WAGENINGEN WORLD

MAGAZINE OF WAGENINGEN UNIVERSITY & RESEARCH ABOUT CONTRIBUTING TO THE QUALITY OF LIFE

no.4 2019

‘We can avoid millions of tons of emissions’

Eight visions on addressing climate change, page 10

Less nitrogen is doable
Farmers managed to cut emissions by 20 per cent

Parasites caught on camera
High-speed cameras film killer sleeping sickness parasite

Closing cycles together
Circular agriculture takes shape in various regional initiatives

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

PHOTO GUY ACKERMANS

Time for climate action

'I remember very clearly telling my dad to turn off the car engine because it would harm the seals at the North Pole. I was about eight years old; now I am 26. Meanwhile, the Arctic ice coverage has shrunk by roughly a million square meters. Sea levels are rising faster than expected, putting my hometown in a vulnerable position. Despite this, my parents and many of their generation do not seem to feel the same urge to act on the climate and ecological crisis as I do. My dad still drives his diesel car.

It is, however, the youth who will have to live with the consequences of climate change – without having had a meaningful say in the negotiations that are shaping the future. I am disappointed that Nature-based Solutions (NbS) receive only two per cent of the global funding for tackling the climate breakdown. I think NbS involve people like my dad in climate change adaptation in a beautiful way. That's why I joined the organization Youth4Nature, which aims to mobilize youth to advocate for NbS to combat the climate and ecological crisis. To raise our voices, we attended the UN Climate Action Summit last September. Meanwhile, with COP25 in Madrid just behind us, there have been countless high-level events like this since the Club of Rome sounded the alarm in 1972. I question how these events have helped the world.

And yet I am optimistic. For the first time, millions of people all over the world have been taking part in climate strikes and are demanding that their political leaders act. Sometimes what we learn, discuss and are driven by in Wageningen seems in stark contrast to what keeps the outside world busy. But this is our chance to open up Wageningen's inspirational atmosphere! Talk to people you don't normally talk to. Connect, share your knowledge and ideas, and act! The challenges are enormous, but if we continue to raise our voices as one, we will be effective.'

Amanda Krijgsman, a researcher at Wageningen Environmental Research, represented Europe at the UN Climate Summit in New York.

METEOROLOGY

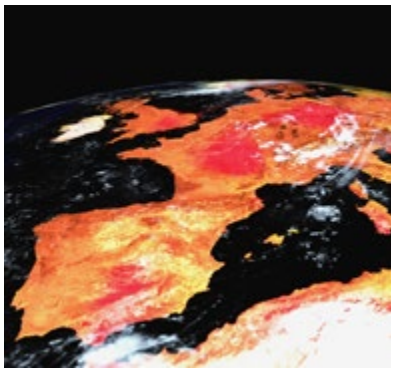

PHOTO SHUTTERSTOCK

Drought triggered heatwaves

The two heatwaves that Europe suffered last summer were triggered by drought in southern Europe. That will happen more often due to climate change. These are the conclusions of Wageningen researchers and their colleagues at Ghent University. The researchers used satellite observations and models to determine the extent to which the air heats up in dry regions and then contributes to extreme temperature increases in areas where the wind blows.
Hot, dry air from North Africa was able to penetrate deep into the continent of Europe because of the dry conditions in France and Spain. The hot air would normally be cooled *en route* by the seawater and the vegetation.
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ANIMAL NUTRITION

Feed additive for tackling methane

The feed additive Bovaer developed by DSM inhibits the formation of the greenhouse gas methane in cows. It is thought that this could cut methane production by about 20 per cent. Bovaer is currently being assessed by the European Food Safety Authority (EFSA). Dairy Campus, Wageningen's research and experimental sector for the dairy sector, will study the effectiveness of Bovaer.
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URBAN CLIMATE

Weather balloons in Dam Square

On a boiling hot day in July, researchers from Wageningen University & Research and AMS Institute released weather balloons in Amsterdam's Dam Square every two hours. The measuring devices recorded the temperature, humidity and wind speed up to altitudes of 2200 metres.
Cities heat up more than other places on sunny days. After a hot day, that heat hangs over the city like a dome. The researchers wanted to know how far up in the sky that urban heat island effect extends. Measurements were also made for comparison in the rural area of Portengen 20 kilometres south of Dam Square. The researchers discovered that the urban heat bubble extended up 76 metres that night. The difference in temperature with the surroundings was considerable, from two degrees during the day to five degrees at night.
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PHOTO ANP

PLANT ECOLOGY

Leeks need wild insects

Pollinating insects are the most important production factor in the cultivation of leek seed, concludes PhD candidate Thijs Fijen. He did research in leek fields used by the vegetable seed producer BASF in France and Italy. He studied management aspects, the numbers of insects and seed yields for five leek varieties, and found that pollination is as important as fertilizer and irrigation combined.
Fijen also discovered that bumblebees, wild bees and hoverflies were the main pollinators. Honey bees did not play a significant role. That means that the current practice of growers hiring beekeepers is not very effective, says the researcher.

'Seed companies and farmers are better off investing in a production environment that is attractive to wild pollinators.' Fijen obtained his doctorate at the end of August; his supervisor was David Kleijn, professor of Plant Ecology and Nature Conservation.
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PHOTO SHUTTERSTOCK

ENTOMOLOGY

Insecticides spread via honeydew

PHOTO ALAMY

Neonicotinoids spread via insect secretions known as honeydew, which causes these chemicals to inadvertently kill harmless insects as well. That means the risk assessment for these insecticides needs to be tightened up. Wageningen entomologists and their Spanish colleagues published this conclusion in the journal *PNAS*.

Neonicotinoids are crop protection agents that permeate the whole plant. Harmful insects that attack the crop come into contact with the product and are killed. But it has been clear for a while that this is not the entire story: neonicotinoids also harm bees via the nectar and pollen.

The research team have now discovered another 'leak' that is much bigger: neonicotinoids are found in the secreted sugars (honeydew) of greenfly, mealy bugs, whitefly and psyllids.

These insects suck out plant juices and secrete the excess sugars as honeydew, which is an important source of food for many 'useful' insects that do not harm crops, such as bees, ants, parasitic wasps and hoverflies.

The researchers treated orange trees with neonicotinoids and then infected the leaves with mealy bugs. Chemical analyses showed that the pesticides had ended up in the honeydew produced by these bugs. Parasitic wasps and hoverflies that ate the honeydew died.

In 2018, the European Commission banned three neonicotinoids from use in field crops. The decision was taken because numerous studies had shown that these products were harmful to pollinating insects such as bees. 'Growers argue that they can still be used outside the flowering season or on crops that don't have flowers,' says Professor Marcel Dicke of the Laboratory of Entomology. 'But the death of useful insects through exposure to the product in honeydew has not been taken into account in the risk assessments so far.'

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WAGENINGEN ACADEMY

Doing business in a complex world

Wageningen is joining forces with TIAS Business School to run an Executive MBA in Food & Agribusiness. In the first integration module on the programme – 'Doing business in a complex world' – students are challenged to apply the theory they have learned in previous modules in a real business context. This includes developing future scenarios for the coming 10 years. In the 2019 course, the focus was on the polder province of Flevoland and one of the business cases was Gerjan Snippe's company Bio Brass. His inspiring story can be read in the interview on page 40 of this edition. The biggest eye-opener for the EMBA students was his assertion that a multi-disciplinary approach brings a lot of solutions within reach.

www.wur.eu/academy

FOOD SAFETY

DNA investigators find listeria source

Wageningen Food Safety Research (WFSR) and the National Institute for Public Health and the Environment (RIVM) have tracked down the company responsible for contaminating meat products with the listeria bacterium in October. Twenty people in the Netherlands became ill, three died and one woman had a miscarriage. WFSR and RIVM were able to find the source by comparing their research results. Wageningen researchers use whole genome sequencing to map the genetic material of listeria in food samples. RIVM scientists use the same technique but they apply it to listeria isolated in patients. They set up a joint database to share that information which gave a match between the listeria in meat products and the listeria in patients.

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PHOTO SHUTTERSTOCK

SUSTAINABILITY

Little growth in sustainable food

In 2018, Dutch households spent over 4.9 billion euros on sustainably produced food, seven per cent more than in 2017. That expenditure growth is mainly due to price rises. The share of sustainable items in the overall spend on food increased slightly but is still only 11 per cent. These findings come from the Sustainable Food Monitor, an annual report that Wageningen Economic Research produces for the Ministry of Agriculture, Nature and Food Quality. A product in the sample counts as 'sustainable' if it has a sustainability label.

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ANIMAL ECOLOGY

PHOTO ROB VAN BEMMELEN

Seabird migration in a new light

The long-tailed skua, an Arctic seabird, overwinters off the west coast of southern Africa, although it had always been assumed that the bird flew to Antarctica. That is one of the surprising results of studies by Rob van Bemmelen of Wageningen Marine Research.

Van Bemmelen studied four species of Arctic seabirds to find out where they spent the winter. It turned out variety is the spice of life for the red phalarope. They spend winter in three different places in the Atlantic Ocean but don't keep returning to the same place even though these areas are 6500 kilometres apart.

To track the birds, Van Bemmelen used geolocators weighing almost nothing. The geolocator was attached to the legs of Arctic and long-tailed skuas and to the backs of red and grey phalaropes. These chips measure the light every five minutes; this allows the longitude and latitude to be determined and consequently the bird's position. Van Bemmelen's migration data is supporting evidence for a proposal by Birdlife International to designate a protected nature area as a port of call in the northern Atlantic Ocean. 'That proposal is based on the migration data on the long-tailed skua from my study and on data for 23 other birds,' says Van Bemmelen, who received a PhD for his work on 30 October.

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EDUCATION

Best university for 15 years

For the 15th time in a row, Wageningen has been declared the best university in the Netherlands by an annual national guide to degree courses, the *Keuzegids*. In spite of their growing numbers, Wageningen students are still very satisfied with the quality of the education they get.

The *Keuzegids* compares all the Bachelor's programmes in the Netherlands, basing its assessment on the National Student Survey. In the lead is the Wageningen BSc in Plant Sciences, which scores 96 out of 100, followed by Technical Physics at the University of Twente and Archaeology at Groningen.

The top three Wageningen degree programmes are Plant Sciences, Molecular Life Sciences and Biology. Dutch universities in general are thriving, shows the guide, which came out at the end of November. Numbers of new students are rising, and the quality of the education is scoring higher than last year in evaluations. The pass rate is also at its highest since 2006.

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DEVELOPMENT ECONOMICS

Emergency aid study rewarded with UNICEF prize

PHOTO MAARTEN VOORS

The Wageningen development economist Maarten Voors has won the Best of UNICEF Research Award for a study on the effect of emergency aid.

Voors conducted research in the Democratic Republic of the Congo, where violence has driven millions of people from their homes. These refugees usually manage to find shelter with family or friends but they rely on emergency aid, including from UNICEF, for everything else. Voors and some international colleagues investigated whether that aid works.

Seventy families who weren't quite in the neediest category were given vouchers worth 55 to 90 dollars to buy household goods such as soap, pots and pans, a mosquito net or a mattress. A control group of the same size was not given vouchers.

The effect of the aid was measured using questionnaires. 'The main research question was whether this is better than doing nothing,' says Voors. The conclusion was that the families were indeed better off. 'People on the run have to leave everything behind. That puts huge mental pressure on them. The voucher system reduces stress because they are able to buy and use essential items.'

The aid let the refugees spend slightly more on food. Even so, their health was no better than that of the people in the control group. The benefits are mainly in terms of mental stability and resilience, says Voors. 'People who have had to flee are traumatized. This study shows that giving direct aid immediately has a positive effect. Subsequent aid programmes are also expected to be more effective as a result.'

The researcher is pleased with the recognition from UNICEF. 'An organization that is mainly focused on practical implementation has shown that it finds research important.'

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PHOTO MAARTEN VOORS

CONSUMPTION

Rise in meat consumption

Meat consumption has increased slightly in the Netherlands for the first time in 10 years. The figure for 2018 was over 77 kilograms per person, half a kilo more than in the previous year. The increase is mainly due to greater consumption of poultry. These results come from the data that Wageningen Economic Research collects every year for animal rights group Wakker Dier. The figures are based on the carcass weight — about half of that is eaten as meat or processed meat products.

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ENTOMOLOGY

Malaria mosquito connects chimpanzees to humans

Mosquitos of the genus *Anopheles* that transmit the malaria parasite are attracted by the odour of both humans and chimpanzees, according to research by PhD candidate Julian Bakker of the Laboratory of Entomology. The *Anopheles* mosquitoes probably form a bridge for transmitting the disease between apes and humans. 'If we want to eradicate malaria, it is important to know which mosquito species can transmit malaria between humans and apes, so that the disease doesn't simply reappear in humans after coming from apes again,' says Bakker.

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PHOTO SHUTTERSTOCK

GENETICS

Bacteria protect plants against fungi

Bacteria that live in plant roots protect their hosts against fungal infection. If there is an infection, the bacteria start producing useful substances such as enzymes that break down the cell walls of the attacking fungi. An international team headed by Wageningen and the Netherlands Institute of Ecology (NIOO-KNAW) published a paper on this in November in *Science*. The researchers came across these auxiliary troops thanks to metagenomics, a DNA technology designed to get a picture of the diversity in the microcommunities that are present.
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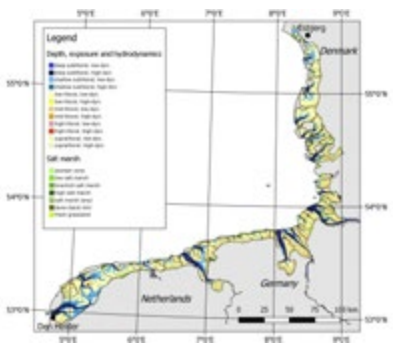
MARINE ECOLOGY



Ecotope map of the Wadden Sea

An international team headed by Wageningen researchers has compiled an ecotope map of the Wadden Sea, from the island of Texel to Denmark.
The new digital map divides the sea into sections based on such features as depth, salinity, flow and ecological properties. This map can be used to work out quickly where specific plants and animals could live.
The map can be found at: https://data.mendeley.com/datasets/27mysx289g/1.
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APPLIED STATISTICS

PHOTO ALAMY

Model predicts maize yields following climate change

Statisticians in the Wageningen research group Biometris have developed a model that predicts the yield from maize varieties in various climate zones. This will let plant breeding companies respond to future climate conditions.

