes, for instance. De Vos sees more new opportunities. 'Humans are the only species that heat their food. We have discovered an intestinal bacterium that is able to specifically convert the toxic compounds produced by heating into beneficial compounds.'



THE SUSTAINABLE CATWALK

Fungal footwear and orange peel fabrics

‘The clothing industry is the most polluting branch after the oil industry’

Our wardrobes have a massive environmental impact. Scientists and creatives are designing sustainable clothing and shoes, making them out of fruit waste, discarded fibres or fungi. 'If we work with the big fashion labels, innovations can be fine-tuned and scaled up.'

TEXT RENÉ DIDDE **PHOTOGRAPHY** SVEN MENSCHEL

At the State of Fashion exhibition in De Melkfabriek in Arnhem last summer, there was a jacket on display made out of the skin of the pirarucu, one of the largest freshwater fish in the world. There were also sandals with straps make of fungal threads, bags made of processed green tea leaves, and a dress made of orange peel.

'We are not setting out to make existing fashion more sustainable, but to develop totally new materials that are "acceptable" from the word go,' says Kim Poldner, who leads the Circular Fashion Lab at Wageningen University & Research. 'Materials that use hardly any water or environmentally harmful chemicals, and are biodegradable when discarded.' The exhibition, a slimmed-down version of which will be on display in Wageningen in September and early October, starts where conventional fashion, including the use of biocotton, hemp and flax, leaves off. Poldner, who works in the Management Studies Group and is fascinated by sustainable entrepreneurship in fashion, organized the Arnhem exhibition in collaboration with the local University of the Arts, ArtEZ, as part of the WUR centenary.

'A lot of things are still under development and not ready to go into production yet, but if we work with the big fashion labels, innovations can be fine-tuned and scaled up.' More than 80 Wageningen MSc students collaborated on the exhibition, says Poldner, developing the materials together with fashion and textile designers. 'They researched things like whether you can dye materials with plant and bacterial pigments, or the potential of fruit waste. During the opening weekend, the students were walking around in lab coats to talk to visitors about their research.'

FUNGAL FABRIC

Iris Houthoff, who has a Wageningen MSc in Biotechnology and now teaches Bioprocess Engineering part-time, has been involved in the exhibition. 'Hides from the leather industry travel great distances and the tanning process produces a lot of wastewater. I am aiming at a new type of leathery material that can be produced locally, does not pollute, and is completely biodegradable once it is written off,' >

Jeans producer G-Star, one of the major fashion chains participating in the State of Fashion exhibition, exhibited new, sustainable dyeing processes.

> ‘We want to develop materials that don’t harm the environment’

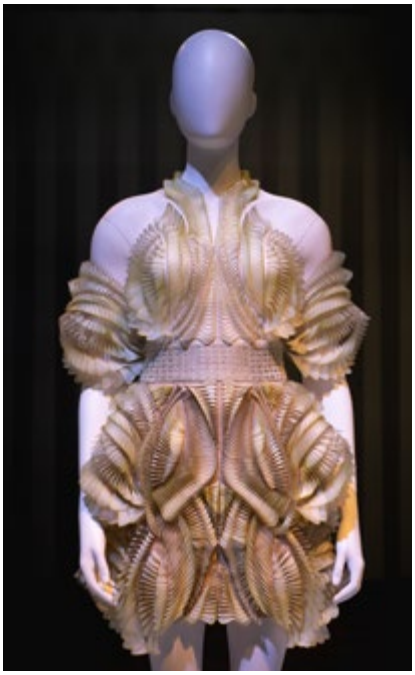
explains Houthoff. To this end, she founded a Wageningen-based company called Mylium.
Thanks to a student competition for inventing new, valuable products using regional waste flows, she identified fungi such as Reishi mushrooms that grow on waste timber. ‘Fungi are nature’s circular motor, and it is high time we tapped into that force. They break down waste material and convert it into a strong fruiting body and mycelium. At Mylium we are studying different production methods for producing ‘lengths’ of mycelium, but we can also get the mycelium to grow directly into the form that is required.’
After harvesting and drying, the mycelium needs to be conserved with a coating to prevent it drying out, keep it flexible and scratch-free, and make it durable. ‘It doesn’t have to last 30 years like leather, as long as it is completely compostable and leaves the soil healthy.’ For the exhibition, Houthoff made the straps for sandals by designer Luc Aarts. ‘A lot of people think the material feels nice, and resembles both cork and cotton,’ says Houthoff. ‘I don’t know where Mylium will be in five years, but we should be able to produce shoes, watchstraps and car furnishings.’

100 BILLION GARMENTS

Conventional fashion companies are increasingly aware of the massive environmental impact of the fashion industry, says Poldner. Cotton, for example, is a water-guzzling crop on which huge amounts of artificial fertilizer and pesticides are used. And the pollution and generation of waste is only increasing thanks to the ever faster rate at which fashion trends change. According to figures from the Ellen MacArthur Foundation’s report *A New Textiles Economy*, the number of garments sold worldwide doubled between 2000 and 2015, going from 50 billion to 100 billion.
According to a study by the Amsterdam University of Applied Sciences, the average Dutch person’s wardrobe contains 173 items, 50 of which have not been worn for over a year. More than 70 percent of that clothing soon gets cast off and is then burnt or – even worse – dumped in landfill. The Ellen MacArthur Foundation calculated that the fashion industry’s annual total CO_2 emissions are equivalent to those of all the world’s aeroplanes and ships.
‘The fashion industry is the most polluting branch in the world after the oil industry,’ says Poldner. ‘But the branch has now drawn up a lot of guidelines for reducing the environmental impact and promoting

PHOTO GUY ACKERMANS

Louise Fresco, WUR Executive Board president, in a vegan dress of dead-stock silk printed with waste ink.



Left and above: designs using recycled material. Below right: sandals with straps made of Wageningen mycelium (Luc Arts).

better practices such as the use of biocotton. And the accident in the Rana Plaza factory in Bangladesh in 2013 opened the broader public's eyes to the labour conditions in the fashion industry,' she says. The disaster cost 1134 people their lives and left over 2000 seriously wounded. In the aftermath, more than 200 international fashion brands signed an agreement on safe factories.

VIKTOR & ROLF

As well as students, creatives and scientists with an out-of-the-box attitude, there were multinational fashion chains and established designers present at the exhibition. Viktor & Rolf, for example, made a series of garments out of the online store Zalando's unsold remnants (deadstock). African designers developed new fashion out of cast-off clothing shipped from Europe to Africa. Jeans company G-Star exhibited new, sustainable dyeing processes. The exhibition covers the recycling of textiles too. This issue is coming in for more and more attention in the conventional fashion industry. Beside direct reuse through exchange of clothing, second-hand shops and clothes libraries, there are more and more initiatives targeting the reclaiming of worn-out textile to spin it into second-hand yarns. 'At the moment, if you recycle cotton you always need some "virgin" cotton on which to spin the short, weaker second-hand cotton fibres,' explains Martien van den Oever of Wageningen Food & Biobased Research. 'We are now researching whether hemp and especially flax fibres are suitable substitutes for virgin cotton fibre. Hemp requires no water and no pesticides. Flax does require a few chemicals, but on the other hand the fibre is naturally much finer than hemp.' Van den Oever is helping to improve the cultivation of hemp for fibres, too. 'We have realized we need to harvest it earlier. The yield per hectare is then smaller, but the hemp fibres are much better suited to use in textiles.'

MIXED FIBRES

Another tricky issue for recycling cotton is the fact that cotton is rarely used in its pure form these days. It often contains elastane, polyester and polyamide. 'Because we don't have techniques for separating the fibres, these mixed fabrics currently get rejected for reuse. But once we can separate the cotton fibres from the synthetic ones, we can spin them into new yarns and make high-value textiles from them.'

Kim Poldner applauds these developments. But her dream is for her research on business models in fashion to lead to a breakthrough with innovations in areas such as fungal fabric and fruit leather, both in startups and in big chains. 'I hope that in 10 years' time we shall be wearing more clothes we have designed ourselves, made of plant material we grew ourselves: clothing that fits perfectly, thanks to 3D body scanning and printing, and which can be thrown in the organic bin when we discard it.'

At the opening of the academic year in September, WUR President Louise Fresco gave a good example by wearing circular-economy fashion. Fresco wore a vegan dress made of deadstock silk and printed with waste ink. Her scarf was dyed with the help of bacteria and she sported one of Iris Houthoff's mycelium watchstraps. ■

www.wur.eu/sustainablestyle

Until mid-October, part of the State of Fashion exhibition is on view on Wageningen campus.

ELLEN KAMPMAN, PROFESSOR OF NUTRITION AND DISEASE:

‘A healthy diet can prevent one third of cancer cases’

In May, the World Cancer Research Fund presented its new guidelines for the prevention of cancer. It will be quite difficult for consumers to follow the recommendations for a healthier diet. 'You shouldn't put all the responsibility on consumers,' believes Ellen Kampman, professor of Nutrition and Disease.

TEXT ASTRID SMIT **PHOTOGRAPHY** MARCEL VAN DEN BERGH

On the table in Professor Ellen Kampman's office in Wageningen stands a card with guidelines for preventing cancer. The dos and don'ts for consumers are indicated using the colours of a traffic light. The central red circle tells us: don't smoke, don't drink and don't get overweight. In the amber circle around it: limit your intake of fast food, red and processed meat and other processed foods with lots of fat, starch and sugars. And then in the green outer circle: eat fruit and vegetables, pulses and high-fibre products; breastfeed your baby; and above all: get exercise!

It's a clear message, based on 10 years of research and a 12,000-page report. Cancer researchers all around the world combed the scientific literature in search of links between nutrition, exercise and the risk of cancer in humans, animals and cells. Then Imperial College London processed the mountain of data from all the researchers. After that, a panel of independent experts – who weren't involved in the research themselves – assessed the data and drew up the new guidelines. Kampman chaired the meeting in May at which the World Cancer Research Fund drew up the guidelines.

The World Cancer Research Fund already published guidelines 10 years ago. What are the main changes?

'Actually the guidelines have pretty much stayed the same. Luckily, because otherwise scientists would have a problem. The main thing is that certain recommendations have become more forceful because the evidence for them has become stronger. Especially the recommendations that have to do with obesity, such as the consumption of fast food and sugary soft drinks. The recommendation on alcohol has been sharpened up too. In the previous guidelines the recommendation was to drink in moderation, whereas now the advice is: don't drink any alcohol if you want to prevent cancer. Ten years ago, the harmful effects of alcohol were weighed up against its preventive effect: alcohol was believed to reduce the risk of cardiovascular disease. But in the meanwhile several studies have contradicted that claim of a protective effect. Alcohol really is one of the most carcinogenic substances we consume. It leads to DNA damage and causes many kinds of cancer, including breast cancer, the most common form among women.'

Is the relation between other foodstuffs and cancer as direct as that?

'Luckily there are not many substances that are present in our diet in such high concentrations that they cause damage to our DNA, making them carcinogenic. Others besides alcohol are the acrylamides in potato chips and fries. But big manufacturers have largely cut those out of their products. Then there are other substances in food that raise the risk of cancer. There is haem iron in red meat, for instance. If you are exposed to too much of that, the gut wall sustains damage, raising the risk of colon cancer. And there are substances that boost the growth of a tumour cell that has already formed. Too much fatty tissue around the organs, for instance, can lead to chronic inflammation that stimulates tumour growth. That is why the guidelines also say: avoid overweight. Because overweight is associated with 12 types of cancer, such as bowel, pancreatic, breast and uterine cancer.' >

Which types of cancer are the most sensitive to what you eat?
'To find that out you have to look at the attributable risk. What percentage is explained by diet and exercise? For bowel cancer, it is 40 to 50 percent, for breast cancer 30 to 40, and for pancreatic cancer 5 to 10 percent. The writers of the report did the sums on those attributable risks for the four main types of cancer – lung, bowel, breast and prostate. They found that 30 to 40 percent of all the 100,000 Dutch cases of cancer per year could be prevented if the Dutch ate a healthy diet and got more exercise. If the Dutch didn't smoke, we'd also prevent about 30 percent of cancers.'

And does it help to eat fruit and vegetables?
'It is hard to measure the effect of fruit and vegetables. Surveys don't work very well because people often forget what kinds of fruit and vegetables they have eaten. And we don't have a good indicator for measuring fruit and vegetable consumption in the blood. Some of my colleagues say that fruit and vegetables don't help prevent cancer. But that is a dangerous statement. There is a clear link between fruit and vegetable consumption and a lower risk of head and throat tumours among smokers. And people who eat a lot of fruit and vegetables consume fewer calories, lowering their risk of becoming overweight and therefore their risk of cancer. So there definitely is an indirect link between fruit and vegetables and cancer.'

The guidelines apply to cancer patients as well. Do a healthy diet and exercise help when you already have cancer?
'That remains to be seen from the studies that are now being done. My sister-in-law got breast cancer about 10 years ago. She asked, 'What now, Ellen? Is there any point in a healthy diet now?' I had no idea; up to then I had only done research on nutrition and the prevention of cancer. It turned out there was hardly any scientific literature about it, so I started a study. We now have three large studies running, in which we monitor cancer patients, looking at their diet and lifestyle. The first focuses on bowel cancer patients, the second on breast cancer patients, and the third on patients whose genes mean they are at very high risk of all types of cancer. Other recent studies show that more exercise can reduce the risk of a recurrence of the cancer. Hopefully in a few years we'll find out whether a healthy diet can enable us to live longer with a better quality of life.
'On the basis of those results we would like to start an intervention study among cancer patients. Then we won't just study the relation between their diet, their lifestyle and the course of their illness, but we shall influence it as well. In a pilot study last year, we studied whether tending a vegetable garden changed the course of the disease for the better. I have a vegetable garden myself, and I thought it would be very good for cancer patients too. They get exercise,

ELLEN KAMPMAN

1982 - 1988	MSc in Human Nutrition, Wageningen University & Research
1988 - 1989	Worked on cancer registration at the Comprehensive Cancer Organization for the central Netherlands
1989 - 1994	TNO Nutrition, PhD at Maastricht University on the link between colon cancer and dairy consumption
1990 - 1991	Visiting fellow at Harvard School of Public Health, Boston, US
1994 - 1996	Postdoc in Molecular Epidemiology, Fred Hutchinson Cancer Research Centre, US
1996 - 2008	Associate professor, Wageningen University & Research
2005 - present	Senior researcher in Nutrition and Cancer, Radboud University Health Centre, Nijmegen
2008 - 2015	Personal professor of Nutrition and Cancer in Wageningen University & Research
2010 - 2015	Professor of Diet and Cancer, VU University Amsterdam
2015 - present	Professor of Nutrition and Disease, Wageningen University & Research

'Overweight is associated with 12 types of cancer'

‘Alcohol is one of the most carcinogenic substances we consume’

they make vitamin D (which cancer patients are often short of) because they are out of doors, and they meet fellow sufferers. And with a bit of luck, they eat the vegetables they grow too. The initial results seem promising. Then we also want to find out why coffee protects against bowel, liver and uterine cancer. Which substance could be responsible for that?’

An awful lot of people don’t know that there is a link between diet, obesity and cancer. And even when they do know it, they hardly make any changes to their diet or behaviour. Giving up alcohol is especially taboo.
‘Yes, for a lot of people that is a difficult message. But there are all sorts of ways of making sure the Dutch start living more healthily. It’s important that we inform doctors, for instance, and that they communicate the often unwelcome message: “maybe you could try to lose weight and drink less”. Research shows that consumers have a lot of faith in doctors. But the consumer’s environment will have to be changed too: less advertising for alcohol and fast food, cheaper fruit and vegetables, a tax on sugar and fat – measures like that. You shouldn’t put all the responsibility on the consumers. They need help.’

Interesting ideas, but who is going to take the lead?
‘In the Netherlands, the ministry of Public Health, Welfare and Sport is working on a national prevention agreement, in which cutting obesity, alcohol consumption and smoking is central. The contents and the approach will be established this year together with stakeholders – from health insurance companies, patients’ associations and hospitals to representatives of the food industry. I think the draft plans that were leaked, for subsidizing sugar-free products and discouraging bargain prices for alcohol, are rather feeble. I doubt whether we shall solve the overweight and alcohol problems that way. Anyway, I shall do everything in my power to inform consumers. I recently gave a talk on diet and health at a science café in Wageningen. To my great surprise, the room was full of young people. They were well-educated young people, mind you. It would be good if we could reach less highly educated young people too, because they stand to benefit the most in health terms. The period in which they enjoy a good quality of life, free of disease, is 20 years shorter for them.’ ■

www.wur.eu/nutritioncancer

Delicious mouldy straw

In many developing countries cows are fed on straw, which is not very digestible. Professor Wouter Hendriks makes use of fungi to turn it into nutritious animal feed. There is a lot of interest in what he is doing.

TEXT RIK NIJLAND **PHOTO** GETTY IMAGES

Globally, farmers produce 2000 million tons of straw per year. In the Netherlands, the main use for this straw is as stable bedding for horses, but in many developing countries it is fed to goats and cows. But because straw contains a lot of lignin, ruminants cannot extract the carbohydrates from it very well. To remedy this, professor of Animal Nutrition Wouter Hendriks and his colleagues have taken a leaf out of nature's book.

There are several kinds of fungi, such as oyster mushrooms, which are capable of breaking down lignin. They colonize straw and other plant matter with a network of fungal threads, thus breaking down the lignin and making the valuable carbohydrates available for the growth of the fungus. By adding these fungi to straw and stopping the process just before the fungi appear, feed is obtained that is more digestible in the rumens of the ruminants.

PERFECTLY EDIBLE

Laboratory research reveals an 85 percent increase in the digestibility of wheat straw. 'Actually, in nutritional terms, we are turning it into grass. We are upgrading low-value biomass into a highly usable animal feed,' says Hendriks. 'Goats find it perfectly edible, at any rate.' Hendriks hasn't tried the mouldy straw on cows yet. 'They eat a lot more. We don't have the capacity for that level of production in Wageningen. In the Netherlands you have to make major investments: we do our tests indoors, at 24 degrees and high humidity. In Asia you can just do them outdoors, as the fungi are more in their element at high temperatures. What is more, there is plenty of rice straw available there.'

> 'We upgrade low-value biomass to get usable animal feed'

The process is easy for small farmers to carry out too. Once the fungi have done their work after four to six weeks, the

farmer can store the processed straw in a closed, airtight barrel. 'The fungi produce acids that conserve the product. Pack the barrel, stamp it down, put the lid on it, and you can keep it for years if you need to,' says Hendriks. And a farmer can use the fungi from the previous batch for another portion of mouldy straw.

INDONESIA AND VIETNAM

Hendriks' colleague John Cone is currently doing tests in Indonesia, applying the technique in rice cultivation on a small scale. And in September, with support from the Victam Foundation, a PhD student will start research on semi-commercial application of the method in Vietnam. Part of his research will be to test an alternative to the processing method Hendriks uses in Wageningen. 'Before we let our fungi loose on the straw, we sterilize it to get rid of competing fungi,' explains Hendriks. 'That is probably overkill. He is going to see whether you can also disinfect the straw adequately in water in an oil drum that you paint black and that heats up in the sun.'

There is interest in using the Wageningen fungi in other countries too, and even on completely different waste products. In Thailand there have been experiments with the waste from sugar cane. And two Iranian researchers brought their own research material with them to Wageningen: leaves and other waste from the date palm. 'Our fungi were up to that too,' says Hendriks. 'The Iranians took the fungi with them to do further research, and they are now working on two publications.'

Hendriks sees plenty of scope for improving the breakdown of lignin. Adding extra substances that the fungus needs to make enzymes speeds up the process by 30 percent. He also hopes to introduce genetic improvements in collaboration with fungus researchers at Wageningen Plant Research. 'Next autumn Nazri Nayan will graduate with a PhD for a thesis on the enormous variation in the capacity to break down lignin in one of our species of fungus. That suggests that there are is a lot of potential for breeding the fungi and making the process faster and even more efficient.' ■

www.wur.eu/yummystraw

FUNDS FOR GROUND-BREAKING RESEARCH

The research project about using fungi on plant waste that Wouter Hendriks and his colleagues are working on was facilitated by Food for Thought, Thought for Food, one of University Fund Wageningen's fund-raising campaigns. Hendriks's lignin research is funded by three parties: a private donor, a company and a charitable foundation.

The University Fund facilitates socially relevant, multidisciplinary research projects which are out of the ordinary and therefore do not so easily get funding through other channels. It is precisely these projects that have the potential for ground-breaking results.

For more information about supporting University Fund Wageningen's projects, see: *www.universityfundwageningen.eu*

OVER 100 YEARS OF PLANT BREEDING

Looking for the best genes

In the early 20th century, Wageningen wheat varieties were popular for their high yields. Today's plant breeders aim at making crops less dependent on pesticides or more resistant to climate change. The approach is also increasingly customized thanks to robots and DNA techniques.

TEXT MARION DE BOO

'Look, this is quinoa,' says plant breeder Gerard van der Linden of Wageningen University & Research. 'The quinoa research is the most important breeding programme we're running at the moment: most European growers are using Wageningen varieties.' In the greenhouses north of Wageningen, there is a colourful collection of bushy quinoa plants, some of them green, others purplish-red. 'We are mean to them – we are giving them saltwater,' says Van der Linden. 'Rice would have died here long ago, but these plants are staying fairly healthy at salt concentrations approaching that of seawater. Only they are a bit smaller than usual.'

Quinoa is at home on the hot dry highland plateaus of the Andes. The crop even grows around Lake Titicaca, whose banks are white with piles of salt crystals. 'In the course of evolution, this crop has adapted remarkably to salt, drought and strong sun,' explains Van der Linden. 'Other crops sorely need those characteristics now, as an adaptation to climate change. In countries such as Bangladesh and Vietnam, for instance, the rivers are lower in the dry season, so that seawater penetrates the delta and the salt front moves inland. The irrigation water from the river gets saltier and saltier too, seriously affecting the rice harvest.'