In a project with other European institutes, about 50 different maize varieties were cultivated in 30 trial fields under a range of growing conditions. Biometris used the data on yields, temperature, soil moisture and light intensity for a model that predicts how well a variety will perform under different environmental conditions based on its DNA. The researchers then tested the model by letting it predict the yield of 56 maize varieties from another project under various growing conditions. The model turned out to be highly accurate, as they report in the journal *Nature Genetics*. Plant breeding companies can use the results to crossbreed varieties best suited to each climate zone.
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PHYSICAL CHEMISTRY

Paint to combat termites

As part of her PhD research in the Physical Chemistry and Soft Matter group in Wageningen, Aurélie Féat developed paint that ants and termites slide off. These insects cause billions of dollars of damage to buildings every year. At her employer's, AkzoNobel, Féat developed and tested paint that gives insects less of a grip. The most suitable variant is a poorly mixed paint with pigment particles that protrude from the surface. This means that the adhesive liquid that the insects use to climb does not work properly.
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RECYCLING

More plastic collected, but also more unwanted waste

PHOTO HOLLANDSE HOOGTE

Over 50 per cent more plastic packaging was collected from Dutch households in 2017 than in 2014, but it included a lot more unusable waste.

These findings come from an analysis by Wageningen Food & Biobased Research that was published in *Waste Management* in September. Researcher Marieke Brouwer says the increase in the volume of collected plastic packaging is due to a new policy. 'Many municipalities have started collecting plastic, metal and drinks cartons (PMD) instead of just plastic packaging,' says Brouwer. As a result, about 50 per cent more households are covered by the separate collection.

The downside is that the plastic that is collected separately includes more waste such as organic materials, textiles or glass. That needs to be separated out or the plastic that has been collected will be rejected. In 2014, the waste needing to be sorted out was just 19 kilotons but that had increased to 55 kilotons in 2017, with 15 kilotons in rejected materials.

Despite that adulteration, sorting and recycling companies have managed to maintain the quality of the recycled plastic. Even so, only part of it is sufficiently pure to be used for new packaging. More of the recycled plastic is lower quality and can only be used for items such as crates and garden furniture. The total volume of plastic suitable for reuse rose by 37 per cent from 75k ilotons to 103 kilotons in 2017.

'For the recycling system to run smoothly, households need to throw out less waste inamong the PMD,' says Brouwer. Packaging companies also need to do more in developing packaging that is better suited for recycling.

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PLANT PATHOLOGY

Panama disease reaches South America

The dreaded Panama disease has gained a foothold in banana cultivation in South America, as a new field test developed in Wageningen shows.

The discovery of the disease in Colombia is a blow to the region. The cultivation and trade in bananas is hugely significant for the South American economy and society.

The culprit is the soil fungus TR4, which causes a *Fusarium* wilting disease also known as Panama disease, as researchers from Wageningen, the company Keygene and Utrecht University report in *Plant Disease*. Cavendish, the most widely grown banana variety, is very susceptible to TR4. Once the soil has become infected, the banana grower will not be able to grow Cavendish bananas there for more than 20 years. In recent decades, TR4 has made numerous plantations unusable in Asia and Australia.

The new test, which was developed by a research team headed by Professor Gert Kema, makes it easier to detect TR4. 'The test can be used in the field,' says Kema. 'You no longer need a lab to analyse the samples.'

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EIGHT WAGENINGEN VISIONS ON ADDRESSING CLIMATE CHANGE:

‘We can avoid millio tons of emissions’

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Planting forests, improving the efficiency of farming and getting the chemical industry to go biobased are all effective, affordable strategies for addressing climate change, say eight Wageningen researchers. They should be enshrined in a long-term government vision. ‘A vision that can stand up to short-term political thinking.’

TEXT RENÉ DIDDE **PHOTOGRAPHY** SHUTTERSTOCK AND HARMEN DE JONG **ILLUSTRATIONS** PETRA SIEBELINK

Worldwide, it is now more than one degree Celsius warmer than it was a century ago. According to international studies, we must keep the temperature rise below 1.5 degrees to keep extreme weather conditions within bounds. It is going to be a tough job to reduce emissions of greenhouse gases such as CO_2 and methane, according to Wageningen scientists who work on the climate change problem. Yet they do have some hope-giving plans, suggestions and solutions.

Talk to Gert-Jan Nabuurs, for example, professor of European Forests at Wageningen Environmental Research. He worked on a study published at the end of October which demonstrates that planting new forests, combatting deforestation, especially in tropical rainforests, and restoring degraded forest such as mangroves can significantly boost CO_2 storage. 'It is effective and affordable,' says Nabuurs. And it helps towards several other goals at the same time. 'Biodiversity increases, sustainable forestry creates jobs, and using sustainable wood saves on steel and concrete in the construction industry. Andforests are a source of bio-energy.'

If the forestry plans are consistently implemented in Brazil, Indonesia, the US and the EU, and the agriculture sector takes effective climate measures such as reducing fertilizer use and using improved livestock feed, then the agriculture and forestry sector could be 'carbon-neutral' by 2040. In fact, by 2050 this sector could even be storing more carbon than it emits, suggests the article, which was published in *Nature Climate Change*. 'One of the key measures is to intensify agriculture, especially in South America, Africa and Asia,' says Nabuurs. 'That frees up land for expanding forests and investing in a sustainable forest sector.'

GERT-JAN NABUURS
Professor of European Forests

'Planting new forests is effective and affordable'

TAKING MEASURES

If the splendid prospect of climate-neutral agriculture and forestry by 2040 is to become a reality, agriculture will have to adopt better climate measures, and faster, says Jan Verhagen, an Agriculture and Climate researcher at Wageningen Plant Research. 'Agriculture and land use account for 25 per cent of global emissions of greenhouse gases.' A little more than half of that is directly due to agriculture, for example in the form of nitrous oxide from manure and artificial fertilizer, massive methane emissions from cows, and also from rice cultivation. A lot of CO_2 emissions also occur in the food supply chain in the course of harvesting, transport, processing, cooling and consumption, explains Verhagen. The other half of the emissions comes from land use, with the most eye-catching sources being oxidation in peaty soils, deforestation in rainforests and slash-and-burn practices in South-East Asia.

To guarantee food security for the growing world population, especially in Africa and Asia, we don't necessarily have to start using more land, thinks Verhagen. 'Refining the livestock farming systems by using more efficient technology would be the main solution. Precision agriculture with better timing and dosing of fertilization, for example, could bring emissions down considerably.' That wouldn't have to be done with robots or satellite-guided tractors, says Verhagen. 'It can be done low-cost too. Farmers in Africa and Asia work a lot with mobile phones, and if they see diseases in their crops they take photos. Then they can get specific advice, such as to use cow manure for one crop and goat manure for another one. With more knowledge you can work more precisely.'

He also mentions combatting food waste by consumers as a useful strategy. 'That increases efficiency a lot.'

TIM VAN HATTUM
Green Climate Solutions programme leader

'The climate problem is already having such an impact that we must adapt to consequences'

Researchers at Wageningen Livestock Research share the view that improving efficiency can boost food security as well as being good for the climate. Take cows in Ethiopia, says Theun Vellinga, a Livestock and Environment researcher. 'Livestock there is underfed and doesn't get enough drinking water. Farmers also hang on to unproductive cows. The animals are their "walking piggy banks". Livestock researchers have calculated that better livestock feed and more water could boost the milk yield of cows in Ethiopia by a factor of 14, from a few hundred litres to 3000 litres per year. The trick is to send unproductive cows straight to the slaughterhouse and build up a herd of young, productive cows, says Vellinga. This should be combined with improving the infrastructure with a guaranteed market for the milk, milking machines, cooling, transport and breeding programmes – all of which offer the farmers more security. 'We have worked out that methane emissions per litre of milk can be drastically reduced this way. But even absolute methane emissions drop, because you produce much more milk from a somewhat smaller herd.'

MILK AND MEAT

Vellinga thinks a nice target would be 3000 litres of milk per cow per year. That is roughly the productivity of a cow in the Netherlands in around 1920. 'Dutch cows have since been bred to produce up to 10,000 litres per year. By focusing purely on milk, we have forgotten that we keep cows for both milk and meat. If you take those together, emissions go down.'

In Vellinga's vision, farmers in the Netherlands should shift towards a 'dual-purpose cow'. 'So not aiming for even more milk, but for getting a bit less milk and more meat out of a more robust cow. In spite of the discussion about the need to eat less red meat, there is still going to be a demand for it for the foreseeable future, and at present we import a lot of beef from Ireland and Argentina. Emissions per kilo of meat are far higher from that livestock because it only produces one product.'

Vellinga also thinks that the methane emissions from Western cows could be halved through breeding and additives in feed that partially block methane formation.

FOSSIL ADDICTION

If agriculture is responsible for a quarter of greenhouse gas emissions, that leaves 75 per cent for other sectors such as industry, transport and energy provision. Achieving improvements there has been Jacco van Haveren's mission for years. He is a researcher at Wageningen Food & Biobased Research, and his aim is to help the chemical industry and the fuel sector kick the fossil fuel habit. His research group is visited regularly by manufacturers looking to make changes such as replacing fossil fuel-based polypropylene (PP) with PP made from waste streams such as wheat straw.

'We can definitely do that and of course, it saves on CO_2 because petroleum is not used as a raw material. The problem with polypropylene, however, is that it is not easy to recycle and it's not very biodegradable, even when it is made out of biomass,' explains Van Haveren. 'If the chemical industry seriously wants to have an impact, it should think far more in terms of switching to polyester plastics such as PET and PET-type plastics like PEF and PLA. 'These plastics can easily be made out of biomass and are much easier to recycle and far more often biodegradable.'

PEF can be made out of waste streams from agriculture such as sugar beet pulp and straw. 'If the chemical industry were to switch to biopolyesters such as PET-type plastics, we could avoid millions of tons of CO_2 per year, worldwide. That will cost tens of billions of euros, but I think that kind of transition is affordable in the packaging industry, for example,' says Van Haveren. 'A mushroom box or a soft drink bottle would only cost a few cents more.'

JAN VERHAGEN
Agriculture and Climate researcher

'Precision agriculture could reduce emissions by a lot'

VEGETABLE OIL

Kicking the fossil fuel habit for transport would carry a heftier price tag, however, Van Haveren warns. 'To pay three to five times more for a litre of petrol or diesel would be unacceptable,' says the researcher, who does not yet envisage seeing Boeings or supertankers running on biofuels. 'That is partly >

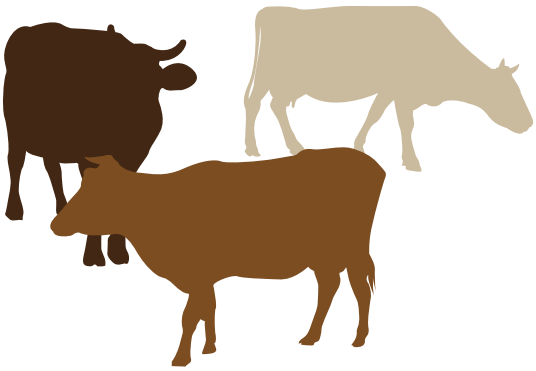
JACCO VAN HAVEREN
Biobased Chemicals and Fuels programme manager

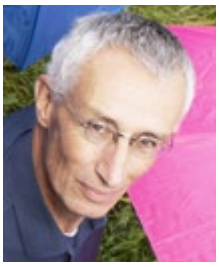
'By switching to biopolyesters, we could save millions of tons of CO_2'

because only five per cent of the biomass can be pressed into vegetable oil.' Biomass consists largely of lignocellulose, the hard parts of plants, which is much harder to refine. They do, however, harbour a wealth of undiscovered substances. Van Haveren and his colleagues have succeeded in getting a glimpse of these treasures. 'We can extract additives for asphalt from them, ingredients for home and personal care products, and glues for construction materials. It is also possible they could serve as shipping fuel.' Van Haveren thinks 10 to 15 per cent of greenhouse gas emissions – 'a conservative estimate' – could already be avoided by going biobased. He would like to see that happening more. 'The established chemical and oil industries are going on defending their interests as long as possible. But look at the car industry. They resisted change for decades, but suddenly things are moving very fast. All the brands are working on electric cars. So I take heart when I think of the plastic producer who this month first rejected our proposal for replacing biobased polypropylene with PET-type polyesters. He changed his mind last week and does want biobased PET now.'

SVEN STREMKE
Landscape architect

'The Netherlands has always been an energy landscape'





THEUN VELLINGA
Livestock and Environment researcher

'We can drastically reduce methane emissions per litre of milk'

'We must deal with the rising temperatures by heating our houses with sustainable fuels rather than natural gas, driving electric cars and making food production and consumption more sustainable,' says Tim van Hattum, Green Climate Solutions programme leader at Wageningen Environmental Research. But the climate problem is already having such an impact, he adds, that we must adapt to consequences such as the incidence of extreme weather, even in the Netherlands. 'Adapting to climate change consequences can be done by greening cities and reserving space for water storage.' Van Hattum is primarily interested in combinations of reducing CO_2 emissions (mitigation) and adjusting to climate change (adaptation). 'If, for example, we reserve a peaty soil area for water storage, we are also doing something to prevent emissions of CO_2 and methane from the oxidizing peat.'