SALT TRANSPORT

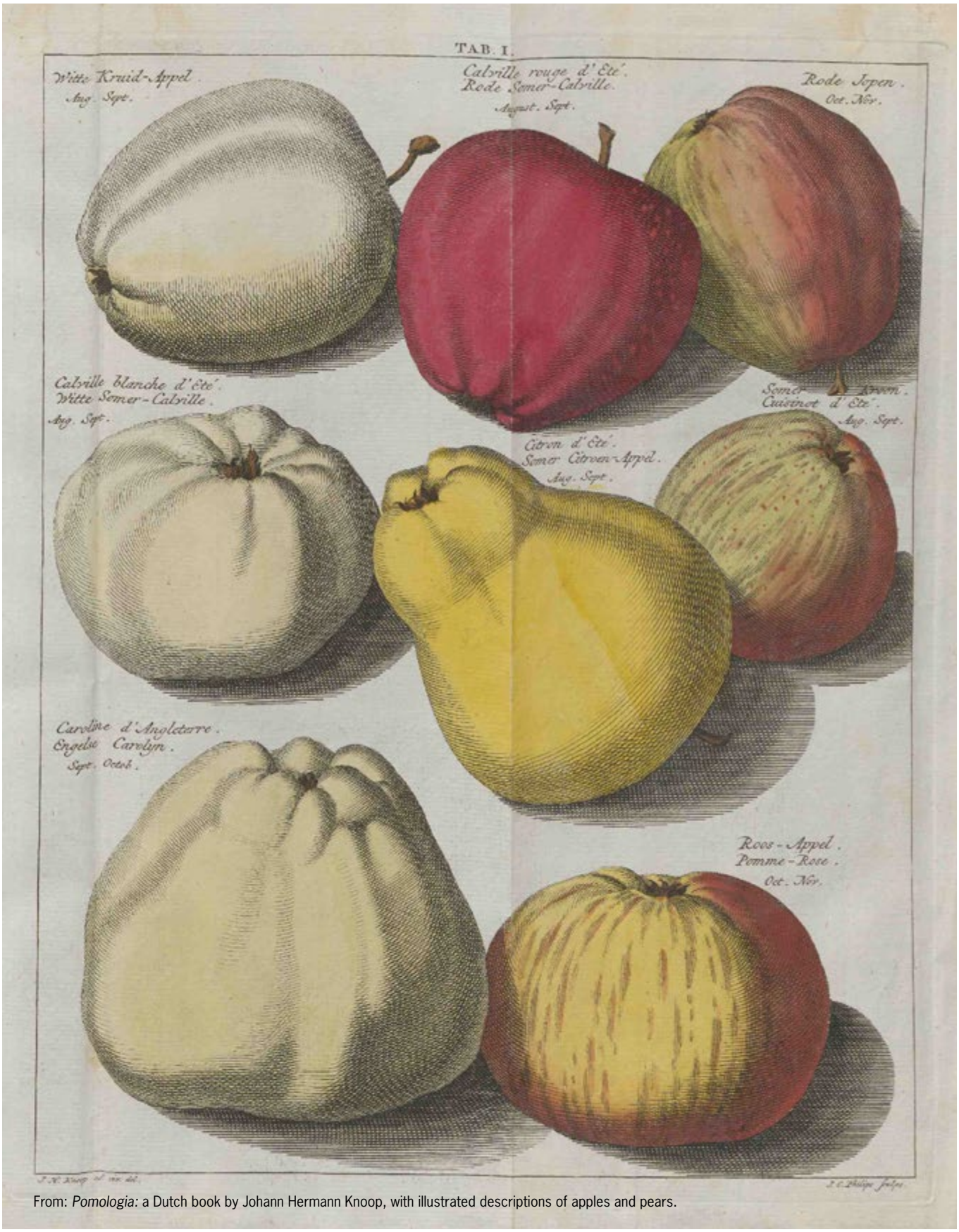
Van der Linde's research group, Abiotic Stress, is working out quinoa's particular physiological characteristics with a view to building these into other crops. 'We have gradually formed an idea of the main genes involved, in things like salt transport and storage for instance.'

Quinoa also makes smart use of its stomata, as revealed by infrared cameras flown over the crop on drones. Drought-resistant plants close their stomata in time to limit evaporation. In order to monitor the position of the stomata even better, work is now being done on a trial installation with robots in which the camera readings are analysed automatically.

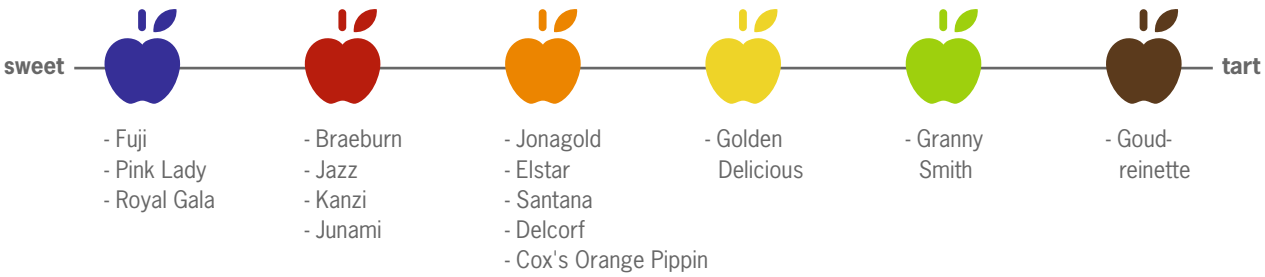
The quinoa research fits into a long tradition. Plant breeding has always been a Wageningen subject area. The Institute for Plant Breeding was founded in 1912, which makes it six years older than the university itself. 'Two highly successful wheat varieties, Wilhelmina wheat and Juliana wheat, were bred in the early 20th century, and that was ground-breaking,' says professor of Plant Breeding Richard Visser. Thanks to the new varieties, wheat yields went up from about 2000 to 2700 kilos per hectare between 1900 and 1920. 'Because of that, the farmers' resistance to the academics from Wageningen melted away.' From around 1930 to 1950, two thirds of the area planted with wheat in north-west Europe was planted with Wageningen varieties. Nowadays, up to 12,000 kilos of wheat per hectare are harvested.

TRACKING DOWN CHARACTERISTICS

The aim of plant breeding is to develop new varieties by selecting and cross-breeding plants with suitable characteristics. >



From: *Pomologia:* a Dutch book by Johann Hermann Knoop, with illustrated descriptions of apples and pears.



Nowadays the consumer can choose from a rapidly expanding range of apple varieties.

> **Plant-breeding programmes that used to go on for 50 years are completed within five years nowadays**

In the past, this was a matter of time-consuming selection by hand of the plants with the best characteristics for cross-breeding. After cross-breeding the seed was sown in order to find the best breeding results among the descendants. Nowadays, the search for desirable characteristics involves a lot of technology. In April 2018, the green light was given for the construction of a new research centre which will include greenhouses with robot-driven cameras and sensors for measuring the differences in plants' characteristics under a range of different conditions. Wageningen is working with Utrecht University in this Plant Eco-phenotyping Centre (NPEC), a 22 million-euro project. Van der Linden: 'Using phenotyping you can select a group of offspring with a desirable characteristic very precisely, and then you can look for the underlying genetic characteristics within that group. Those genes can be tracked down ever more quickly and cheaply.'

The sequencing of genomes enables plant breeders to focus their work more precisely. As early as 1983, Wageningen scientists sketched a gene map of Arabidopsis thaliana, the model plant of the plant sciences, and in 2000 its complete genome was sequenced. In 2011, Wageningen plant breeders and other research groups around the world published the complete genome of the potato. The genome of the tomato followed in 2012. Since then the breeding of these and other crops with sequenced genomes has moved up a gear. Programmes that used to take 50 years can now be completed within five years.

DROUGHT, HEAT AND DISEASES

According to Visser, plant breeding is both an art and a science. To conquer the market, new varieties need to be better able to withstand diseases, drought, heat and salt, and to give better yields. Yields are going up by an average of 1.5 percent every year. Varieties are also under development that can fix nitrogen from the soil, that don't cause allergic reactions among consumers, and last but not least, that taste better.

'For years, Wageningen breeders marketed new varieties themselves,' says Visser. 'Since the 1960s, the business world has taken over this role. To avoid undesirable competition, Wageningen started concentrating on crops that were not yet being bred commercially, such as quinoa, hemp, flax, marigolds, elephant grass, strawberries, apples and pears. The big commercial successes were the Elsanta strawberry and the Elstar apple. We also give growers a lot of plant material in a 'semi-finished' state for them to continue cross-breeding. Potatoes, for example, that have been cross-bred with related wild species with resistance genes, as well as tomato and lettuce material. Resistant varieties are crucial. Take lettuce, for instance. In the shops it all looks the same but there are new varieties every year because the resistance to disease of the older varieties has been overcome after a year. If there is a random mutation in one in a million fungal spores, and you've got hundreds of billions of spores flying around your greenhouse, in no time you'll have thousands of mutant fungi attacking your crop.'

LOOKING FOR VARIATION

Since the 1940s, breeders have been looking for new plant characteristics by inducing mutations in the genetic material using radiation or chemicals. This kind of mutation breeding led in the US to the seedless grapefruit, for instance, a mutant that would not last long in nature but is very popular with consumers. A disadvantage of mutation breeding is that the mutations that occur are totally random. At the end of the 1990s, molecular-biological techniques were

developed for changing DNA in a targeted fashion, thus speeding up breeding programmes considerably. For potatoes, for example, which have four sets of chromosomes, complicating cross-breeding, and for strawberries, which have eight sets. And for apples, which only start flowering after five or six years and can therefore only be cross-bred then. So in traditional cross-breeding it can take 50 years to cross an apple five times. With a special gene construct for early flowering, in the laboratory the apple plant now produces a mini apple within a few months, and this can be used for testing for resistance genes. In the final phase of the research the gene construct for early flowering is then outcrossed by classical methods.

FENDING OFF PATHOGENS

Exciting new territory is being explored by Yuling Bai in her research on Susceptibility genes, or S genes, as a new source of resistance to pathogens such as fungi and viruses. 'Some pathogens make active use of certain plant genes to penetrate the plant,' she explains in her office, which is full of bouquets as she has just been appointed personal professor of Plant Breeding. 'If you switch off that kind of S gene, infection doesn't recur.'

A subsequent research question is then whether the plant can do without that gene. Bai solves this by making some small changes in the gene instead of switching off the entire gene. A change might be made to part of the promoter, for example, which is what the pathogen uses to switch on the gene. 'Then the pathogen doesn't stand a chance. Removing just one or two base pairs can suffice to fend off a fungus or a virus.'

What is remarkable is that a number of these S genes are ubiquitous in the plant kingdom. But only some plants suffer if their S genes are switched off. It is no problem to switch off a particular S gene in the tomato to make it resistant to fungi, while the same intervention in the same gene in barley hampers growth.

A new technique, CRISPR-Cas, makes it possible to change DNA very subtly. Wageningen microbiologist John van der Oost received a Spinoza grant of 2.5 million euros in September for his contribution towards making this technique usable in practice. With CRISPR-Cas, plant breeders can change a characteristic more precisely than ever, using protein scissors (Cas9). This can modify one or more genes at a particular location in the DNA. That way, breeders in the laboratory can equip an existing variety with a new characteristic within a few months. Meanwhile, after years of debate the European Court ruled in July 2018 that varieties obtained this way are to be designated genetically modified organisms (GMOs) and may therefore only be marketed after extensive safety research.