NATURE-BASED SOLUTIONS

His term for these kinds of solutions is 'nature-based climate solutions'. 'The raised groundwater level keeps the peat a lot wetter. Which incidentally helps prevent soil subsidence.'
Van Hattum sees building with nature as another nice example of combining mitigation and adaptation, with other goals being addressed along the way. In the Ems-Dollard estuary, for instance, sludge is removed from the murky water, improving the water quality and enabling nature to thrive. Once on land, the sludge ripens over a few years into clay that is used to reinforce dykes in the face of rising sea levels (adaptation). This in turn saves on transportation by road and sea from the Baltic states, where the clay normally comes from (mitigation).

DESIGNING ENERGY GARDENS

Like Van Hattum, Sven Stremke, a landscape architect in Wageningen, aims at a combination of goals that can be achieved through climate measures, of both the mitigation and the adaptation kind. He works with Nature and Environment Federations in three provinces on designing 'energy gardens'. 'The gardens are a few tens of hectares in size, and half of that is reserved for solar panels. The other half is used for other goals such as recreation, nature development and education. We want school classes to visit them every day,' says Stremke.
The solar farms – large areas of blue-black solar panels – are controversial. A lot of people think they are ugly and a blot on the landscape. For Stremke, that is not a reason

to hide the two sources of sustainable energy we have – wind turbines and solar panels – or to try and fit them into the landscape entirely. 'We've got to embrace renewable energy sources all over again,' he believes. 'With its historic windmills and its peat bogs, partly dug up for turf, the Netherlands has always been an energy landscape. Kinderdijk with its numerous windmills is a world heritage site. It was developed over a period of 250 years. Now we've got to reintroduce the energy landscape in 25 years.'

IT IS NOT ENOUGH

'All of this is inspiring and I find it very cheering,' says the outgoing 'climate ambassador' of Wageningen University & Research Bram Bregman, who will head the Natural and Rural Areas sector at the Netherlands Environmental Assessment Agency from December 2019. 'But it is not enough to reduce global emissions of 40 gigatons of CO_2 to zero by 2050, nor to keep the temperature rise to below 1.5 degrees Celsius, I'm sorry to say. Agriculture and land do account for 25 per cent of the emissions, but the remaining 75 per cent are down to industry and consumers. So radical behaviour change is needed: less flying and more environmentally-friendly production and consumption. But the IPCC scenario for that is considered unrealistic. Other IPCC scenarios therefore include large-scale storage of CO_2 in underground reservoirs or as biomass in trees. Iam sceptical about that. We don't have the technology for large-scale storage and there is no guarantee that the CO_2 will remain in the biomass or the ground. Eventually, that CO_2 will be released again. What is more, there isn't the popular support for it, especially not for underground storage. So we shall have to factor the harm done to the climate into our economy by putting a price on damage to ecosystems, including such things as a CO_2 tax.'

BRAM BREGMAN
Nature and Rural Areas sector head at PBL

'Harm done to the climate should be factored into our economy'

That the government should be taking more initiative to address the climate crisis is a widely shared view among Wageningen scientists. Firmer policy, better enforcement and giving producers and consumers incentives to change, through a CO_2 tax for instance, are necessary measures for averting the climate crisis. But the political reality is more intractable than the scientists' wishes, notes Robbert Biesbroek of the Public Administration and Policy chair group. International climate conferences get organized at which targets are set, but they are largely consensus-oriented, says Biesbroek. 'Whereas there are always countries that set other priorities. Brazil and Indonesia, for example, want to convert forest into farmland in the service of their economic growth. Exactly as we did in Europe for hundreds of years, when we demolished our forests. We have remarkably few instruments at our disposal for enforcing the implementation of international agreements. And on top of that, politics is a matter of making choices. The government simply cannot do everything at once. And then they often make choices in the interests of short-term benefits that people experience directly, such as health care and pensions.'

INTEGRAL VISION

'Recent Dutch cabinets were no different in preferring practical and short-term solutions, but now The Hague can't duck out of developing a long-term vision on what the Netherlands will look like in 2100 and beyond. That must encompass choices regarding agriculture and landscape, including the social dimensions,' says Biesbroek. 'How you fund the energy transition, for example, how you avoid inequality, and how you deal with protests against wind turbines. To some extent you can organize it along the same lines as the Delta programme for water safety. That is based on a long-term vision that can withstand the short-term political thinking.' ■

www.wur.eu/climate

ROBBERT BIESBROEK
Public Administration researcher

'Recent cabinets preferred short-term solutions'

Agrofood meets high-te

Wageningen wants even more collaboration with partners, says the strategic plan of early 2019. WUR is investing heavily in linking agrofood with data science, artificial intelligence and nanotechnology so as to address health and climate challenges.

ILLUSTRATION JEROEN MURRÉ

Collaborating with other research institutes and companies is a familiar line of approach at Wageningen University & Research. But now that 'Finding Answers Together' has been adopted as a spearhead policy in the strategic plan for 2019-2023, links are being intensified, extended and given more substance. 'We know that institutes and disciplines cannot tackle the global challenges on their own,' says rector magnificus Arthur Mol. Wageningen is going to work closely with partners such as Eindhoven University of Technology, Utrecht University and the latter's Medical Centre. The four boards plan to sign an agreement around the New Year. 'Wageningen and Eindhoven are fully complementary,' says Mol. 'In Eindhoven they are interested in agrofood and sustainability and want to work on them with us. And we want to invest in data science and artificial intelligence: topics Eindhoven has fundamental knowledge on.'

ARTIFICIAL INTELLIGENCE

Wageningen and Utrecht have a lot of common ground too. 'Animal scientists in Wageningen work a lot with the Veterinary Science faculty in Utrecht, the plant researchers already collaborate on the topic of phenotyping, and in the environmental sciences we are collaborating in the research school Sense,' says Mol. Utrecht University's Medical Centre was brought in on the collaboration too. 'Our nutrition groups are keen to work with them on healthcare issues. So last year the four institutions got together and decided to start experimenting with intensive collaboration, initially on molecular life sciences, artificial intelligence and education.'

In terms of education, the four partners are primarily interested in synchronizing their efforts towards educational innovation and increased flexibility. They also aim to make their courses more accessible to each other's students. Mol: 'It should be made easier for Wageningen students to take a course or a minor in Utrecht or Eindhoven, and vice versa.'

INVESTING

Each of the partners will invest one and a half million euros a year for the next four years. 'So we are going to invest 24 million euros altogether. In March 2020 we shall hold a meeting in which our scientists will explore the form the collaboration will take.' Wageningen was admitted to another collaborative partnership three years ago, when the 3 TU Federation made up of the technical universities of Delft, Eindhoven and Twente became 4TU.Federation. 'There is tremendous public demand for technologists who are also sensitive to social and ecological issues,' says Executive Board chair Louise Fresco, who took over as chair

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of the federation for two years from the end of October. 'It was logical to join forces. Researchers must start being more in touch with each other. One example is the Plantenna programme, which we are implementing together, researching whether we can use a plant as a sensor. That means opening up a whole new territory, and if you only have one way of looking at things, you don't see everything. We are expanding in the domains that are important to us, such as artificial intelligence and the circular economy principle. We are not going in a new direction but we are getting some new input. Access to expertise, people and talent.'

> **'If you only have one way of looking at things, you don't see everything'**

ONEPLANET

Another striking result of a new partnership is the OnePlanet Research Centre, an initiative by Wageningen, Radboud University and its Medical Centre, and imec, a leading international research centre in the field of micro-electronics and nano-technology. OnePlanet, which moved onto Wageningen Campus in May and has a branch in Nijmegen, is being supported by the Province of Gelderland to the tune of 65 million euros over eight years. Another 81.5 million euros needs to be added to that by other institutions, government bodies and businesses. The ambition is to grow from a staff of 35 in 2019 to about 120 in 2028, and to develop ground-breaking digital innovations for addressing the major social challenges related to health, the environment and agrofood. Biodegradable mini-sensors that you sow among your potatoes, watches that offer you personalized dietary advice, microchips that tell you the use-by date of your chicken fillet: all this should be on the market in about 10 years' time, if it's up to OnePlanet.

BIOECONOMY UNIVERSITY

It is not just in the Netherlands that research ties are being strengthened. Six European universities are pooling their research, education and innovation on the bioeconomy, in the European Bioeconomy University. This consortium, which was presented in July, includes Wageningen from the Netherlands, AgroParisTech (France), the University of Eastern Finland (Finland) the University of Bologna (Italy), the University of Hohenheim (Germany) and the University of Natural Resources and Life Sciences in Vienna (Austria). 'Every one of these universities is a front-runner in its own country in the field of the bioeconomy,' says Luisa Trindade, professor at the Laboratory for Plant Breeding, who represents WUR in the consortium.

The international Agrofood 5 Alliance had already been launched in 2018; this is a partnership focusing on agriculture and food formed by Wageningen, China Agricultural University, Cornell University (US), UC Davis (US) and the University of São Paulo (Brazil). 'Our shared mission focuses on educating the leaders of the future with the aim of helping to bring about changes to the food production system,' says Tiny van Boekel, emeritus professor and a former dean at WUR, who was involved in establishing the Alliance. 'We want new generations of students to start learning to work on the world food supply problem during their degree programme.' ■

More information about these and other collaborative ventures involving Wageningen at: www.wur.eu/collaboration


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Tackling sleeping sickness with zebrafish

High-speed cameras have revealed for the first time how parasites that cause sleeping sickness move around and penetrate their host. This could help in the battle against this fatal disease. The researchers used live zebrafish. 'You can see exactly what is happening in their bloodstream.'

TEXT NIENKE BEINTEMA **PHOTOGRAPHY** ALDO ALLESSI **INFOGRAPHIC** PETRA SIEBELINK

New videos made by Wageningen researchers reveal a fascinating sight. Elongated tadpoles are tumbling and swirling in a network of fast-flowing streams. But the real scale is 10,000 times smaller and these are not tadpoles, but trypanosomes: unicellular organisms in the bloodstream of a transparent zebrafish. Trypanosomes are a group of parasites that cause sleeping sickness in Africa and Chagas disease in Latin America (see text box). In the footage they seem to float through the blood vessels in an aimless, almost languid fashion. They don't use their flagellum – or 'tail' – for propulsion, as has always been presumed, but go wherever the bloodstream takes them. They can, however, stick to the wall of a blood vessel with their backs and then enter their host's tissue. This is important new information, offering a starting point in the battle against these diseases. The results were presented in the September issue of the scientific journal *eLife*.

'Sleeping sickness and Chagas disease are what we call neglected diseases,' says Maria Forlenza, associate professor in the Cell Biology and Immunology group. 'Worldwide they cause thousands of deaths per year, but they receive relatively little scientific attention. Why? Because they are less deadly than diseases like malaria. And because it is very difficult to find funding for the kind of fundamental research that is needed to understand how these diseases work at the parasite level.'

ECONOMIC IMPACT

Trypanosomes may kill fewer people than the malaria parasite, yet they are a much bigger economic factor, says Forlenza. This is because certain variants of the parasite infect livestock. 'Almost all sheep, cows and goats in Africa carry trypanosomes in their blood,' she says. This huge parasite reservoir does not directly affect human health, because it concerns a livestock-specific variant that is harmless to people. Just like the human variant, however, it is easily transferred by tsetse flies. 'The parasite doesn't kill the animals, but it weakens them,' explains Forlenza. 'Infected livestock have much lower milk yields and muscle mass.' Incidentally, trypanosomes are the reason that attempts to introduce high-yield Dutch dairy cows in Africa have failed: unlike their African relatives, Dutch cows have not evolved any resistance to the disease, which kills them.

> 'You need this fundamental knowledge'

Forlenza and her colleagues have revealed for the first time how the parasite moves and behaves in a living host. 'Conventional laboratory animals like mice are no use in >

PHOTO ALAMY

Transport for a sleeping sickness patient near Lake Victoria in Uganda, 1906.

'Worldwide they cause thousands of deaths every year'

this kind of research,' she says, 'simply because you cannot look into their moving bloodstreams and living tissues under a microscope. That's why we used live zebrafish. Very young zebrafish are transparent so you can literally see what is happening in their bloodstream.' Forlenza used a trypanosome variant that naturally infects fish and that is very comparable to the human variant. In addition, zebrafish have veins and arteries that closely resemble ours and their immune system works in much the same way.

In these *in vivo* studies, the researchers were able to prove that current models and assumptions about how trypanosomes move and infect their hosts are incorrect. 'All previous research has been based on *in vitro* studies and computer modelling,' says Forlenza. 'To me, one of the most important messages of our study is that in some cases, live animal models are still needed. Today's trend is to minimize animal experiments, which I fully support – but we have shown that sometimes there is added value in using an actual host and seeing how the parasite really behaves *in vivo*.'

CLINGING TO THE VESSEL WALL

It was previously thought that trypanosomes use their 'tail' to move around actively in the bloodstream. Hence, strategies to block this type of parasite have focused on the motor proteins that make their tails move.

However, the footage that Forlenza and her colleagues filmed at 500 frames per second now shows that there is no active propulsion.

The footage also reveals how the parasite attaches itself to the walls of blood vessels. 'This attachment is very similar to that of our own immune cells,' explains Forlenza. 'The parasites, just like white blood cells, can attach themselves to the walls of veins, but not to those of arteries. Apparently there is something in the make-up of vein walls that makes them penetrable – and the parasite has found a way of moving in and out of the bloodstream just like our own immune cells.'

The footage showed that the parasite first touches the wall of the vein with its back. Interestingly enough, this contact site is not on the same side as the tail. As the tails of single-cell organisms more often pull them along than push them, we call the side they are on the front. 'That is one of our major discoveries,' says Forlenza. 'While the parasite is attached to the vein wall, the flagellum is still free to move. It may play a role in pushing the parasite through the wall, into the tissue.'

The researchers suspect that, just like immune cells, trypanosomes use adhesion molecules, or 'glue' molecules, on their surface to attach themselves to proteins on the surface of vein cells. 'We are now zooming in on which proteins these may be,' says Forlenza, 'and we have found some very promising candidates.'