SWITCHING ON AND OFF

'In the search for desirable characteristics, our methods of measuring are becoming more and more refined,' says Van der Linden. 'And we can map the DNA faster and cheaper all the time, getting more and more information out of it. We can characterize genes and study their functions by switching them on and off using molecular techniques, and thus identify their specific contribution to the yield of the crop. In quinoa, for example, in which many different genes determine the harvest between them.' Breeders can then cross-breed using the plants with the right genes. 'We can also build them in to new varieties, or into other crops. Once we know which tricks quinoa uses for its drought and salt resistance, and how the damage is minimalized, we can also start designing drought-resistant rice or wheat varieties.'

According to Richard Visser, designer varieties are just around the corner. 'You can figure out in advance what the best combinations are, and which parent plants you should pick, and how big your population needs to be to have enough chance of selecting the right offspring, instead of indiscriminately screening 100,000 offspring. If the fieldwork becomes cheaper to do, plant breeders will be able to serve all kinds of smaller, local niche markets and micro-environments as well. We are getting more of a grip on genetically complex characteristics such as yield stability and drought tolerance. We shall soon be getting the same yields with less water and pesticides. That is interesting from the food security angle as well.' ■

www.wur.eu/plantbreeding

DUTCH PLANT-BREEDING COMPANIES ON THE WORLD MARKET

Plant breeding is big business. One kilo of tomato seed is worth more than a kilo of gold. The production of horticultural seeds, seed potatoes and flower bulbs brings 2.4 billion euros into the Dutch economy every year. 40 percent of all the horticultural seeds and 60 percent of all the seed potatoes on the world market come from the 350 or so Dutch plant-breeding companies. These companies employ 11,000 people, with branches in more than 100 countries. This commercial success is due to intensive collaboration between educational and research institutions and the business world. On average, 14 cents out of every euro earned goes towards research and development.

PHOTO ALAMY

THE TRANSFORMATION OF THE IJSSELMEER

The Blue Heart is getting greener

The IJsselmeer lake was created to prevent flooding and famine. Today, the area is the focus of many other interests including recreation and nature. Migrating fish and fish-eating birds find room here. But the fishing community is still adjusting to not having it all to themselves.

TEXT RIK NIJLAND **PHOTO** HOLLANDSE HOOGTE **ILLUSTRATION** JEROEN MURRÉ

There is not an activist or a warden to be seen. Not even one of the resident large grazers. This morning the controversial Oostvaardersplassen nature reserve is a green oasis with reeds, willows and water birds. The waters of the Markermeer lap at the other side of the dyke. Above an eel fisher's traps, two black-backed gulls bide their time; a common tern dives into the water to catch a smelt.
All this nature is a familiar sight to the commuters who speed along the dyke between Lelystad and Almere, but their grandparents can still remember when the large sea bay known as the Zuiderzee dominated the area.
'In the bed of the IJsselmeer and the Markermeer, there are still bacteria that are familiar to us from the saltwater coastal environment: these are lakes in transition,' explains Piet Verdonschot, leader of the Freshwater Ecosystems group at Wageningen Environmental Research, and professor at the University of Amsterdam. 'All kinds of things go on underwater that we still don't understand. This is a unique ecosystem.'

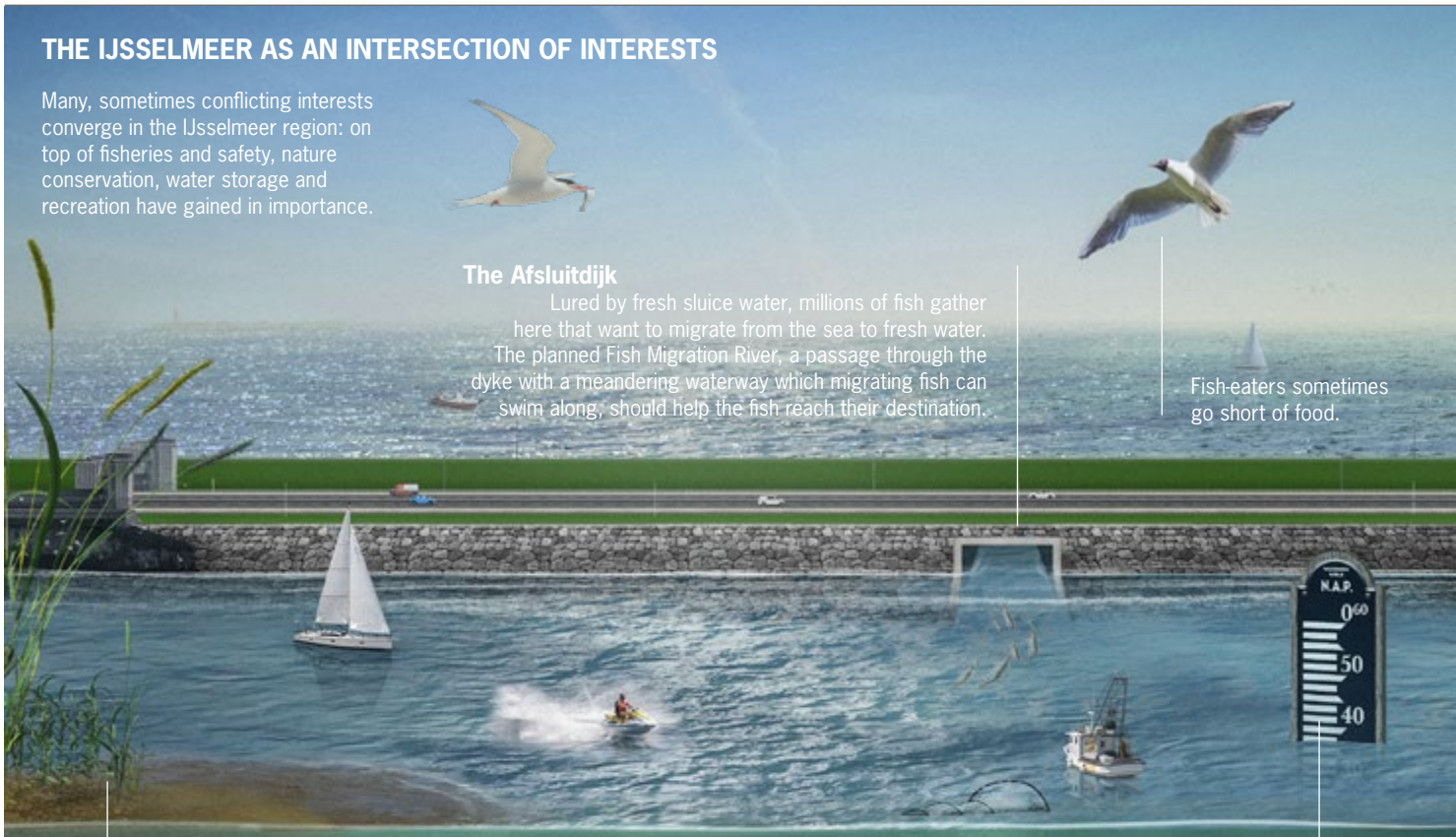
FAMINE

After the flooding around the Zuiderzee in 1916 and the famine of 1918, the Dutch parliament embraced plans drawn up by the engineer Lely to create the Afsluitdijk and then polders. The dyke was complete in 1932 and the Wieringermeer polder was then quickly pumped dry on account of the acute shortage of farmland. The extensive IJsselmeer polders followed later. It was agricultural engineer Roel van Duin, director of the IJsselmeer Polders Development Authority and professor by special appointment in Wageningen, who led a change of course in the late 1970s. Since then, agriculture has no longer been the sole priority and cycle paths, recreational green spaces and woodlands have been created. It was Van Duin too who saw the potential of the Oostvaardersplassen as a habitat for birds.
Immediate economic utility took more and more of a back seat. And people were starting to question whether the Netherlands still needed additional farmland. The Houtrib dyke between Lelystad and Enkhuizen >

The creation of the Marker Wadden.

THE IJSSELMEER AS AN INTERSECTION OF INTERESTS

Many, sometimes conflicting interests converge in the IJsselmeer region: on top of fisheries and safety, nature conservation, water storage and recreation have gained in importance.



The Afsluitdijk

Lured by fresh sluice water, millions of fish gather here that want to migrate from the sea to fresh water. The planned Fish Migration River, a passage through the dyke with a meandering waterway which migrating fish can swim along, should help the fish reach their destination.

Fish-eaters sometimes go short of food.

Marker Wadden

The artificial islands are intended to increase the Markermeer's capacity to support water birds. The shallow shore zones can support aquatic and marsh plants among which fish can spawn and take shelter. The islands will also be open for recreational purposes.

The hitherto stable water level will go up in the summer, providing an extra freshwater buffer for longer dry periods.

Bream, roach, perch and pike-perch are caught with vertical hanging nets.

Eel fishing is allowed in the IJsselmeer region.

Getting a licence to catch smelt partly depends on the number of fish left for the young of terns and cormorants.

Bacteria from the salty environment still live in the soil.

was completed in 1976, separating the Markermeer from the IJsselmeer, but the plan to create polders out of the Markerwaard area was put on the back burner and then scratched for good in 2003. Nature, on the other hand, was now centre stage. And to provide additional impetus for that, nature organization Natuurmonumenten instigated the creation of the Marker Wadden, a lagoon of artificial islands in the Markermeer. Work started on this in 2016, and ecologist Piet Verdonschot is now doing a study for the Ministry of Agriculture, Nature and Food Quality on whether these islands with their shallow shorelines are increasing the Markermeer's capacity to support water birds.

'To answer that question we first had to get to grips with how the Markermeer's ecosystem worked,' explains Verdonschot. Postdoc Mariëlle van Riel took samples of the soil life of the Markermeer at more than 80 locations. Research is also being done on the extent to which water plants thrive in the muddy water, and the fish are being studied in partnership with Wageningen Marine Research. 'In two years we hope to have a good idea of the food web. Initial findings are that the birds that eat water plants and soil creatures do find enough to eat, but that the fish-eaters only find half the amount they need at present.'

> 'There are still bacteria in the soil that are familiar to us from the saltwater coastal environment'

SEWAGE WATER FROM AMSTERDAM

Fish stocks changed dramatically after the closing of the IJsselmeer in 1932 and the desalination of the water. But the rich fishing grounds remained, largely because of the phosphate-rich river and sewage water from Amsterdam that flowed into the lake. That pipe closed in the 1980s, and the Markermeer has undergone a second transformation since then. 'A major nutrient source for the ecosystem disappeared,' says Verdonschot. One of the effects of that was a reduction in the food supply and a decline in fish stocks. The Marker Wadden were intended to give nature a push in the right direction. 'The Markermeer is a bowl of water between dykes, more like a bathtub than a lake,' says Verdonschot. 'Natural shorelines would make a world of difference. You need shallow zones where water and marsh plants grow, and where fish can spawn and take shelter. But the most important thing is that organic material washes into the lake from those shores, and provides a source of new life. Our initial estimates suggest that the Marker Wadden are working out well, but that at their current size they only produce 1 to 2 percent additional material. The area is too small.'

The ecologist sees more future in plans to connect the Oostvaardersplassen and the Lepelaarsplassen at Almere with the Markermeer. 'The lake would then gain a large riparian zone, which could boost that percentage gain considerably,' says Verdonschot. He would also like to see big fluctuations in the traditionally stable water levels. Minister of Infrastructure and Water Management Cora van Nieuwenhuizen decided this spring to authorize a fluctuation of 20 centimetres so that an extra freshwater buffer can be built up in the summer. That is necessary in order to protect the north of the Netherlands against longer periods of drought.