FAST BLOODSTREAM

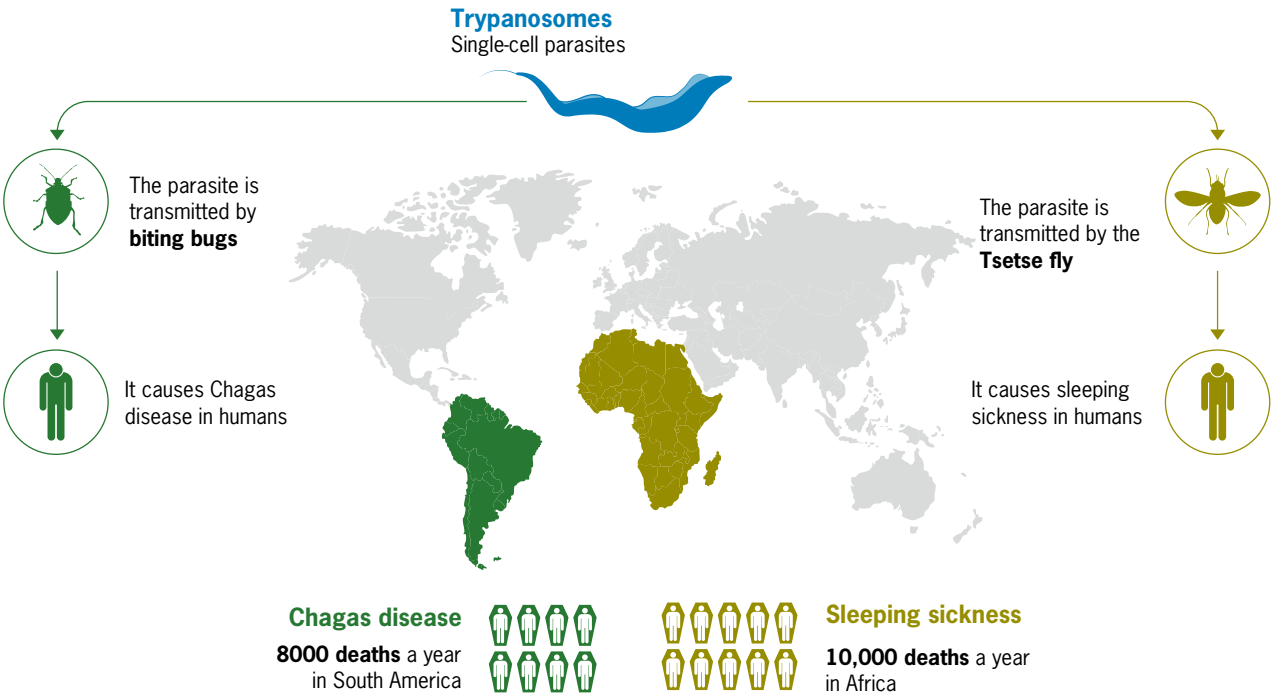
Looking more closely, as Forlenza points out, you can see that the parasite attaches itself to the blood vessel wall with the very tip of its back. 'You can also see how strong the bloodstream is', she continues. 'The red blood cells rush by at high speed, and push past the parasite quite violently. Then look at how tiny the contact area is between the parasite and the wall. This glue protein must be very, very strong.'

What if scientists were able to block this surface protein? Either directly, by altering it with certain other molecules, such as antibodies, or indirectly, by blocking the gene that codes for the glue protein? Forlenza and her colleagues explored this possibility by producing mutant trypanosomes in which they labelled different surface proteins with colours that are distinguishable under the microscope. 'One of the mutant proteins seems to be located exactly where the parasite attaches to the host,' says the researcher. 'Now we have a nice starting point for our follow-up research: to see what happens if you alter or disable this protein in the par-

SLEEPING SICKNESS AND CHAGAS DISEASE NEARLY ALWAYS FATAL

Sleeping sickness and Chagas disease are both caused by single-cell parasites, trypanosomes. Sleeping sickness is caused by a different variant than Chagas disease.
Sleeping sickness occurs in Africa, where the parasite is transmitted by the Tsetse fly. **Chagas disease** holds sway in South America, where it is spread by beetle-like biting bugs.

These diseases are nearly always fatal. There are drugs for both diseases but they are pricey and have severe side effects.
No treatment is available in many parts of Africa and South America. Sleeping sickness kills about 10,000 people a year in Africa, although some sources speak of between 50,000 and 500,000, saying that many cases go unnoticed. The figure for South America is about 8000 deaths per year.



asite – or if you create antibodies that target it. I am pretty sure that one of these routes will prove successful in the fight against these diseases.'
Forlenza is currently writing grant proposals for this follow-up research, together with the University of Cambridge. 'In the UK there is more funding for fundamental research on neglected diseases,' she explains, 'and a lot of experience in this area. We've already been collaborating for many years.'

MEASURING FORCES

This research also requires collaboration within the WUR Department of Animal Sciences. 'My own group, Cell Biology and Immunology, contributes in the area of host-pathogen interactions,' says Forlenza, 'and the biomechanics expertise comes from the Experimental Zoology group. They have world-class experience in the use of high-speed cameras, with which you can measure forces and analyse movements. That combination of specialisms is powerful.'
It may take at least 10 to 15 years before this research results in a clinical application such as a vaccine against sleeping sickness. 'Every sub-project takes at least four to five years,' explains Forlenza, 'even just to confirm, for example, that these proteins really are important factors in the disease. And then we still need to find a company that is interested in taking the idea further.'
Progress may be slow, but every little step is important, says Forlenza. 'You need this fundamental knowledge,' she underlines. 'For a very long time there have been all these assumptions about trypanosomes, but what you need is to show what actually happens *in vivo*. "Seeing is believing" is our motto.' ■

www.wur.eu/sleepingsickness

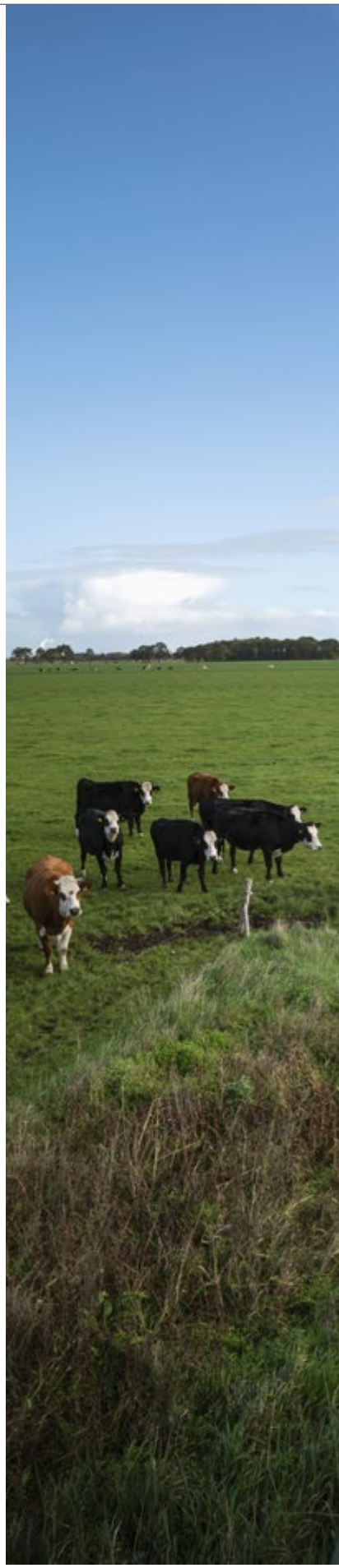
Closing cycles together

The Dutch ministry of Agriculture, Nature and Food Quality does not have a blueprint for the circular agriculture it is aiming at. The idea is that the approach will be developed in a patchwork of initiatives in which farmers, conservationists and scientists work together. The first of these are taking shape.

TEXT ALBERT SIKKEMA **PHOTOGRAPHY** REYER BOXEM

Maurits Tepper, joint owner with his wife Jessica of Eytemaheert farm, is busy building a 'skybox' in honour of the big shots from WUR and the ministry of Agriculture who will be visiting the farm tomorrow. They'll be able to survey his Groningen Blaarkop cows from the raised platform in the shed. They are coming to discuss a research programme at this brand-new experimental farm of Wageningen University & Research's.

We are in Leutingewold, at the northernmost tip of the province of Drenthe. Eytemaheert borders the Onlanden, a Natura 2000 reserve. It's a vulnerable area in terms of nitrogen, but Tepper is keeping his cool. His farm is to be a showcase example of a livestock farm with a closed manure and nitrogen cycle. Eytemaheert has 500 Groningen Blaarkop cows for meat production. The meat is sold directly to consumers through a webshop. The cows are entirely grass-fed and the farm buys no feed or manure from elsewhere. But it does process grass clippings from the nearby nature reserve into the fertilizer bokashi. 'The nitrogen-rich clippings from the nature reserve compensate for the nutrient loss from the farmland due to grazing cows,' says Tepper. He would like further research done on bokashi, a mixture of grass clippings, chalk, clay and micro-organisms that break down the cell structure of the hay. 'Together with Staatsbosbeheer (the state nature service) and Natuurmonumenten (a nature conservation organization), we want to look at how other farmers could make use of this bokashi too. That is not possible at present because if you transport it more than five kilometres it comes under the Waste Substance Act and farmers



Maurits and Jessica Tepper of Eytemaheert farm in Drenthe.

must record it in their fertilizer records.' Tepper will probably get his research because last summer, Eytemaheert became one of Wageningen University & Research's experimental farms for nature-inclusive circular agriculture. Martin Scholten, director of the Animal Sciences Group, wants to explore new opportunities for putting circular agriculture into practice, he explains on Eytemaheert's website. Tepper and his wife will still own the farm, but they are keen to have the nitrogen cycle quantified by Wageningen researchers. And they intend to start milking their Blaarkop cows, so that they turn into 'dual-purpose' cows producing both milk and meat.

NATURA 2000

Tepper thinks the Blaarkop cows can produce about 5000 litres of milk per year – half of standard production levels. He wants to make cheese with some of it. Wageningen could also study this business model with dual-purpose cows. 'This business model works well near Nature 2000 areas,' thinks Tepper. His guess is that his farm does not produce much ammonia, because he doesn't import any nitrogen in the form of feed concentrate and artificial fertilizer, but actually removes nitrogen from the nature reserve with the bokashi. What is more, the cows spend most of their time out in the fields, so their cowpats and urine do not get mixed and no ammonia is formed that way. He is also thinking about how he can increase biodiversity on the land using mixed grass and clover, and creating hedgerows that produce hazelnuts, providing food and nature at the same time.

The representatives of the ministry and WUR are coming tomorrow to consult Tepper about a research programme at the farm that is aimed at finding out what effect his farming system has on biodiversity and soil life, and what effect the bokashi has on his nitrogen cycle. Tepper: 'We must start measuring and finding out if it's any good.' >

'The cows are entirely grass-fed – no feed comes in from elsewhere'

Hans Bergsma, director of Westerkwartier regional cooperative in Groningen.

> **‘The farmers are looking at how they could make use of each other’s waste streams’**

Hans Bergsma, director of the Westerkwartier Regional Cooperative, is sitting in an office in the village of Noordhoorn with four law students from the Hanze University of Applied Sciences in Groningen. They are poring over a folder that describes the key features of the planned new Food Factory. The food suppliers are listed on the left-hand flap: livestock farmers, arable farmers and horticulturalists from the region. Their clients are listed on the right-hand flap: hospitals, care institutions, schools and restaurants in Groningen. In the centre is the Food Factory, which is going to slaughter animals, process food and make meals. A regional food chain is in the making.
The task of the law students is to figure out how participants in The Food Factory can sort out issues around intellectual property rights. The investors in the factory, including the regional cooperative, a project developer and processors of food and waste streams, contribute their knowledge of processes and their patents. The law students have to work out how these things should be valued.
This regional cooperative was started at the end of 2013 by an agricultural nature association of about 500 farmers, Staatsbosbeheer and a vocational training college, Terra Groningen. Since then the Rabobank and an energy cooperative have joined too, says director of the cooperative Bergsma. The aim is to find new business models for farmers in the Westerkwartier region. Bergsma thinks The Food Factory can offer farmers inthe regional supply chain 10 to 20 per cent higher prices, starting with 50 to 70 farmers who are going to supply food to hospitals and care providers in Groningen. The necessary planning permission for The Food Factory, to be built near Leek village, has been granted.
The Westerkwartier is farmed by conventional farmers who are looking for alternatives to the export-based business model, says Bergsma. ‘At the same time, we want to restore the relationship between farmers and the villages. So a transparent regional chain which enables consumers in Groningen to know where their food is coming from fits the bill.’

WAGENINGEN SPECIALISTS

Once the regional food chain is established, Bergsma wants to further develop circular agriculture, with WUR’s help. ‘Within the regional cooperative, livestock farmers, arable farmers and horticulturalists are now talking to each other about things like how they can use each other’s waste streams. This involves them in the issues around CO_2 and nitrogen. I hope Wageningen specialists can tell us how they can best look after the climate and nature.’
Bergsma wants to collaborate on this with the Fjildlab in nearby Buitenpost, where a local association, Noardlike Fryske Walden, is working on circular agriculture with Wageningen.

SO WHAT IS CIRCULAR AGRICULTURE, EXACTLY?

The Dutch cabinet wants the agriculture sector in the Netherlands to make a transition to a form of agriculture that primarily contributes to closing cycles, cutting emissions and reducing biomass waste in the food system. The cabinet also wants Dutch agriculture to strengthen the socio-economic position of farmers in the supply chain and help make the countryside more attractive and dynamic. Further objectives are to benefit nature, improve animal welfare and strengthen relations between farmers and other citizens.