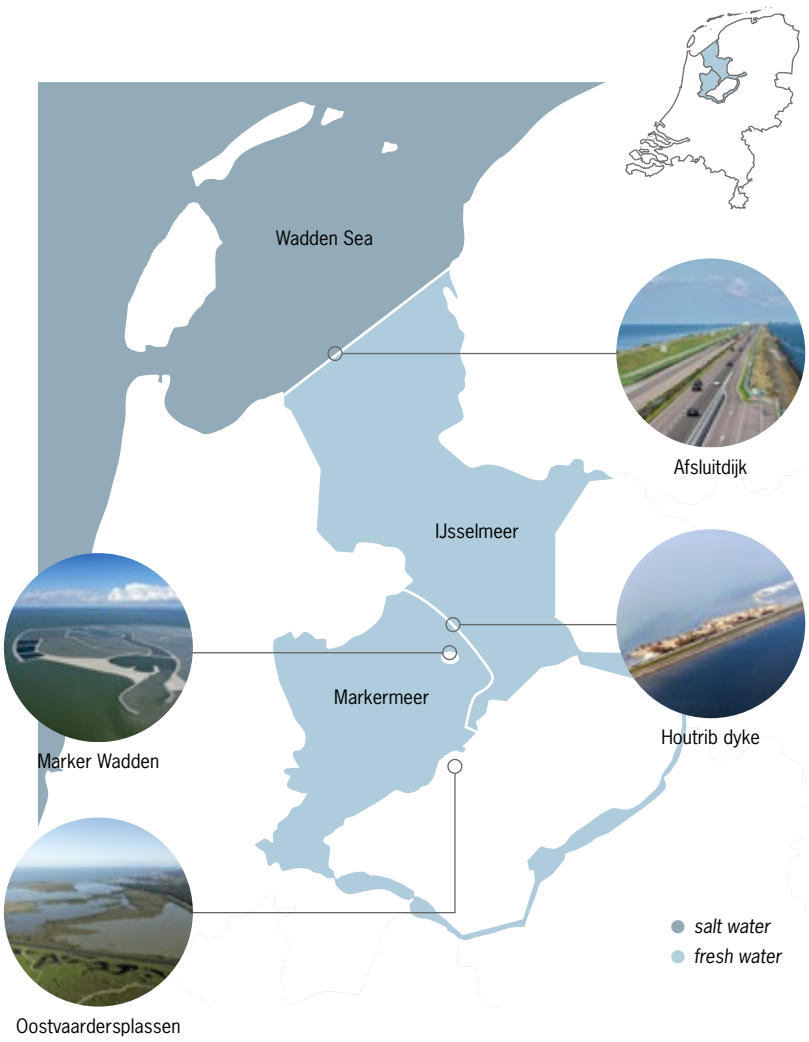
BIGGER FLUCTUATIONS

Verdonschot says 20 centimetres is not enough. Nor is he very keen on a low water level in winter and a high one in summer. Nature would benefit from the exact opposite, he thinks. 'I expect that the Marker Wadden islands won't get flooded enough, or it will happen at the wrong time of year. It is not feasible to increase the fluctuation in the Markermeer; the piles on which Amsterdam is built couldn't cope with that. If you ask me, we should build a new dyke around the IJ waterway and get rid of the Houtrib dyke. At the moment, that dyke is being reinforced, but what purpose does that really serve now? Without the dyke, the wind will have more impact on the water level, and the interaction between the IJsselmeer and the IJssel River will be restored.'

Jeroen Veraart, who coordinates IJsselmeer research at Wageningen University & Research, notes that the IJsselmeer region has gained importance as an intersection of different interests: both lakes are Natura 2000 areas, fisheries operate there, water recreation is a big economic factor and there are plans to build housing and wind turbines along the shores. Not all these ambitions are mutually compatible. Veraart sees a lack of a coherent vision on developing the region. 'Of course there is a joint regional agenda, but that is largely a product of the creation of the polders. What often happens in the end is that ministries and provinces each make their own plans and only look at the long-term vision after that.' But in May, 60 government bodies, lobby groups and citizens' initiatives did decide to improve their collaboration in The IJsselmeer 2050 Agenda. This is the first time such a broad coalition of organizations has rallied behind the 'Blue Heart of the Netherlands' in areas including water safety, nature, fisheries and recreation. There is also broad agreement on reinforcing and transforming the Afsluitdijk between the IJsselmeer and the sea between the end of this year and 2022.

TWO LITTLE EYES

I met Ben Griffioen at the brand-new Wadden Centre at Kornwerderzand on the Afsluitdijk. Every day, superfluous water is pumped into the Wadden Sea here, just as it is at Den Oever on the North Holland coast. 'Millions, and maybe billions of fish that want to migrate from the sea to fresh water are attracted by that influx of fresh water,' says Griffioen. 'For strong swimmers such as the sea trout or the salmon, that migration is feasible, but most of the fish cannot cope with the strong current. A flounder larva is not much more than two little eyes staring at you. Under natural conditions, >



REINFORCING THE HOUTRIB DYKE

The ministry of Infrastructure and Water Management is currently working on reinforcing the Houtrib dyke between Lelystad and Enkhuizen. Up to Trintelhaven, the half-way point, that is done in the conventional way with more basalt blocks. For the remaining 10 kilometres to Enkhuizen, the dyke is being reinforced with a sandy bank which absorbs the shock of the waves. That is good news for nature, says Marieke de Lange of Wageningen Environmental Research. 'You get a shallow riparian zone full of water plants, and that benefits fish. And above the water it all starts looking much more attractive too.' De Lange was involved in a pilot study carried out by Ecoshape, to try out this 'softer' approach for 500 metres of dyke. 'In the summer of 2014, 80,000 cubic metres of sand was deposited on the Markermeer side,' says the researcher. 'We focused on the vegetation: what starts growing there, how deep-rooted are the plants, and how does the plant growth contribute to erosion control? We also experimented with planting out plants to speed up the reinforcement. This 'gardener option' worked particularly well, says De Lange.

they just get swept in on the incoming tide.' The ministry of Infrastructure and Water Management has an obligation under the Water Framework Directive to make sure these migratory fish can access fresh water. To this end, a kind of elevator for fish has been installed at Den Oever, and experiments are going on with more fish-friendly ways of pumping water into the sea. Work will start next year on the crowning glory: the Fish Migration River, an opening in the Afsluitdijk for migrating fish to swim through. 'The idea is to recreate a tidal flow on a small scale, specifically to help the smaller fish to migrate from the Wadden Sea to the IJsselmeer,' explains Griffioen. These fish will pass through a 10-metre-wide gap in the Afsluitdijk on the incoming tide, into a meandering channel that runs for four kilometres before flowing into the IJsselmeer. The Province of Friesland has designed that channel to create a gradual transition from salt to fresh water. 'On our advice, there will be a bed of sand and gravel so that the speed of the current varies; for the smaller species especially, it is important that they can rest when the tide goes out, and find shelter from predators. Narrow passages with a lot of turbulence are taboo, because a lot of fish hate them. It's our job to think from the fish's point of view.' Griffioen expects a colourful variety of fish in the channel, from local sticklebacks to long-distance swimmers such as the eel. The fish migration river could be the salvation of freshwater fish, thousands of which currently land in the Wadden Sea every time water is pumped into it. 'They survive for a little while in the freshwater bubble; perhaps some of them will be able to swim back along the Fish Migration River.'

SNACK BAR FOR BIRDS

Some professional fishers are sceptical about the Fish Migration River, calling it 'a snack bar for birds', but a bigger influx of glass eels and flounders could work out well for them too. Although banned in the IJssel River, eel fishing is still allowed in the IJsselmeer. There are poles with eel traps every few hundred metres along the dykes, and mitten crabs are caught in them as well. The cast net fishing is less eye-catching, and involves kilometres of metres-high nets that hang in the water like curtains to catch bream,

PHOTO HOLLANDSE HOOGTE

There are over 30 professional fishing companies plying the IJsselmeer and Markermeer lakes, with a combined turnover of more than 4 million euros per year.

roach, perch and pike-perch.
Fishing quotas are determined by the minister of Agriculture, Nature and Food Quality. They are based on Wageningen research on fish stocks, explains Joep de Leeuw of Wageningen Marine Research. ‘To estimate numbers we fish with a trawl in the autumn. We supplement the information we get with catch data from the fisheries themselves and on the size distribution and the age breakdown of the main species. All that information is used to decide how much fishing to allow, so that it is sustainable,’ says De Leeuw.
‘For fish with a long lifespan, these models work fine. We can estimate the impact of fisheries quite accurately,’ he adds. But that does not apply to small fish with short lifespans, such as the smelt. ‘We don’t know exactly what determines the population growth.’ Early in the spring these little fish set off en masse to spawn at the coast. There they are fished using smelt traps and sold to Spanish consumers. ‘That is a season of two to three weeks, but this smelt fishing can boost fishers’ incomes significantly,’ says De Leeuw. ‘Fishers think not catching them is wasteful. Their argument is that the fish die after spawning anyway. We question that. We are seeing a lot of older smelt too, now they have no longer been fished for the past few years. We don’t know what the respective roles are of fisheries, fish-eating birds and the weather. These are not unsolvable questions but it would cost a lot of money to find the answers to them.’
If the ministry of Agriculture, Nature and Food Quality authorizes smelt fishing, that decision is based on the fish stocks and fisheries legislation. The fisheries still have one more bureaucratic hurdle to jump, though. They need an exemption from the nature conservation law because they work in Natura2000 areas established for water birds. They have to apply for that exemption to the provincial governments, which test whether terns and cormorants are still able to find sufficient fish to feed their young if fisheries catch some of them too. Because you cannot be sure about that, no licences have been issued in recent years, or they were withdrawn by court order after objections from the Society for the Protection of Birds.

HARD TO JUSTIFY

Wim Zaalmink of Wageningen Economic Research understands that it must be difficult for fisheries to observe all the rules. ‘Last year the ministry required them to catch 36 percent less roach and bream. You can only do that if you fish with fewer or shorter cast nets. But then the fishers catch fewer pike-perch too, which are their most lucrative fish. Whereas the pike-perch stocks are fine at the moment. That is hard to justify.’
Professional fisheries in the IJsselmeer and Markermeer lakes make up a modest sector, says Zaalmink. A total of 60 licences for a certain number of nets or traps are issued to over 30 companies, which have a turnover of over four million euros a year between them. In this profession, people are attached to their traditions. ‘When the fishermen set out they still say, “we are going to sea”,’ says Zaalmink. ‘Smaller fishermen do other jobs when times are hard, in construction for instance. But they want to go on fishing come what may. There is a strong sense that they have a right to pass this occupation on from one generation to the next. But the fish stocks are a strong argument for rationalization. In the past there were arrangements for buying companies out but now the EU sees that as unfair state support.’
There is a good living to be made for a limited number of fishers, thinks Zaalmink, as long as they adapt to the focus on nature. ‘And it’s fine for them to branch out too, running boat trips to the Marker Wadden, for instance, or reaping water plants.’ ■

www.wur.eu/IJsselmeer

Together with Wageningen

100years
1918 — 2018

This year, Wageningen University & Research is celebrating its centenary, thanks in part to its many partners. Close collaboration, on the campus too these days, typifies that relationship. 'It's inspiring for our staff and gives us new ideas.'