Wageningen alumnus Albert van der Ploeg has a small business with beef cattle and sheep in the north-east of Friesland. But today he is at a meeting in the Fjildlab, the innovation workplace for circular agriculture in north-eastern Friesland which he heads. He is also chair of the Noardlike Fryske Walden association, in which about 800 farmers and individuals collaborate on agricultural nature management and landscape restoration in this bocage landscape.

> ‘The farming system no longer meets the demands of society’

HEDGEROWS

The farmers aim at managing a small-scale landscape with hedgerows, field birds and biodiversity, says Van der Ploeg. The innovation workplace has eight expertise groups in which farmers can exchange knowledge on topics such as the use of manure and sustainable soil management.
Wageningen is closely involved in this Fjildlab. Researcher Durk Durksz is the project leader and Ingrid van Huizen, who was director of the Fryske Walden association for years, is now Wageningen’s circular agriculture programme manager for the northern Netherlands. In this capacity, she links questions coming from the region to researchers in Wageningen. And not just in Friesland, she adds. ‘We want to find answers together with Eytemaheert and the Westerkwartier Regional Cooperative too.’
Van Huizen: ‘Our starting point for circular agriculture is the vision of WUR professor Imke de Boer. She wants us to use plant-based food solely for human consumption, and to feed livestock on grassland and waste streams. The farmers in this region have been practising circular agriculture for years. In the Fjildlab expertise circles, we are looking at the research needs of these farmers and we want to bring in the relevant scientific knowledge for them. One example is a project we have submitted on the use of human faeces in agricultural cycles.’
Van der Ploeg is aiming at an agricultural transition. ‘The farming system no longer matches the demands of our society,’ he says, referring to the nitrogen and manure problem and the falling numbers of insects and field birds. ‘We are looking for system-wide changes.’
Just like Eytemaheert, the Fjildlab wants to document the manure and nitrogen cycles of dairy farms and experiment with fertilizers such as bokashi and sewerage sludge. Van der Ploeg also wants to organize a closed manure cycle between livestock farmers and arable farmers, and to make use of waste streams from potato and beet farmers in the region.

Albert van der Ploeg, who heads the innovative workplace Fjildlab in north-eastern Friesland.

NATURE-FRIENDLY

For the nature management side, he relies on the scope for experimentation in the European Agricultural Policy. Farmers can get grants for creating nature-friendly field edges and hedgerows. Van der Ploeg expects Wageningen to contribute knowledge of biodiversity and landscape to this process. Ecological landscape management requires a business model, adds Van der Ploeg.
‘If you want cheap food, you get the monotonous landscape that goes with it, poor in biodiversity. If farmers want field birds, insects and a rich soil life, they have to do something to attract them. So the government must subsidize farmers to do that. There’s nothing extraordinary about that, because Staatsbosbeheer and Natuurmonumenten get government subsidies for nature management too – they are in the same boat as the farmers.’ ■

www.wur.eu/circularfood

Heads together on sustai

Wageningen ran its first Business Day this year and wants it to become an annual event, giving interested businesses an impression of the most innovative research now in progress. 'I had wanted to get in touch with scientists from WUR for some time.'

TEXT KENNETH VAN ZIJL **PHOTOGRAPHY** JONNE SEIJDEL

In September, interested visitors could find out about new technologies at lectures, brainstorming sessions, workshops and presentations dotted around Wageningen Campus.

'Through the Business Day we aim not only to inspire people, but also to encourage them to engage in dialogue,' says Ruud Duijghuisen, business development manager at Wageningen Livestock Research. 'We hope that people who are interested, including our partners, would like to help think through the challenges facing us now, such as climate change and population growth. We don't have all the answers to the challenges of the future up our sleeves.'
The Business Day was organized by the Value Creation department along the lines of a successful open day for companies in 2018 on the occasion of Wageningen University's centenary. This year, businesspeople, developers and policymakers were introduced to new technologies and their possible applications and impact through lectures, brainstorming sessions, workshops and presentations at venues across Wageningen Campus.

NEW PROTEINS

One of the visitors was Serpil Tascioglu, Research & Development director at Unilever. She wanted to get up to speed on the latest developments in the field of nutrition and technology, she says. She was especially interested in the theme of 'new proteins': the search for sustainable new sources of protein as substitutes for meat and dairy. 'You see more and more people buying plant-based products. I came to the Business Day to find out how Unilever can help with that. Ultimately, we want to have more sustainable plant-based products on the shelves.'

INNOVATIVE SPIRIT

The big surprise of the day for Tascioglu was that you meet people you don't come across in your day-to-day work. 'Very inspiring to experience that there is a great big world outside Unilever.' She was struck by the innovative spirit and drive with which young researchers do pioneering work in startups in the field of food technology. 'I get a lot of energy from that.'
'I have had many interesting conversations with mostly new contacts,' says Marc Arts, founder and director of Greenfoods50, a campus-based company that develops food ingredients. 'My main reason for coming to the Business Day was to exchange ideas with other people about how to make food systems more sustainable. And of course I wanted to show how our innovative quinoa ingredients, based on quinoa seeds

nable food production

SET THE BAR HIGH

Alumnus Onno van de Stolpe was the keynote speaker at the Wageningen Business Day. Van de Stolpe (Plant Pathology, 1986), founder and CEO of biotechnology company Galapagos, talked about how his company has grown in 16 years from a small startup in Leiden with an idea for an anti-inflammatory treatment for rheumatoid arthritis into one of the biggest biotech companies in Europe. Van de Stolpe: 'Value creation requires stamina. By making a deal with a pharma company, we have ensured that we can't be taken over for the next 10 years. That enables us to work on developing our original ideas.' His lessons: 'Stick to your plan; always think about the financing; be agile and think big. I said from early on, much to other people's amazement, that we would become leading in biotech in Europe. Set the bar high and keep your ultimate goal in mind.'

> 'We aim to inspire people and encourage dialogue'

bred in Wageningen and grown in the Netherlands (without pesticides) can contribute to this.'

AUDIO-RECORDING ANALYSES

Dirk Nordwig drove all the way from southern Germany especially for the Business Day. Nordwig is a senior consultant with a small software company, Dawin. 'We support scientists in the field with software with which they can audio-record results and analyses using a headset. The data is stored and categorized on a computer, while the researcher can just carry on working.'

Dawin works mainly with scientists in Germany, Austria and Switzerland. 'Of course I've heard of Wageningen University & Research, but I've never been here before. I've wanted to get in contact with the scientists from WUR for some time, because I had already understood that the procedures regarding collaboration between private parties and the university are excellent here. I wanted to talk to those Wageningen guys, so when I heard about the Business Day, that was a perfect opportunity.'
Dawin offers its software free to research institutes. A win-win situation, according to Nordwig. The comments, questions and experiences of their researchers help Dawin to further develop and optimize its software.

PHENOTYPING

Nordwig wanted to talk to as many people as possible and collect business cards. 'I have talked to a lot of very interesting people, including Rick van de Zedde from the Plant Sciences Group.' Van de Zedde spoke about the up-and-coming phenotyping technology with which the growth andhealth of plants can be screened automatically.
Nordwig hopes shortly to run a workshop for Van de Zedde's group on how Dawin's software can contribute to phenotyping. He has now established the contacts he would need, at least. 'Workshop or no workshop, I got what I came for 100 per cent.' Nordwig is familiar with the concept of a business day from universities in Germany and Austria, but he experienced a fundamental difference. 'I am impressed by how accessible everything is at this event. There are so many places and options for getting into conversation with each other that the match-making feels very natural.' ■

www.wur.eu/businessday

Mixing science with indigenous knowledge

Philosopher David Ludwig is documenting the biological knowledge and spiritual beliefs of local communities in Brazil. And he is looking for ways of integrating them with Western know-how. 'It starts with taking people outside the academic setting seriously as experts, and recognizing that local people understand the local context far better.'

TEXT ALEXANDRA BRANDERHORST **PHOTO** ANP

'In Bahía, a state in the north-east of Brazil, the local people believe that the mythical creature Caipora inhabits the forest. If you harvest too much wood, you will anger Caipora and you will get lost in the forest,' says David Ludwig, a researcher in Wageningen's Knowledge, Technology and Innovation chair group.

In indigenous communities, spiritual beliefs and taboos dictate behaviour and forestall excesses like too much hunting or tree-felling, he explains. 'One part of the forest might be sacred, so you are not allowed to hunt there. Or during a particular period – which turns out to be the spawning season – people are not allowed to catch fish.'

These spiritual ideas often lead to a sustainable way of life, notes Ludwig. 'Indigenous groups have been living in the middle of the rain forest for a long time without destroying it. That is why it is important to consider

An indigenous fisherman looks for crabs in a mangrove forests in Bahia in Brazil.

their way of life and spiritual worldview if you want to help protect their environment. I want to look at how you can integrate spiritual and traditional knowledge with scientific knowledge.'

RELIGIOUS BELIEFS

And these are not a million miles apart, Ludwig thinks. 'Religious backgrounds partly determine how people deal with challenges. Secular scientists often don't realize how their own perspective is shaped by Judeo-Christian beliefs. We see culture and nature as two different, separate matters. That way of looking at them has arisen from our religious history. But in other cultures, people don't make such a sharp distinction. Indigenous communities often feel a sense of moral responsibility towards plants and animals, the river or the forest, whereas Western researchers only feel a responsibility towards other people.'

'I study the misunderstandings that can arise when groups with different worldviews come together, and how you can forestall problems,' says Ludwig. He explains that for scientists, for example, it can be hard to understand why it is wrong in the eyes of indigenous people to build a canal or dam on a sacred river or in a sacred area. He cites another well-known example in relation to hunting wild sheep in Canada: 'To prevent the extinction of the sheep, nature conservationists proposed only allowing hunting ofolder males who no longer had a role to play in reproduction. That proposal shocked the indigenous residents, for whom respect for elders is an important value. It was as though the ecologists had proposed culling the elderly members oftheir own community.' >

PHOTO DAVID LUDWIG

David Ludwig on his way to the mangrove forests near Siribinha, Brazil. A researcher teaches children on the beach about whales and nature conservation.

‘Technologists often have a let’s-get-things-done mentality’

David Ludwig studied philosophy. He wants to make his knowledge ‘relevant to many people’s daily life and social reality.’ So in Wageningen he specializes in ethnobiology, in which researchers document the biological knowledge of ethnic groups. But he is also interested in the interaction with Western science. For example, he studied how the interaction goes in the Brazilian state of Bahía between academics from different disciplines and local fishers. The latter live in villages with a population of a few hundred and traditionally live off catches of fish and crab from the ocean and the mangrove forest, where they are dependent on the tide. But increasingly, the outside world is impinging on their way of life. Villagers are leaving for the cities, and tourists are trickling into the village. A nearby factory is polluting the water, the mangrove forests are shrinking and the fishing boats are getting bigger.

The Federal University of Bahía is working here on nature conservation and studying rare species and sustainable fishing practices together with the local population and the government. Ludwig: ‘I look mainly at the way fishers, scientists and the government tackle the problems together. Where do power discrepancies show up and where do tensions arise?’

He also studied the role of the fishers’ spiritual worldview. They are the descendants of the indigenous community and escaped slaves. Traditionally they are Catholics, a faith which allowed them plenty of scope for integrating elements of local beliefs. ‘But in recent years more and more people are becoming evangelical, thanks to the active mission work of evangelical churches. These and other changes have an impact on the traditional knowledge about nature and fishing. I research those effects too, as well as the efforts to document and pass on that knowledge. Educationalists, for instance, are looking at how they can integrate traditional knowledge into local education.’

Ludwig is also doing research among the Kayapo, an indigenous tribe in the Brazilian Amazon region. 'I mainly study the differences between the traditional knowledge of the more isolated Kayapo community in the rainforest and that of the fishing community in Bahía, who speak Portuguese, who are Christians, and whose children go to school.'

MEDICINAL PLANTS

In September 2019, Ludwig was awarded a five-year research grant of 1.5 million euros by the European Research Council. Earlier this year, the Dutch Research Council, NWO, gave him a VIDI grant worth 800,000 euros. All that grant money enables him to do research in Mexico alongside his work in Brazil. Together with the National Autonomous University of Mexico (UNAM), he is going to study the biological knowledge of the indigenous population in the south of Mexico. What is the role of this knowledge in hunting, farming, food preparation and medicine? 'The indigenous population speaks Maya and Zapotec languages,' says Ludwig. 'But Spanish is squeezing out that linguistic diversity and with it the local knowledge expressed in the language. Age-old knowledge is therefore under threat, including knowledge about the medicinal effect of plants. Yet that knowledge could be useful in other parts of the world, and could contribute to nature conservation. Some of that knowledge is locked into the language and the indigenous systems for classifying plants and animals.' Those systems can be very different to the way we categorize plants and animals in the West. 'Academics classify according to evolutionary criteria, while the indigenous categories are often based on their usefulness or role in the area. Birds and bats have in common that they fly, eat fruit, distribute seeds or eat insects. So some indigenous tribes see bats as birds, whereas scientists would say they are mammals. According to biologists, plants and fungi are two different things, but indigenous people give them the same name if they look the same, serve the same medicinal purpose or can be used the same way in cooking.'

Do you have any advice for scientists about contact with indigenous communities?

'It starts with taking people outside the academic setting seriously as experts, and recognizing that local people understand the local context far better. You need a kind of humility as an academic. On that basis, you can begin a dialogue that is respectful and two-way. It is also important that you examine your own ideas and worldview, form an idea of the norms and assumptions of others and learn to relate to them. Sadly, we have a tradition of ignoring local communities and their knowledge. Of course, there has already been some improvement, but you get scientists who perhaps aim at boosting harvests finding that local communities don't act on their recommendations. In that case you must take people's doubts seriously and find out what underlies them. Good intentions are not enough.'

'You need a kind of humility'

Surely the need for recommendations to fit local beliefs and practices sank in a long time ago?

'Of course the world of development work became more self-aware at some point. For decades, social scientists have argued for more collaboration and inclusion of all stakeholders. It is now more a case of "finding answers together". But it is not so easy to actually realize that. Natural scientists and technologists often have a let's-get-things-done mentality and are very optimistic. Sometimes that works out well, but they can also impose their ideas on people too much, and tend not to take problems seriously. Social scientists are more critical and engage more in self-reflection. They tend to point out all the problems, such as the fact that a process is not truly participatory, or that it reinforces existing power relations in the society. But that attitude can be counterproductive too. The challenge is to stay critical and address the problems without becoming pessimistic or cynical.'

Do you experience that challenge yourself?

'Oh yes. Brazil has a government that denies climate change and leaves indigenous communities out in the cold. As a scientist, it is not nice to have to take sides. I am not a development worker, and I try to remain a critical observer and outsider. At the same time, I would really like to support the indigenous communities, in terms of education and developing educational material, for instance, and by helping increase our appreciation of indigenous knowledge.' ■

www.wur.eu/etnobiology

Luring pests with LED lamps

The thrips is a pest insect dreaded by horticulturalists. Rob van Tol has designed a trap for catching the insects using LED light. But what light composition are they most attracted too? It turned out that Dutch and German thrips have different ideas about that.

TEXT ROELOF KLEIS **PHOTO** MARCO HOFSTÉ

In the giant greenhouse at the chrysanthemum nursery G&C Flowers in Gameren, the Wageningen entomologist Rob van Tol displays a cube. This is the prototype for a new generation of insect traps that he is going to test here on thrips, a pest that causes damage to a range of crops, from cut flowers to courgettes and bell peppers.
The hope is that he has found an alternative to the flat, coloured sticky boards that many growers still use to monitor and control their pests. 'Of the thrips that are attracted to a coloured board, only between five and 15 per cent actually land on it. The rest escape. Why is that? Apparently there is something wrong with the trap. The insects come towards it, but once they get close they lose their way and get disoriented. The few that do land are the "crashers", the losers who more or less crash into it.'
The sticky boards are useful for monitoring insects but not really for capturing them in large numbers. And yet that must be possible, thinks Van Tol. 'Actually, so far all the research on insect traps has mainly been empirical. The whole spectrum of colours has been studied for attractiveness to insects but no one has gone into it in greater depth. What do insects actually see? How do they orientate themselves, and which aspects play a role in that? I want to use that basic knowledge to create better traps, the kind that insects do decide to land on.'

CAUSING DAMAGE

Several species of thrips are found in Dutch greenhouses. Horticulturalists currently fight them by setting natural enemies such as assassin bugs on them, or by spraying them with – increasingly ineffective – pesticides. With funding and support from the horticulture organization LTO-Greenhouse Horticulture, Koppert Biological Systems, Lincoln University in New Zealand and the Horticulture Top Sector in the Netherlands, Van Tol has been working for over two years on what he has begun to see as his life's work: the LED trap for the highly destructive Californian thrips. His prototype is the cube which consists of eight sections, each of which can be lit up separately with LED light of different colours and levels of intensity, and with combinations of these.
In a wind tunnel, Van Tol tested the behaviour of thrips when exposed to LED light in this palette of colours. Two infrared cameras made it possible to record the route of each insect in 3D. This setup has already delivered some remarkable findings. One example: thrips always approach a trap from downwind. Van Tol: 'They always land against the wind. They can fly with the wind in their backs, but they can't land. So they fly past the trap and turn to fly into the wind.'

PREFERENCE FOR YELLOW

This may seem a trivial point, but it is not, says Van Tol. 'This is important for designing a good insect trap. The trap must not be

Rob van Tol road-tests his prototype of a new generation of insect traps at chrysanthemum nursery G&G Flowers in Gameren.

> **‘The hungry thrips flies towards anything yellow, mistaking it for a flower’**

flat but three-dimensional so that it is possible to land on it from all sides. That makes the trap more efficient.’ It also transpired that thrips prefer yellow light to blue. Which is interesting, given that blue boards are often used to lure the insects in greenhouses. Moreover, German researchers found a preference for blue, and this held even when the German thrips were tested in Wageningen. ‘The insects reacted in the same way as in Germany, says Van Tol. ‘So it was not due to a difference in the experiment. It is also clear that the host plant on which the thrips are bred plays a limited role. Another explanation might be genetic differences between the two families of thrips.’

To get to the bottom of this, a new series of tests using the LED cube is planned to study the effect of all the possible combinations of yellow, blue, UV and green light. And to complicate matters even more, the hunger factor might play a role too sometimes, says Van Tol. ‘Thrips fly towards yellow because they are hungry and they think it is a flower they are seeing. But a thrips that isn’t hungry might be drawn towards blue. So maybe you need several colours to catch all the thrips. We can figure all that out with the new LED trap.’

Besides colour and contrast, patterns play a role in the orientation. Van Tol shows us his latest toys: LED lights that produce a pattern of concentric circles, stripes or dots. The researchers are pulling out all the stops to seduce the insects into landing. Researchers at Lincoln University working for the Wageningen thrips project on a study of how the insect’s eye works (see inset). The aim is for the insect trap of the future to be the perfect lure. ■

www.wur.eu/cropprotection

THE NITROGEN PROBLEM IS NOT AS BLACK AND WHITE AS IT SEEMS

Less nitrogen is very doable

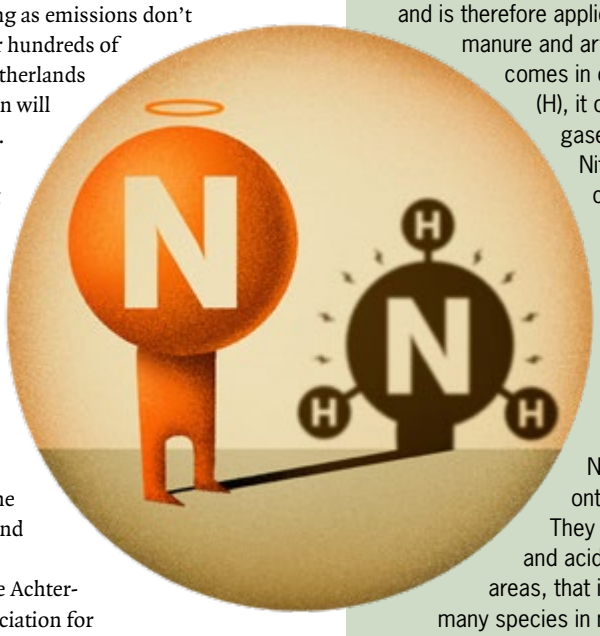
This autumn, Dutch farmers protested en masse against their government's nitrogen policy. But they are also collaborating on research aimed at cutting nitrogen emissions. That is no easy task for pig farmers, but on dairy farms a reduction of 'at least 20 per cent' seems very doable.

TEXT ALBERT SIKKEMA **ILLUSTRATIONS** RHONALD BLOMMESTIJN

On several occasions over the past few months, hundreds of Dutch farmers drove their tractors to the seat of government in The Hague and those of Provincial Councils around the country to protest against the government's nitrogen policy. Measures had been announced for protecting nature areas better against damaging nitrogen deposition (see inset). As the biggest producer of nitrogen in the country, the agriculture sector needed to change the most. And something had to be done fast, because as long as emissions don't go down, planning permission for hundreds of barns, houses and roads in the Netherlands is on hold because the construction will generate extra nitrogen emissions.

At the same time, many hundreds of dairy farmers in the Achterhoek region in the east of the country, the Groene Hart in the west and the province of Overijssel have been testing measures for reducing nitrogen loss on their farms. The farmers' organization LTO supports the protesting farmers as well as the research into lowering nitrogen emissions around nature areas. The nitrogen problem is not as black and white as it seems.

More than 300 dairy farmers in the Achterhoek have joined forces in an association for promoting circular agriculture, *Vruchtbaar Kringloop Achterhoek* (Fertile Cycle Achterhoek). They have been working for years on a voluntary basis to limit nitrogen loss on their farms using the *Kringloopwijzer*, a system for measuring the mineral cycle on a farm that was developed with input from the Wageningen research farm De Marke. Farmers can use the *Kringloopwijzer* to register how much nitrogen comes onto the farm in the form of artificial fertilizer and livestock feed, how much they use on the farm, and what quantity of minerals disappears into surface water and the atmosphere. De Marke, where the mineral cycle has been the subject of study since 1990, then makes recommendations on the measures with which the farmer can reduce nitrogen loss.



SURPRISINGLY POSITIVE

Dairy farmers in the Groene Hart are working on reducing their nitrogen losses too. For the past year, in

WHY IS NITROGEN A PROBLEM?

There is nothing problematic about the element nitrogen (N). It is in the air we breathe all the time, in the form of N_2. It is nitrogen compounds such as NH_3 and NO_x that cause problems, and that we refer to in common parlance when we talk about 'nitrogen'.

Nitrogen is the main nutrient for plant growth, and is therefore applied to farmland in manure and artificial fertilizer. When it comes in contact with hydrogen (H), it can be converted into gaseous ammonia (NH_3). Nitrogen (N) can also be converted into nitrogen oxides (NO_x) during combustion with oxygen. Traffic and industry are largely responsible for this process.

The nitrogen compounds NH_3 and NO_x fall out of the air onto the soil (deposition). They increase nutrient density and acidify the soil. In nature areas, that is problematic because many species in nature need low nutrient densities or an alkaline soil. As a result, species disappear and that has an impact on populations of birds and other fauna. European member states are obliged by the Birds and Habitats Directives to conserve and improve nature in certain areas.

Farmers succeeded in cutting ammonia emissions by 20 per cent'

the Veenweiden Innovation Centre in Zegveld, 10 dairy farmers have been working with researchers on measures for cutting nitrogen losses. Hundreds more farmers are following the results with interest. 'They are surprisingly positive,' says researcher Gerard Migchels of Wageningen Livestock Research. 'With simple measures such as spreading manure that has first been watered down – preferably choosing times when there is little wind and low temperatures – the farmers succeeded in cutting ammonia emissions by at least 20 per cent.'
'They could cut the emissions by another 10 to 15 per cent by using less protein-rich feed and putting cows out to pasture more,' says Migchels. Less protein-rich feed lowers the amount of nitrogen the cows ingest, and therefore also the amount they excrete. Moreover, the harmful ammonia is only formed when the cattle's faeces and urine get mixed, as they do in old barns and slurry pits. There is much less mingling out in the field. Migchels thinks a combination of measures can deliver a reduction in ammonia emissions of 35 to 40 per cent. Comparable results came out of Wageningen applied research done between 2011 and 2015 among farmers close to nature areas in Overijssel.

COLLECTIVE AGREEMENTS

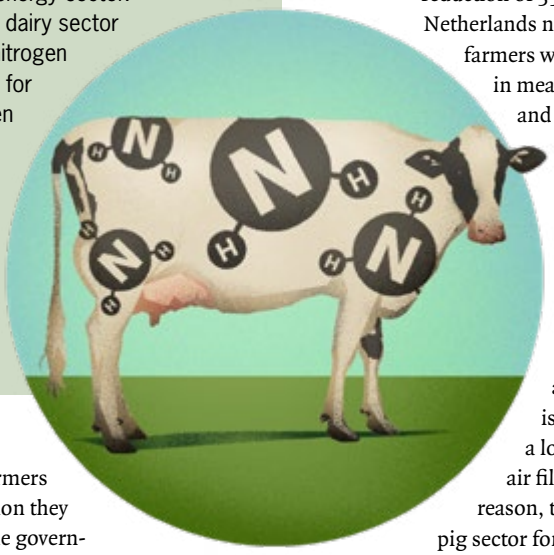
While ammonia emissions went down on the research farms, not much changed at other dairy farms in the Netherlands. True enough, the government had drawn up collective agreements on ammonia reduction with the agriculture sector, but these had not been converted into objectives for individual farms. One consequence of this was that when the European milk quotas ended in 2015, dairy farmers started building new cowsheds without incorporating the available innovations for cutting ammonia emissions.
'The Wageningen tests were not used as the basis for directives for the dairy industry,' notes Migchels, 'but it's not too late to do so.' He expects that farmers will use the *Kringloopwijzer* to improve how they close the mineral cycle on their farms. Affordable ammonia sensors, currently under development, keep the farmer informed about where nitrogen losses are taking place.
With the *Kringloopwijzer* and these sensors, farmers can show the government how they are performing in terms of nitrogen. Livestock farms that emit little nitrogen or that reduce their emissions fast should be rewarded, Migchels suggests, with exemptions from regulations or financial compensation. He talks of 'yellow services', echoing the 'green services' recognized for nature conservation. >

WHY HAS THE NITROGEN PROBLEM SUDDENLY COME OUT OF NOWHERE IN THE NETHERLANDS?

There has been a nitrogen problem in the Netherlands since about 1980, when the country was affected by what was called 'acid rain'. Besides sulphur dioxide (SO_2), that rain consisted of nitrogen oxides (NO_x) and ammonia (NH_3). Government policy since then has focused on trying to reduce these emissions. Emissions of NO_x and NH_3 have been halved since that time, but emissions of ammonia have gone down by little or nothing since 2010. In spite of the reduction in nitrogen, too much nitrogen still gets deposited on about 75 per cent of nature areas in the Netherlands.
The Integrated Approach to Nitrogen (PAS) of 2015 was intended to further reduce nitrogen emissions so as not to endanger the building of roads, industrial infrastructure and new livestock sheds. But in May this year, the Council of State ruled that the PAS was not adequate. This was because the government was allowing new nitrogen emissions from construction, for example, on the strength of some of the planned (but not yet actually realized) reduction in emissions. The European Court, and following in its footsteps the Dutch Council of State, did not accept this approach.

WHERE DOES ALL THAT NITROGEN COME FROM?

Agriculture produces about 45 per cent of the nitrogen that is deposited on nature areas in the Netherlands, while about 35 per cent of the nitrogen comes in on the wind from neighbouring countries. Dutch road traffic accounts for about 6 per cent, as do Dutch households. The rest comes from air traffic, shipping, industry, construction and the energy sector. Within agriculture, the dairy sector is by far the biggest nitrogen producer, responsible for twice as much nitrogen as the pig sector. And the Netherlands produces more nitrogen than is deposited in the country; most of it blows on the wind to other countries.