You can find more information about the centenary and the many contributing partners on www.wur.nl/100years.

PETER HARING,
Ecosystem Director, Unilever Foods

'It's inspiring for us to be located on campus'

'We have a close partnership with WUR. The organization is very focused on industry and it's strong on applied science. It is occasionally criticized for this but that's precisely what lets us collaborate effectively and innovate rapidly. Food needs to become more sustainable and that requires new knowledge. In the Sustainable Food Initiative, which Unilever is involved in, we want to reduce the ecological burden from our products by 50 percent by 2025. Examples are the replacement of animal proteins by plant proteins, and saving energy by reducing the processing of ingredients.
We are moving to Wageningen next year. It's an inspiring prospect for our people to be based on Wageningen campus along with researchers and young entrepreneurs. That will give us new ideas. Conversely, we expect we will also be able to help young companies. We have legal expertise on exporting abroad, for instance, and we can let people use our research facilities. We are also considering sharing patents with start-ups that we aren't using ourselves.'

MARTINE BOON,
Global head banking for Food Education & Engagement, Rabobank

Our ties with WUR are deep. Our collaboration has made the farming sector strong. Now we are cooperating intensively on a new challenge: how to feed the growing world population. There are personal links too. Many of our staff studied at Wageningen, including me. Louise Fresco was on the bank's supervisory board until recently and Berry Marttin, one of our directors, is a member of WUR's supervisory board.
To mark the centenary, we are sponsoring the WUR Greenhouse Challenge, in which students from all over the world are coming up with ideas for urban farming in Amsterdam. Local food production is becoming increasingly important, so this is helping us work on global food supplies for the future.'

BERT URLINGS,
Director of Quality, Vion Food

'We collaborate with WUR on lots of projects, for example in the fields of food technology and animal science. We are working with WUR and RIVM on a major study of microbial resistance. This has led us to adapt our working methods in various respects. We're also cooperating to figure out how to prevent infection with the listeria bacterium, a pathogen that is found on vegetables as well as meat.
Our staff sometimes teach classes at WUR too. That's something I enjoy. You talk to young people about your field of expertise, which keeps you on your toes.'

TED VOLLEBREGT,
Director, Klasmann-Deilmann Benelux

'WUR helps us expand our network. As a company manufacturing substrates, we are essentially at the start of the food supply chain. Collaborating on campus immediately brings us closer to major companies in the food industry, such as FrieslandCampina and Unilever. That boosts cross-fertilization. We also get access to an international network of students. We recently recruited a Taiwanese and a Chinese student for our branches in Asia.'

XIANG CHEN,
Director, Weiming Group

'China is a huge country for agriculture, but not very energetic on that front. WUR has made a significant contribution to farming and nature conservation in the Netherlands. Weiming, an IT company that produces solutions for agriculture among other things, had a very successful collaboration with WUR in the past in the rural area of Xiuzhou Huabang.
Now we will be collaborating in a new innovation centre in Beijing. This will let us both help revitalize farming in our country.'

CAROLIEN WAGENAAR,
Programme Manager, Seed Valley

'Seed Valley is a cluster of plant breeding and seed technology companies in Noord-Holland. Together we are working on a strong reputation and a sufficient intake of qualified staff.
WUR is an important training ground for the talented young professionals at Seed Valley. We need that talent to sustain the solid growth of recent decades, expand our plant breeding and research activities, and effectively exploit new developments.'

MICHIEL SCHEFFER,
Member of the Provincial Executive

'WUR is important for Gelderland'

'The province of Gelderland is incredibly proud to be home to the best agrifood university in the world. Whenever I'm abroad as a provincial executive member, I hear Wageningen mentioned many times a day.
An ecosystem of businesses, start-ups and research institutes has grown up around the university. The provincial authority wants to create as many jobs as possible here. We are working on a cohesive policy for start-ups and we are investing in shared research facilities and making them accessible. WUR is important for Gelderland, but even more important globally. Through WUR and FoodValley, the Netherlands is leading the world in the development of healthy food and sustainable production techniques. Here in Gelderland, we can make a difference through collaboration around the world.'

ERWIN KOENEN,
Director, Breed4Food

'Many of our employees studied in Wageningen'

'The Netherlands has a strong animal breeding sector, and researchers and companies have always collaborated with one another. Many of our employees studied or did a PhD in Wageningen, so we have close ties. But those ties were mainly bilateral. That is why we set up Breed4Food in 2012, a collaborative venture between the biggest breeding companies in the Netherlands and WUR. In this consortium, we work together in pre-competitive research on the options for making better use of the available genetic makeup.
This lets us implement any discoveries more quickly. The collaborative venture has helped Dutch companies to stay ahead of the game, certainly where genomic selection is concerned (DNA sequencing and linking that information to properties of the animals).'

UNIVERSITY PRESIDENT TASSEW WOLDEHANNA:

‘If you want to change your life, education is crucial’

‘I want to put this university more in touch with professional practice and industry,’ says Addis Ababa University president Tassew Woldehanna. He experienced this approach for himself in Wageningen, as a student of Economics, a PhD researcher and a professor. That was where he learned to cook Ethiopian cuisine too.

TEXT ALBERT SIKKEMA **PHOTOGRAPHY** PETTERIK WIGGERS / HH

It is 1 May, a public holiday in Ethiopia, but Tassew Woldehanna is happy to meet me in his spacious office with its leather chairs. In February of this year, he was appointed president of Addis Ababa University. ‘It was the first time there was an open competition for this post at the university,’ professor of Economics Woldehanna tells me on the deserted university campus. First, 13 suitably qualified candidates were longlisted by the university, after which the university’s appointments committee drew up a shortlist of five candidates. The university board narrowed this list down to three, and the minister of Education had the last word. As part of the appointment process, Woldehanna wrote a 10-page vision paper, which he was invited to present to university staff, the appointments committee, and even on TV.

Woldehanna lives close to the university in the big city of Addis Ababa, but he grew up in the sparsely populated South Tigray region. After leaving secondary school, he worked as an agricultural advisor for the ministry of Agriculture, where he developed an interest in economics. ‘The ministry gave the farmers artificial fertilizer and generalized advice on using it: so many kilos of nitrogen and so many kilos of phosphate, for any type of soil. The farmers did not have much faith in this advice. Then I made a cost-benefit analysis of the quantities of artificial fertilizer and the conditions under which it had most effect.’

Partly thanks to that analysis, Woldehanna was admitted to the Bachelor’s degree programme in Agricultural Economics at Alemaya University of Agriculture in >

‘I wanted to become a professor and make a useful contribution to Ethiopia’s development’

Addis Ababa University, Ethiopia.

eastern Ethiopia, where he graduated in 1994 as the top student of his year. This led to a lectureship at this university, but Woldehanna was more ambitious than that. ‘I wanted to become a professor and make a useful contribution to development in Ethiopia.’ You only have to look at his father to see where he gets that drive from . His father was an illiterate farmer. At the age of 30, he met a monk, whom he asked to teach him to read and write. Once his father had mastered these skills, says Woldehanna, he read a lot of books and ended up being appointed village representative in the regional government. ‘I come from a poor area where even now, not all children go to school. But education is crucial if you want to change your life. My father taught himself, and he was the first person in his community to be able to send his children to school. So right from childhood I was given a strong sense of the importance of education for development.’

In pursuit of his dreams, Woldehanna sought a scholarship to study overseas. Some of the staff at Alemaya University knew Wageningen University & Research, so he made enquiries there too. But that was before Wageningen had a degree programme in Economics that was taught in English. One year later, in 1995, the MSc programme in Agricultural Economics and Marketing was launched, and Woldehanna lost no time in applying. He received a Wageningen University scholarship and was one of the first eight students on this new international degree programme.

APPLYING THE LESSONS

Woldehanna was immediately struck by how practically oriented the programme was: he applied the ideas taught in class in work groups and in the field. What appealed to him most about the Wageningen philosophy was the emphasis placed on acquiring the skills required to apply the knowledge taught in practice. Woldehanna specialized in environmental economics and wrote his final thesis on deforestation in Ethiopia. He analysed the way timber was used over several years, found out what alternatives to wood were available as fuel and as building material, and proposed subsidies and taxes in order to bring deforestation to an end. ‘The government adopted my policy proposals and is still using them,’ he says proudly. Deforestation is still a serious problem in Ethiopia, though, as the demand for firewood is keeping pace with the population growth.

After graduating in Wageningen, Woldehanna went back to Alemaya University, and with the help of Wageningen Economics professor Arie Oskam, he won a grant from Dutch funding programme NWO-WOTRO to do a PhD in Wageningen. His research was about farm and off-farm employment opportunities for Ethiopian farmers. He selected 200 small-scale farmers in the Ethiopian region of Tigray, and monitored their

activities over two years. He made a discovery: the farmers' off-farm activities such as temporary bricklaying or carpentry work did not clash with their farming or animal husbandry activities, as agricultural advisors had always believed. Instead, they were complementary to farming activities. Farmers with a good mix of farming and other work achieved the highest productivity and incomes, his PhD study revealed. So Woldehanna advised the government to stimulate off-farm activities, another recommendation of his that was taken on board.

LEARNING TO COOK

The years he spent in Wageningen doing his PhD were enjoyable, says Woldehanna, but they were lonely too because he missed his wife and daughters. In those days, all foreign students were assigned to a host family, and that was a tremendous help to him. His host family was Wim and Agaath van Norel in Bennekom. 'That was excellent', he recalls. He could visit them every weekend. 'We went on trips, I got to know Dutch eating habits – dinner between five and seven – and we cooked together.'

So it was in Wageningen that Woldehanna cooked a traditional Ethiopian meal for the first time. 'I had never cooked before I came to the Netherlands. I found I could even buy sorghum flour in Wageningen!' He still keeps in close touch with his host family. He regularly skypes with Wim and Agaath and they sometimes go to Ethiopia on holiday.

For 12 years after getting his PhD in 2000, Woldehanna was visiting professor in Wageningen alongside his job as Economics lecturer in Addis Ababa. This meant spending one month a year in Wageningen. Together with Arie Oskam, he supervised six Ethiopian PhD students, five of whom are now in prominent positions in Ethiopia.

WAGENINGEN APPROACH

Woldehanna sees the training of such experts as Wageningen's biggest contribution in Ethiopia. Wageningen's practically oriented education has brought about a lot of development, he believes, and other universities should take a leaf out of Wageningen's book. He has adopted the Wageningen approach in his own teaching as a professor in Addis Ababa, where he teaches Microeconomics, Development Economics and Econometrics.

In line with this, Woldehanna's vision paper as a candidate for the presidency of Addis Ababa University focused on career development and good prospects for graduates on the job market. 'In the coming years, huge numbers of young people will come onto the job market from universities. We must ensure that they can find jobs easily, or be able to create work for themselves. For this reason I aim to put this university more in touch with the field and industry, like Wageningen. I want our Bachelor's students to do a three-month internship with a company, so they understand what is required of them in that setting.' He also wants to set up more project-based education and more facilities for practicals.