Such an approach puts farmers at the helm. Which direction they should steer in, is up to the government to decide. It is impossible to achieve the 'critical deposition values' (see inset) in all the nature areas in the country, says the Wageningen nitrogen professor Wim de Vries. Even just the nitrogen that blows in on the wind from neighbouring countries (one third of the nitrogen deposition in the Netherlands) is too much for some kinds of nature. But by halving domestic nitrogen emissions, the deposition in the majority of the nature areas will be reduced to below the critical values. De Vries thinks it would be sensible for all the sources of the nitrogen problem in the Netherlands – including industry, traffic and shipping – to halve their emissions so that they all make a proportional contribution. 'If you want to achieve that halving by, say, 2030, you are talking about an emissions reduction of five per cent per year.'

The dairy sector could achieve a lot in the first few years with Migchels' fast, cheap solutions, but they will not suffice in the long run. Migchels' farmers achieve a reduction of 35 to 40 per cent at most, while the Netherlands needs a reduction of 50 per cent. Dairy farmers will therefore still ultimately have to invest in measures such as separate storage of manure and urine or improved barn floors, from which manure can be removed fast and separately from the urine. If that is not possible or does not make enough difference, the livestock population might have to be reduced.

> 'The tests were not used as the basis for directives'

SERIOUS INVESTMENTS

The dairy industry currently emits twice as much ammonia as the pig sector. That is because pig farmers have already invested a lot in emissions-cutting measures such as air filters and manure management. 'For that reason, there are now fewer possibilities in the pig sector for cutting ammonia emissions fast and cheaply,' says researcher André Aarnink of Wageningen Livestock Research.

'Half the pigs in the Netherlands are in sheds fitted withan air filter,' says Aarnink. Most of these sheds were built since 2007. The chemical air filters capture as much as 90 to 95 per cent of the ammonia, more than the 85 per cent stipulated by the provincial government in its nature conservation legislation.

Most of the older pigsheds don't have air filters, because those sheds lack a central outlet for the air in the ventilation system. These pig farmers have two options: closing this shed, and perhaps building a new one, or taking steps to prevent ammonia emissions in the first place.

SLATTED FLOORS

methane and odour emissions at source. 'By using a combination of measures, farmers can just about manage a reduction of 85 per cent,' estimates Aarnink. The pig farmers would have to invest in slatted floors

that allow the manure through better and create a smaller manure surface from which ammonia can be released. 'That way they can reduce the barn floor emissions by about two thirds.' But most of the emissions by far come from the slurry pit. These can be reduced by watering down the manure, acidifying it or separating it into faeces and urine in the shed using manure belts and scrapers. The faster the manure is then brought to a closed container or a digester, the better.

'These measures cost money. At the most, 30 per cent of the pigsheds without air filters can be adapted at an acceptable price with measures targeting the source,' thinks Aarnink. 'For the rest of the sheds, it is probably cheaper to build a new one. There are no free options for pig farmers,' says the researcher. In the dairy industry, farmers can water down their manure – a cheap measure – and spread it on the land. Most pig farmers don't have any land. So watering down the manure would be a cost in pig farming, because the farmer then has to sell more manure on the already saturated manure market.

INCENTIVES

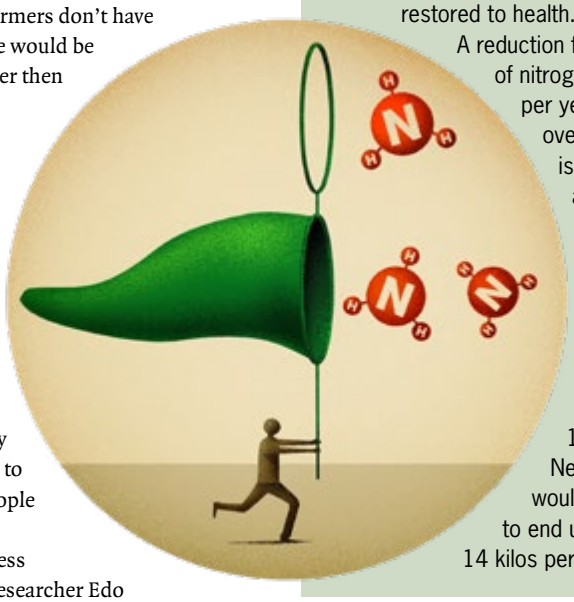
So one quarter of the pigsheds in the country – all older sheds – emit too much ammonia, and these farmers cannot afford the measures to reduce their emissions significantly. These farms may qualify for financial incentives to close down. The ministry of Agriculture, Nature and Food Quality has already allocated 200 million euros to this in order to protect the health of people living near the pig farms.

Closing these farms would also mean less livestock in the country. According to researcher Edo Gies of Wageningen Economic Research, that reduction could best be achieved in buffer zones around nature areas designated by the government. Intensive farms in these zones would be closed down, and only extensive farming would be allowed there.

It remains to be seen whether this becomes policy. Next year, the Remkes Commission will submit its 'structural measures' for cutting back nitrogen emissions in the long term. ■

www.wur.eu/nitrogen

'There are no free options for pig farmers'



HOW MUCH DOES NITROGEN DEPOSITION NEED TO GO DOWN?

According to the Integrated Approach to Nitrogen (PAS), nitrogen deposition on nature areas needs to go down to what it has defined as the critical load for nitrogen deposition. This load varies with the type of nature concerned. A peat bog can cope with less nitrogen than a forest on sandy soil. For most types of nature, the critical load is between 10 and 20 kilos of annual nitrogen deposition per hectare. The average deposition of nitrogen per hectare in the Netherlands is 21 kilos. If this was cut to an average deposition of 14 kilos of nitrogen, most of the nature in the country would be restored to health.

A reduction from 21 to 14 kilos of nitrogen per hectare per year does not seem overambitious. But it is in fact extremely ambitious, because more than one third of the deposition is caused abroad. The Netherlands cannot do anything about those eight kilos. The remaining 13 kilos which the Netherlands causes itself would have to be halved to end up with a deposition of 14 kilos per hectare.

GERJAN SNIPPE, CO-FOUNDER OF BIO BRASS

‘You’ve got to understand the motives of the supermarket buyer and the consumer’

Farmer’s son Gerjan Snippe learned in Wageningen to take carefully considered decisions based on thorough calculations. Now he heads an enterprising organic vegetable company with 2000 hectares. What the customer wants is key at Bio Brass. ‘We get to see the sales statistics of the large supermarket chains.’

TEXT MARION DE BOO **PHOTO** VIDIPHOTO

The company Gerjan Snippe heads in Zeewolde in the province of Flevoland directly supplies large supermarket chains across Europe. With its cauliflower and broccoli, beetroots and sprouts, Bio Brass is one of the largest organic vegetable growers in the Netherlands. ‘In Wageningen I learned to base my decisions as an entrepreneur on a firm foundation,’ says Snippe. ‘I never just say, this feels good, we should just do it. I always want to see the calculations.’

Snippe grew up on a dairy farm near Almere, with two younger brothers and three sisters. ‘It was a nice, big farming family. I loved the farm and I worked a lot on it, but I wasn’t very keen on milking cows. My father said in that case I should think of something else to do.’ Snippe considered doing a degree in economics at Erasmus University in Rotterdam. ‘But the idea of leaving the farming fraternity put me off. So I did Agricultural Business Studies at the Agricultural University of Applied Sciences in Dronten, in the middle of farming country.’

BIG TRACTORS

After about three years, he began to notice how one-sided the world he was now part of was. ‘At secondary school, I also had friends whose parents worked in other sectors such as IT; in Dronten we talked an awful lot about big tractors and potatoes. That has its charm, but it has its limitations too. You can learn a lot from other sectors.’ So it appealed to him to do an internship abroad. ‘I had never travelled and never flown. Through contacts I got the address of a seed potato exporter in Elgin, on the north coast of Scotland. When I didn’t get any replies to my letters I just took a chance and went over there for a weekend.’ Apparently, his pluckiness made an impression and the business offered him an internship that came with his own apartment and a company car. ‘I noticed that farming was definitely my thing. I learned a lot from the contacts with the farmers’ cooperatives that grew the seed >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> ‘I noticed that my heart wasn’t in the sciences’

potatoes, and with international customers. There is a lot more going on in the supply chain than just that primary production.’
After graduating in Dronten in 1997, Snippe considered doing an MBA. The seed potato company offered to fund him if he contracted to work as a management trainee in Elgin for three years after that. But in the end the farmer’s son – by now engaged to a Dutch girl –opted for a Master’s in Agricultural Economics and Management in Wageningen, where several of his secondary school friends were already studying. ‘As an applied sciences student I had learned to get things done, above all. Now it was time to learn how to explain why you are doing what you do, and to justify business decisions.’

PHOTO VIDIPHOTO

GERJAN SNIPPE (1976)

Studied: Agricultural Business Studies at the HAS in Dronten (1997)
MSc in Agricultural Economics and Management in Wageningen (2000
Works: managing director and co-owner of Bio Brass (2005)

He lived with three others in a student house for 18 months. ‘It was a great time. A wonderfully diverse group of people too. Some of my fellow students were from Africa, for instance. And suddenly you found yourself visiting big companies and having discussions with them. Wageningen’s a nice little town too, that has a village feel to it. And then those beautiful walks along the dyke towards Rhenen. I would love it if one of my children goes to university in Wageningen later,’ says Snippe.

EXPORT OPPORTUNITIES

‘My studies went well,’ he says. ‘I took some extra courses, but I noticed that my heart wasn’t in the sciences. Scientists can be so far removed from reality. I’m more of a doer.’ His final project, still for the same Scottish seed potato business, focused on export opportunities to Eastern Europe, and he got his Master’s degree in 2000. ‘After that I was going to get married and move to Scotland but suddenly that company went bankrupt. That’s life, I thought, get used to it.’ Luckily he got a job with an export marketing bureau in Dronten. ‘That wasn’t quite the international career I had in mind. But I soon came across an Austrian exporter of organic vegetables and herbs who was looking for export opportunities to the UK. That market was a revelation. Until then I was used to farmers always being saddled with surpluses, but in Britain there was a huge demand for organic products. And organic farmers turned out to be nice people: open, spontaneous and innovative. Some of their farms were a bit messy, but their ideas about keeping the soil healthy just do make sense.’
It was just at this time that his parents’ farm near Almere was bought up by a project developer. The Snippe family thought about emigrating to Canada, but ended up staying in Flevoland. They bought land to start a mixed farm. Snippe’s younger brothers took over the dairy and arable sides from their parents, and he gave up his job to take care of the vegetable growing, the trading and the marketing.
It turned out that growing organic vegetables on a large scale was quite a challenge and the young entrepreneur worked day and night for the first three years. ‘Products that are delivered fresh every day are so difficult. It is never right. When you have loads of cauliflower, broccoli and lettuce, there isn’t much demand. And when the market wants broccoli, you can’t supply it. The supermarket buyers get annoyed by that, and then you don’t stand a chance of getting your stuff onto their shelves.’
At first, Snippe followed the same business approach his parents took. They had always worked with a fixed price for milk, and the only option for increasing their earnings was to work very hard, do as much as possible themselves and keep running costs low. Only after about three years did he realize that if you want to develop a new business, you might have to invest quite a lot, and incur more costs.
Nowadays, his organic vegetables are cut, washed, sorted, cooled, packaged and labelled on the farm, and go straight from the fields to the supermarket. ‘That way your product is fresher, cheaper and more attractive. The supply chain is shorter, you don’t need intermediate traders, and you avoid unnecessary logistics and handling costs.’
The company also supplies ready-cooked beetroot, some of it even already seasoned, with honey and ginger, for instance. Waste matter from the vegetables goes to the cows.

COLLABORATION

In 2005, Snippe started collaborating with two other growers. That was the start of Bio Brass. A fourth shareholder joined the limited company later. Now about 35 permanent employees and 125 seasonal workers grow 18 million vegetables a year on 2000 hectares. ‘Using each other’s land demands trust and a long-term vision. By cooperating in a

PHOTO VIDIPHOTO

The organic vegetables produced by Bio Brass are processed by the company and go straight from the farm to the supermarket.

bigger group you get better land use and a stronger market position. We also noticed that our cost price wasn't right. When you are self-employed you can quite easily think, well, that tractor is sitting there anyway, and my wife doesn't mind helping a bit. Only when you have to settle up with partners do you really see what your costs are.'

Snippe says himself that he is the price maker for many of his products. 'I get the price I need. That is possible because I'm producing something there is a demand for. We get to look at the sales statistics of our customers, the big supermarket chains, every year. We see from their data scans how much they sold every week. The trick is also to make sure you get the planning right. I have learned not to think too much like a farmer. So I don't say: this vegetable is growing so fast now, you'll just have to take it. You've got to understand what makes the supermarket buyer and the consumer tick. Likewise, the key to solving the world food supply problem is not to go on producing more and more, but above all to understand what goes on in the supply chain everywhere.'

LITTLE NATURE

Organic vegetable growing is alternated with fallow crops such as grain, and clover for Snippe's brother's cows. There is little role for nature on the farm. Snippe: 'I would love to have more woodland but when you grow vegetables, woods are just a nuisance: shade, birds and caterpillars. In the shade your crops stay wet for longer and rot faster. But in Brazil I saw that farmers plant trees to extract phosphates that have sunk deep into the ground, and to use them for wood production. I do think that could be interesting. It is difficult to close the phosphate cycle.'