Over the past 30 years, Woldehanna has had clear ideas about the role he wanted to play in education. 'When I left the ministry of Agriculture I wanted to become a professor. And I wanted to do something useful for my country. My aspiration was: Research for Society. That is very much in line with Wageningen's mission: science for impact.' ■

TASSEW WOLDEHANNA (1964)

Position: President of Addis Ababa University
Studied: BSc Agricultural Economics, Alemaya University of Agriculture, 1991
MSc Agricultural Economics and Marketing, Wageningen University, 1995
PhD Economics, Wageningen University, 2000

CROWDFUNDING FOR RESEARCH

Bumble bees benefit from lupin farming

PhD researcher Thijs Fijen hopes to get crowdfunding for research on improving methods of cultivating lupins. The seed could replace imported soya in meat substitutes. 'And bumble bees are crazy about lupins'.

TEXT YVONNE DE HILSTER **PHOTOGRAPHY** MIRJAM HOMMES

'Have I mentioned that lupin is a good crop for bumble bees?' jokes Thijs Fijen halfway through our discussion. By that point, he has certainly done justice to the crop's many advantages: it is good for the soil, fixing nitrogen from the air; it is an attractive landscape feature; the protein-rich seeds can replace imported soya in meat substitutes. And the flowers are indeed very popular with bumble bees, who are having a hard time of it in the Netherlands. Two thirds of the 29 species in the country are vulnerable, threatened or extremely rare, and some have disappeared entirely. 'We know that a number of rare bumble bees love to forage on lupin. The pollen of lupin is an important nutrient for their offspring.'

Fijen is a PhD candidate in the Plant Ecology and Nature Management chair group at Wageningen University & Research. He hopes to round off his PhD research on the influence of bumble bees and hoverflies on seed production in leeks in May next year. 'I am studying the main factors for seed production in five different varieties of leek. Besides the quality of the plants, which you can influence with fertilization and irrigation, everything points to pollination, especially by wild pollinators such as bumble bees.' This provides good arguments for better nature conservation and for doing more to ensure wild pollinators have a good life.

BEANS IN THE SOUP

Fijen launched a crowdfunding campaign this summer in order to be able to follow up his PhD research with a study on the role of bumble bees in pollinating lupin. The less bitter 'sweet lupin' is cultivated on a modest scale in the Netherlands – a total of 40 hectares in 2016 – partly as green fertilizer, partly as livestock feed, and partly for human consumption. The crop is not very popular due to variable and unpredictable yields. The first move towards expanding the acreage of the crop would be to improve yields, says Fijen. The second would be to make lupin better known among consumers so that demand grows for these nutritious beans to put into burgers, soups and salads, and as a snack.

'Research has been done on breeding lupin in order to increase yields or protein content, but not

on pollination,' says Fijen. 'Whereas that can be important for the yield. So I want to look at the contribution of bumble bees to the pollination of the three varieties of lupin grown in the Netherlands, in comparison with that of honey bees, which farmers usually use at present. Insects that want to access the pollen of the lupin have to get through a kind of flap mechanism in the flower. Honey bees are just a bit too light for that.' Fijen needs about 15,000 euros for field trials in Wageningen. 'Then we can sow next spring and the crop will flower in June.'

CULTURAL HERITAGE

By improving lupin cultivation, Fijen hopes to bring biodiversity and agriculture a little bit closer together. 'The decline of bumble bees is partly because we've lost so many flowering crops in the Netherlands over the last few decades: lupin, beans, buckwheat and flax are hardly grown any more. They constitute a form of cultural heritage actually. What's more, a lot more vegetables are now grown in greenhouses.' There is already plenty of scientific evidence of the importance of wild pollinators such as bumble bees and hoverflies to agricultural crops. 'But those studies are not always relevant at the farm level. Most of them are short studies conducted in small fields without taking crop rotation into account. That makes it difficult to persuade farmers to do more for biodiversity. Besides, it is not like artificial fertilizer: you can't just open a bag of wild pollinators and spread them around.'

If bumble bees turn out to be crucial to lupin yields, growing more lupin in the Netherlands could create an all-round win-win situation with a more flourishing bumble bee population, more stable lupin production and higher yields. Not to mention a lower ecological footprint thanks to higher production of plant-based, locally grown protein to replace imported soya. ■

You can support the project via *crowdfunding.wur.nl/project/lupine*, a University Fund Wageningen initiative. A sponsor will double every donation.

Alumni celebrate WUR centenary worldwide

Alumni celebrated 100 years of Wageningen University & Research in June in numerous places around the world. King Willem-Alexander opened the worldwide alumni reunion on campus in Wageningen on 23 June. The occasion was marked with inspiring lectures and festive shows as well. Thanks to the beautiful weather, people could eat and catch up with each other in the fresh air. In total, about 1500 alumni were gathered in Wageningen.
The centenary was celebrated with reunions and jointly cooked meals at many locations abroad as well.
More photos on www.wur.eu/alumnidayphoto

PHOTO GUY ACKERMANS

A shared meal at the Dutch consulate in Chongquing (China).

PHOTO GUY ACKERMANS

King Willem-Alexander had an informal chat with a number of alumni, staff and students.

PHOTO GUY ACKERMANS

PHOTO GUY ACKERMANS

Left: A meeting between two almost centenarian alumni: Bessel Vrijhof (who started in Wageningen in 1938, left) and Thijs Noordhoek (who started in 1937).

Planting the UniversiTree at Sher-e-Bangla Agricultural University in Dhaka, Bangladesh.

HISTORY OF WUR

How Wageningen made a comeback

***Metamorfose* (Metamorphosis), the book about the recent history of Wageningen University & Research that appeared in June, describes how precarious the university's future seemed 20 years ago, and how the tide was turned.**

It was touch and go whether Wageningen would live to celebrate its 80th anniversary. In the early 1990s, the university, the newly independent Agricultural Research Service (DLO, now Wageningen Research) and the ministry of Agriculture were all in a desperate plight. The number of students in Wageningen was falling faster than would have been expected based on demographic trends, and agriculture was out of favour because of the manure question and environmental problems.

These developments are described in the book *Metamorfose*, which was written to mark the centenary of Wageningen University & Research. The authors and alumni Joost van Kasteren (Molecular Sciences 1975) and Martijn de Groot (Sociology of the Non-Western Regions 1981) show how the dilemma was resolved by a merger between the university and the research institutes, and the tide was turned. Since 2010, Wageningen has had more students than ever and the numbers keep on rising. And agriculture and food head the agenda around the world.

The book is the fourth volume after the three-volume series covering the university's history that Wageningen published to mark its 75th anniversary in 1993. Those standard works are now only available second-hand.

Volume 4 covers the period from 1993 to 2018.

The authors interviewed the key players from that period and place many of the developments in their social context so that the book gives a picture of that era too. The focus is on research and 'science for impact'. The book also deals with the failed merger with the Van Hall-Larenstein University of Applied Sciences and the changing role of the university newspaper. The alumni policy is discussed towards the end: how the position of alumni society KLV changed when the university itself started to pursue an alumni policy and raise funds for research and education.

A supplement was added after the book had gone to the printers, with a list of professors and a summary chapter on the previous 75 years. The latter gives a fascinating account of Wageningen university's entire history from the opening of the regional agricultural school in Wageningen in 1873.

The book is in Dutch and can be ordered online at wur.nl/100years (32.50 euros including postage and packaging), ISBN 978 90 8686 318 1.

WUR CONNECT

Alumnus helps student

Robin van Rosendahl, International Land and Water Management Master's student, found an internship via WUR Connect with an alumnus in New Zealand. This was Calum Revfem (MSc Environmental Management 1996-1998), director of Proxima, a consultancy specializing in sustainability.

PHOTO PROXIMA

Calum Revfem

In figures

WUR Connect, the online platform for finding fellow students or other Wageningen people, expanding your network or looking for a new job, has almost 7900 members. Have you registered yet?
www.wurconnect.nl

Requests and offers

Wilson Songa in Kenya (MSc Crop Science 1989) is looking for Sirak Hailu from Ethiopia who did the Crop Protection specialism with him in 1988-1989. He is also looking for former students from his year in Belize, Chile and Sri Lanka.

Plant Sciences Master's student **Jyotsna Nepal** is looking for an internship in phytopathology, from October to the end of January.

See *wurconnect.nl* for more requests and offers.

Prof. Bettina Bock, WUR Rural Sociology of the Western Regions 1988, WUR PhD 2002, professor holding an endowed chair in Population Decline and Quality of Life in Northern Netherlands at the University of Groningen and also employed at WUR since 1996, has been appointed professor holding a personal chair in Rural Sociology. 1 February 2018.

PHOTO ACTIVE2GETHER

Prof. Hans Brug,

WUR Human Nutrition 1989, dean of the Faculty of Social and Behavioural Sciences at the University of Amsterdam, has been appointed director-general of RIVM. 10 September 2018.

Thijs Fijen MSc, WUR Forest and Nature Conservation 2013, PhD candidate in Plant Ecology and Nature Conservation, has won the Silver Parnassia, a prize for talented young researchers who make a contribution to the conservation of nature. 30 May 2018.

Anton Haverkort PhD, WUR Agricultural Plant Breeding 1978, received a Lifetime Achievement Award at the World Potato Congress 2018 in Peru for all his work on potatoes. 29 May 2018.

Gert Jan Hofstede PhD, WUR Biology 1983, assistant professor of Information Technology, has been appointed professor holding a personal chair in this chair group. 5 July 2018.

Anne Janssen MSc, WUR Environmental Protection 2003, adviser on heat transition and politically active in Amsterdam, has been appointed alderman in Wageningen for neighbourhoods, housing and culture, representing the PvdA (Dutch Labour Party). 14 May 2018.

Andries Heidema MSc,

WUR Land Development A 1986, mayor of Deventer, has been appointed King's Commissioner for the Province of Overijssel. 11 July 2018.

Prof. Pavel Kabat, former professor of Earth System Science and Climate Studies at Wageningen, has been appointed scientific director of the World Meteorological Organization (WMO) in Geneva, Switzerland. March 2018.

Dirk Kloosterboer MSc, WUR Food Technology 1980, supervisory director at Darling Ingredients and former head of VION, has been appointed supervisory director at the starch company Avebe. 5 July 2018.

Robert Smith MSc, a member of WUR's supervisory board and a director of the potato breeding organization Vereniging HZPC, has been appointed supervisory director of the starch company Avebe. 5 July 2018.

Carla Moonen MSc, WUR Economics 1993, chair of the board of the Zorg en Welzijn pension fund, is the chair of Koninklijke NLingenieurs as of 1 September. 19 June 2018.

Bas Rodenburg PhD, WUR Biology 1998, WUR PhD 2003, behavioural biologist, has been appointed professor of Animal Welfare at Utrecht University. 1 May 2018.

Katja Philippart PhD, WUR Biology 1986, WUR PhD 1994, marine biologist at the Netherlands Institute for Sea Research (NIOZ) and Utrecht University, has been appointed professor holding an endowed chair in the Productivity of Coastal Marine Ecosystems at Utrecht University. 1 February 2018.

John Stuiver MSc, WUR Geo-information Science, employee at the Laboratory of Geo-Information Science and Remote Sensing, received the GIS Pro Award for his work over many years on developing GIS education. 10 April 2018.

Ingeborg Swart MSc, WUR Biology 2017, who writes nature columns, has published her first novel, *Dennengeur en zonneschijn* ('Pine scent and sunshine', published by Partizaan). It is chick lit for horsey women, about life in the country, romance and the love of animals and nature. February 2018.

Prof. Jan van Tatenhove, WUR Rural Sociology 1987, WUR PhD 1993, has been appointed professor of Marine Governance and Marine Spatial Planning and head of the new Centre for Blue Governance at Aalborg University in Denmark. 15 August 2018.

Prof. Siem Korver,

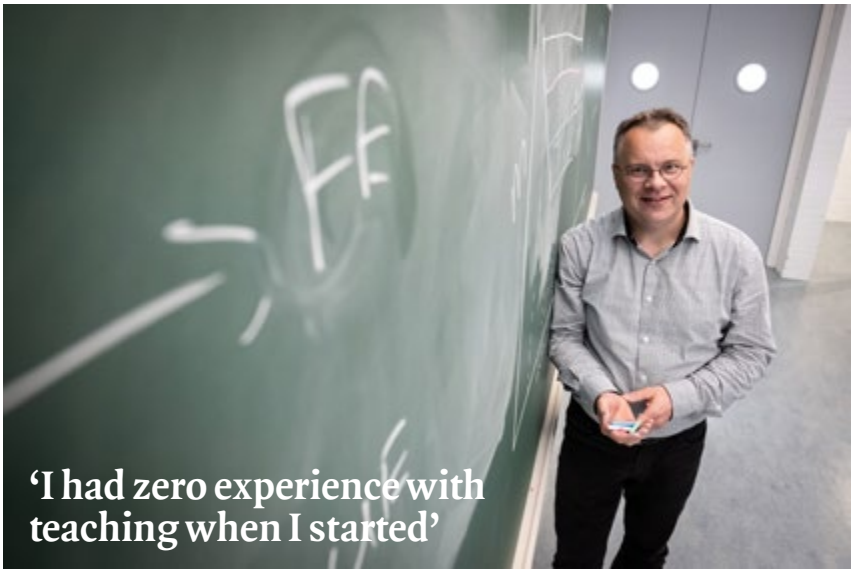
WUR Zootechnics 1978, WUR PhD 1982, has been appointed Officer in the Order of Orange-Nassau in his home town of Rhenen, after being nominated by the Dutch breeding organization for showjumping, dressage, driving and Gelderland horses, which he chaired for many years. Korver is professor holding an endowed chair in Food, Farming and Agribusiness at Tilburg University, a member of WUR's supervisory board and a Wageningen Ambassador. 26 April 2018.

Prof. Just Vlak, WUR PhD 1976, emeritus professor of Virology, has been appointed an honorary member of the Society for Invertebrate Pathology (SIP). 12 August 2018.

Peter Weijs PhD, WUR Human Nutrition 1988, WUR PhD 1993, has been appointed professor of Nutrition and Exercise, with a particular focus on protein, at the VU Medical Centre. 1 March 2018.

Zuilhof appointed Fellow

Han Zuilhof PhD (Leiden University, Chemistry 1988), professor of Organic Chemistry in Wageningen, senior editor of the academic journal *Langmuir* and part-time professor in China, was appointed Fellow of the Royal Society of Chemistry (RSC), for his 'outstanding contribution to the progress of the chemical sciences'. The RSC is a scientific society in Great Britain devoted to promoting the science of chemistry. One of the things Zuilhof's group is working on is a molecule that fits perfectly on the toxin that causes cholera. This is all part of the search for an effective drug against the disease. Zuilhof: 'A lot of diseases cannot be measured in the early stages, whereas that is what you would like to do. One of the goals is to be able to detect diseases faster and more sensitively.'



'I had zero experience with teaching when I started'

PHOTO GUY ACKERMANS

Henry van den Brand, WUR Animal Science 1994, WUR PhD 2000, was voted Teacher of the Year 2018 in April. Van den Brand is an associate professor in the Adaptation Physiology chair group. 'I had zero experience with teaching when I started in 2001. I had actually always imagined I'd work in the private sector.' But the subject enthralled him and now he puts his heart and soul into teaching. He is an enthusiastic and committed teacher, says the jury, someone who tells stories rather than giving standard lessons. In lectures, Van den Brand likes to use chalk and a large blackboard to show students the connections. 'I stick to the essential facts – they can read the rest in their course books.' Van den Brand donated his prize money (2500 euros) to the chair group to help outstanding students present their research at a conference at the end of their degree programme.

IN MEMORIAM

Alumni of Wageningen University, KLV members, staff and former employees of Wageningen University & Research who have recently passed away.

Mr A.T. Berbee MSc, Phytopathology 1973. 6 February 2018.
Mr M.P. Bijlsma MSc, Landscape Architecture 1966. 10 January 2018.
Mr R.H. Brook MSc, Soil and Fertilization Sciences 1966. 29 May 2018.
Mr A.L. Brouwer MSc, Rural Economics 1959. 23 March 2018.
Ms M.H. Feenstra MSc, Human Nutrition 1979.
Mr C.P.M. van der Grinten PhD, Biology 1985. 22 July 2018.
Mr P. Gruys PhD, Forestry 1960. 19 June 2018.
Prof. R.J.J. Hermus, Dairy Production 1968. 22 February 2018.
Mr J.A.H.M. Horsten PhD, Plant Breeding 1972. 6 June 2018.
Mr P. de Kam, 7 March 2018.
Mr W.J. van Laar MSc, Rural Economics 1962. 13 May 2018.
Mr J.W. Leenders MSc, Agricultural Plant Breeding 1952.
Mr B.J. Odink MSc, Rural Economics 1971. 29 April 2018.
Mr J. Roest, 18 March 2018.
Ms M.A. Sanders-Zegers MSc, Plant Breeding 1987. 18 April 2018.
Mr J. Smelt MSc, Biology 1983. 25 May 2018.
Mr W. Sprokholt MSc, Land Development 1966. 2 June 2018.
Mr H.J.R. Stein PhD, Rural Sociology of the Western Regions. 8 April 2018.
Prof. D.A. Stellingwerf, Tropical Forestry 1952. 24 May 2018.
Mr C.H. Strijker MSc, Biology 1983. 4 April 2018.
Mr R. Top MSc, Food Technology 1972. 15 May 2018.
Mr K.K. Vervelde MSc, Agricultural Plant Breeding 1952. 27 May 2018.
Mr J.C.M.M. de Wit MSc, Rural Economics 1970. 7 April 2018.

If you would like to inform us of the death of a fellow former student or relative, you can email alumni@wur.nl or send a death announcement to the Alumni Department, University Fund Wageningen, Droevendaalsesteeg 4, 6708 PB Wageningen, Netherlands.

‘Sponsors only take any notice once you’ve made it’

Track cyclist **Steffie van der Peet,** Biology Bachelor’s student, received a grant of 1500 euros last May from the Niels Smith Fund, which is managed by University Fund Wageningen. The grant is for talented athletes who are not yet receiving funding from the Dutch sports federation NOC*NSF. Van der Peet (19) came second in the keirin (sprint in which cyclists follow the derny) in the Junior Track Cycling World Championship in 2017, and in August she competed in two sprint distances in the European Track Championships for cyclists under 23. She lives at the Papendal sports centre and trains with the group of elite sportswomen. The grant feels like recognition of her talent, but the money is useful too. ‘I already have a loan to pay for my equipment. Track cycling is an expensive sport and sponsors only take any notice once you’ve already made it.’

PHOTO GUY ACKERMANS

PHOTO GUY ACKERMANS

Mihris Naduthodi MSc, WUR Biotechnology 2017, wrote the best Wageningen thesis of 2017. In April he received the UFW-KLV Thesis Award 2017 for his fundamental research on the bacterium *Bacillus smithii*, which can produce succinic acid. This is an organic compound that is generally obtained in the crude oil cracking process and is used in the production of medicines and plastics. Naduthodi was able to use genetic modification to increase production of succinic acid. The research was published in *Nature Communications*. Naduthodi is now a PhD candidate in the Bioprocess Technology chair group.

KLV

KLV WAGENINGEN ALUMNI NETWORK

KLV is for everyone at Wageningen; it aims to foster contacts with other KLV members, alumni, students and the university. You can network in your own subject area through the study groups and sub-networks. KLV also offers its members career support services, such as a CV check and relevant workshops. What is more, members often get discounts on admission to lectures and debates. Learn more about our activities: a selection is shown here and you can go to www.klv.nl for a complete overview.

WUR on Wheels
15 September–15 October 2018. Cycle around the world together and support the Wageningen Borlaug Youth Institute, the change-makers of tomorrow. wuronwheels.wur.eu

Mansholt Lecture
19 September 2018. Lecture to discuss European policy and issues in the WUR domain. Theme: Towards Circular Food Production in Europe. Brussels. wur.eu/mansholtlecture

Company Day
27 September 2018. Company Day: ‘Future Perspectives’ for business innovators and developers. Get familiar with novel technologies. Wageningen Campus. klv.nl

KLV Wageningen Alumni Network is Wageningen University & Research’s active, thriving alumni society with more than 8500 members.

Want to become a member?
www.klv.nl

KLV

Doeko van 't Westeinde

KLV member since 2009

A PASSION FOR farming

Arable farmer Doeko van 't Westeinde (Management, Economics and Consumer studies 2009) from Bad Nieuweschans in Groningen likes to look beyond his own farm. 'I want to learn from others and I'm interested in the role farming plays for all of us.' He has been doing agricultural nature management for years, for example with a field full of herbs that he mows in sections and a field for birds with alternating rows of flowers and alfalfa. 'There was a hen harrier last year and a corncrake this year. That makes you proud of your work.' He also airs his views as a young farmer in columns for RTV Noord and elsewhere. 'We farmers shouldn't keep on moaning about a possible ban on glyphosate, for example; we should tell our side of the story and explain why we make certain choices.'

In this feature KLV members talk about what makes them tick.

WANT TO BECOME A MEMBER?

Visit our website www.klv.nl

PHOTO GUY ACKERMANS

PHOTO WUR

Higher incomes for mango farmers in Haiti

'A lot of mangos disappear or end up as juice in Haiti before they get to the harbour in Port-au-Prince,' says researcher René Oostewechel of Wageningen Food & Biobased Research. He and Jan Brouwers of Wageningen Centre for Development Innovation did a study for the World Bank to see how mango farmers could earn more from exports to the US. This would require technical improvements such as different cultivation methods, good timing of the harvest and better refrigeration. The Wageningen experts also recommended setting up a more transparent system of trade, which the World Bank wants to experiment with. 'This is a new form of Fairtrade, in fact,' says the researcher. For every box of mangos, the harvest location and temperature during transport are recorded digitally using blockchain technology, as are the costs of trading and transport. The payment system is linked to this data. The Haitian farmer owns the mango until it reaches the supermarket shelf. In the end he is paid the difference between the sale price in the shop and the costs accrued along the way. Currently, farmers sell their mangos for a few cents per fruit before they have even harvested them. Yet the new system may pose some dangers, warns Oostewechel. 'The farmers get their money later and they run more risk – if something goes wrong in transit for example.'

Info: rene.oostewechel@wur.nl and jan.brouwers@wur.nl