'We are also experimenting here with strip cultivation, because we like a challenge. But actually, large blocks with just one crop on each are easier. I like the transition model. I like to introduce change in small steps. And nowadays I notice that we human beings want more and more. Bigger houses, bigger cars, foreign holidays, pig feed imported from tropical countries... We are always trying to fill some kind of inner emptiness. If you eat more healthy organic vegetables, the soil stays healthy, you throw away less, you become healthier, and you maintain a closed cycle in a sustainable manner.' ■

> 'I get the price I need, because I produce something there is a demand for'

WAGENINGEN ACADEMY

Gerjan Snippe is one of the guest speakers on the Executive MBA in Food & Agribusiness of WUR and TIAS Business School.
www.wur.eu/wageningenacademy

ANNEMARIE VAN ZAAYEN:

‘We mustn’t let practical plant

‘I am very enthusiastic about my subject and I want to leave my money to a good cause,’ says virologist Annemarie van Zaayen. That is why she has included the L. Bos Fund for plant virology in her will.

TEXT ANJA JANSSEN

FOTO ALAMY

With great regret, Annemarie van Zaayen (79) relates how she saw funding for her subject area, ecological plant virology, dwindle during the course of her career. ‘That is a great pity because new viral diseases are emerging all the time, and it is exactly that practical knowledge about symptoms and how diseases spread that is still needed. An infectious tomato virus turned up recently in the Westland greenhouses, for example.’ By contrast, molecular research on plant viruses in laboratories has made great strides. ‘It really is marvellous what they can do with genetic analyses. But it doesn’t solve everything. In the lab, they find DNA or RNA of all kinds of viruses but then they don’t know what they do: are they harmful or in fact beneficial? Which symptoms do they cause, and how do they spread?’
So a donation to the L. Bos Fund for ecological plant virology was an obvious choice for Van Zaayen when she came to make her will. This fund was established by the family of virologist Lute Bos (1928-2010) and has financed special professor René van der Vlugt’s chair of Ecological Virology at Wageningen University & Research for one day a week for the past five years. Ecological plant virology looks at the role of viruses in farming systems and in nature. This ‘green’ plant virology was Lute Bos’s subject and his

‘I’m sure we can expect nice results’

virology die out’

passion. The fund is almost empty now, but the university has extended Van der Vlugt’s appointment for five years and is now paying his salary.
Van Zaayen: ‘I don’t have a partner anymore, I have no children and not much family. I am very enthusiastic about my subject and I want to leave my money to a good cause. So I thought: I support the objective of the L. Bos Fund, let me invest it in that. And I’ve had a guarantee from University Fund Wageningen that when that money of mine comes in, they will do something useful with it in the chair group. I know, for instance, that Van der Vlugt needs a lot of assistance at the moment.’
Van Zaayen thought it was important to make good arrangements for her will while she is still healthy. And she hopes to inspire others to follow her example. ‘I prefer to keep out of the limelight, but I thought I should tell my story because we mustn’t let this subject area die out.’
After graduating in Plant Pathology in 1966, Van Zaayen did research at the then Institute for Phytopathological Research (IPO) – where Lute Bos worked too – on a destructive viral disease that was affecting mushrooms and posing a serious economic problem for mushroom growers.

ELECTRON MICROSCOPE

‘In Wageningen I studied the virus under the electron microscope, and at what was then the Mushroom Experimental Station in Horst I did the practical experiments to study how the disease spread.’ This research led to her obtaining her PhD in 1972.
Van Zaayen went on to work as a plant pathologist at the Mushroom Experimental Station in Horst, at the Bulb Laboratory in Lisse, at the tissue culture company PhytoNova in Rijnsburg, and for a short while at the IPO. For the last 10 years of her career, she was head of a branch of the then Netherlands Inspection Service for Arboriculture Products NAKB (now Naktuinbouw (the Netherlands Inspection Service for Horticulture) in Roelofarendsveen), which maintains and promotes the quality of horticultural products.
After Van Zaayen had arranged for the L. Bos Fund to be included in her will, she was invited to Wageningen by Professor Van der Vlugt. ‘We know each other from the IPO and the Plant Virology circle, which sadly is not very active at present. At that time he gave a short overview of his projects especially for me. I was very interested to hear how dynamic it is: he works on a lot of different topics and has students from tropical countries too. Viral diseases are often unknown there, or badly researched. Another thing that fascinates me is a project on maturity resistance against aphids – which transmit certain viruses – in sugar beets and how viruses can inhibit this resistance mechanism. I’m sure we can expect a lot more nice results from this research.’ ■

L. BOS FONDS

The L. Bos Fund is a named fund under University Fund Wageningen. Donations to this fund support scientific research and education in the Wageningen Ecological Plant Virology chair group.
www.universityfundwageningen.eu/lbosfund

Virologist Annemarie van Zaayen has included the L.Bos Fund for plant virology in her will.

PHOTO ALDO ALLESSIE

LEGACIES IN A WILL

More and more people are including charities in their will. People interested in leaving money to Wageningen research or education are welcome to get in touch with Arianne van Ballegooij of the University Fund Wageningen at Arianne.vanballegooij@wur.nl.
More information can be found at www.universityfundwageningen.nl/legacy.

100 YEARS

‘UniversiTREES symbolizes Wageningen’s impact’

When the university celebrated its centenary in 2018, alumnus Henk van Blerck suggested planting ‘UniversiTREES’ all over the world. ‘Together, they form a symbolic forest that shows how Wageningen is making a contribution across the globe.’

‘You come across WUR alumni everywhere,’ explains Henk van Blerck (WUR Landscape Architecture 1985). ‘And everywhere you go, they have done their bit in projects or the development of a region. That’s how I came up with the idea of planting trees all over the world to create a World-Wide Wageningen Jubilee Forest of UniversiTREES. That virtual forest shows the extent and many branches of Wageningen’s influence.’

The Jubilee Forest has slowly grown since the very first UniversiTREE was planted on 12 April 2018 — by Dutch minister Carola Schouten and rector magnificus Arthur Mol in the Chinese capital Beijing. Now there are UniversiTREES in 11 countries: Bangladesh, Brazil, China, France, Hungary, Indonesia, Israel, the Netherlands, New Zealand, the United States and South Africa.

Van Blerck is pleased his idea has been put into practice. ‘We have a duty anyway to plant a lot of trees because *we* can enjoy the trees that previous generations planted. If we don’t plant any trees now, there will be a gap two generations later.’

The UniversiTREES programme will stop at the end of 2019, says Denise Spiekerman of the alumni office. ‘But the UniversiTREES have had such an enthusiastic reception that we are currently discussing whether we could carry on planting them after 2019, for example when new partnerships are concluded or to mark special occasions.’

www.wur.eu/universitree

REUNION

Old and young visit the first alumni open day

PHOTO GUY ACKERMANS

Alumni Johannes Hartmans and Serah Hoeks

Young and old mix effortlessly at the first open day for Wageningen alumni, which took place on 5 October on Wageningen Campus. They ranged from 92-year-old Johannes Hartmans (WUR Agricultural Plant Breeding 1954) to alumni nearly 70 years younger.

The 350-plus attendees heard rector magnificus Arthur Mol recount how Wageningen had evolved over the past century into a highly respected international institution with numerous partnerships. Professor of Entomology Marcel Dicke showed how insects can play a role in the circular economy if they are reared on waste products and then fed to cattle. Afterwards, the alumni could choose between guided tours of the campus buildings and artworks or a visit to StartHub and FabLab or the ISRIC World Soil Museum. But the open day was mainly an opportunity to meet old friends and reminisce.

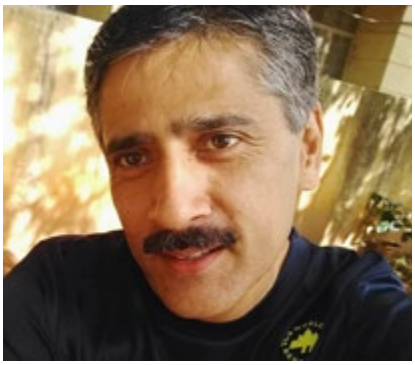
The next Alumni Open Day is scheduled for Saturday afternoon 3 October 2020. Alumni who want to organize a reunion, talk or activity for their year group or society can notify the alumni office, which will then include it in the programme.

Info: www.wur.eu/alumniopenday

AWARD

Alumnus Award for protecting snow leopard

On 2 September, the Indian ecologist and nature conservationist Charudutt Mishra received the Outstanding Alumnus Award 2019 from University Fund Wageningen.



Mishra, who obtained a PhD in the Resource Ecology group in 2001, is director of the Snow Leopard Trust, an international organization for research on the snow leopard and protection of this animal. According to the University Fund Wageningen jury, Mishra is able to get people with different nationalities, religions and cultures working together on nature conservation. He does this "unhindered by difficult circumstances, enthusiastically and with deep conviction". Mishra was nominated for the triennial award by the Wageningen emeritus professor Herbert Prins. In addition to the jury report and a certificate, the ecologist was given a replica of the artwork 'The Opening Flower' in the Belmonte Arboretum.

Info: www.universityfundwageningen.eu/alumnusaward

AWARD

Research Award for genome archaeologists

Bioinformatics specialist Sumanth K. Mutte and biologist Hirotaka Kato of the Biochemistry chair group have won University Fund Wageningen's Research Award 2019. They received the prize for the study they published in *eLife* in the field of evolutionary biochemistry, a new research area in plant biology. As 'genome archaeologists', they went in search of the origins of the universal hormone auxin in plants, which regulates various growth processes. PhD student Mutte (WUR Bioinformatics 2015) and postdoc Kato jointly received the sum of 2500 euros.

Info: www.universityfundwageningen.eu/researchaward

NETWORKS

Singapore alumni get together

On 12 September 2019, the WUR Alumni Network Singapore organized a gathering at the Dutch embassy in Singapore. The occasion was a visit by rector magnificus Arthur Mol to WUR's business relations and partners in Singapore. About a dozen alumni were at the embassy, along with Mol, embassy staff and contacts such as William Chen, professor of Food Science and Technology at the Nanyang Technological University (NTU).

PhD student Amanda Voo Ying Hui shared her experience with WUR and NTU's joint PhD programme in the field of food technology.

The gathering helped boost contact between Wageningen, alumni, the NTU and the embassy, says the organizer Matthijs van Wagtendonk (WUR Land Development 1987).

Info: www.wur.eu/alumnisingapore2019

WUR CONNECT

Connections

WUR Connect helps alumni make contact with more than 8700 fellow Wageningen graduates around the globe. The map of the world in the directory shows where they live. The website is a great place to reminisce with memories new and old and to contact lost friends, for example by sharing photos in the alumni album.

Events

Alumni can use the event board to post their own events in any of Wageningen's many domains or search for meetings they might be interested in. For example, you will find information about the sixth International Climate Change Adaptation Conference in Delhi (India) from 27 to 30 April 2020.

Country groups

On WUR Connect, alumni can join various groups such as the country groups. That way they can keep in touch with other alumni and hear about activities in their own regions.

Reactions

If WUR Connect has helped you find an internship, a job or a friend you lost touch with, let us know by emailing alumni@wur.nl.

wurconnect.nl

Conny Almekinders PhD, WUR Agricultural Plant Breeding 1983, has received a Dutch Research Council (NWO) grant for collaboration with the International Potato Center (CIP) and the International Maize and Wheat Improvement Center (CIMMYT) for the development of improved root crops and banana plants. Almekinders is an associate professor in the WUR chair group Knowledge, Technology and Innovation. 1 October 2019.

Prof. Gerco Angenent, WUR Biology 1985, head of the Plant Developmental Systems group at WUR, has received NWO funding for his molecular biology research project 'A FRUITFULL approach to modify plant traits'. 17 October 2019.

Aalt Dijkhuizen PhD, WUR Agrarian Economics 1977, chair of the Agri & Food Top Sector and former President of the WUR Executive Board, has joined the advisory council of the Agri Facts foundation (STAF). STAF supports validation testing that provides evidence for agricultural and horticultural policies. 21 October 2019.

Sebastiaan van 't Erve MSc, WUR Biology 2003, mayor of Lochem municipality and member of the Green Left political party, has been appointed a member of the board of the Dutch Association of Mayors. 17 March 2019.

Prof. Ine van der Fels-Klerx, WUR Zootechnics 1994, has been appointed professor by special appointment of Food Safety Economics in Wageningen. The chair is funded by Wageningen Food Safety Research (WFSR). 1 August 2019.

Prof. Louise Fresco, WU Rural Sociology of the Non-Western Regions 1976, has taken over the chair of the 4TU.Federation from Victor van der Chijs, president of the executive board of the University of Twente. 4TU is the collaborative venture between the universities of Delft, Eindhoven, Twente and Wageningen. Fresco is the President of the Executive Board of WUR, which joined the 4TU in 2016. 28 October 2019.

André Henken PhD, WUR Zootechnics 1979, has been appointed acting dean of the Faculty of Technology at Amsterdam University of Applied Sciences. Henken has his own consultancy firm. He was previously deputy director-general at the National Institute for Public Health and the Environment (RIVM) and associate professor at WUR. 18 September 2019.

Mirjam Kabel PhD, WUR Food Technology 1998, has received funding from NWO for her research project 'Lignin as an intrinsic tracer for gastrointestinal transit behaviour and feed digestion'. 17 October 2019.

Peter Knippels MSc, WUR Horticulture 1989, is the new chair of the Bulb Academy, a collaborative venture involving the private sector, education, research and cultivation advisory organizations. It aims to provide high-quality training programmes. Knippels works for the Royal General Bulb Growers' Association (KAVB). 7 October 2019.

PHOTO STEFAN HENDRICKS

WUR researchers in major Arctic expedition

Fokje Schaafsma PhD, WUR 2018, a researcher at Wageningen Marine Research, and **Laurens Ganzeveld PhD,** WUR Environmental Protection 1992, a researcher in the Meteorology and Air Quality group, are involved in a major expedition by the research ship *Polarstern* to the Arctic. Schaafsma will be on board from the end of January 2020 to early April, studying the Arctic cod. It is not her first polar expedition. 'Up to now, I've only been in the summer. Now it will be permanently dark for the first few weeks. I'm interested to see what that's like.' Ganzeveld studies the exchange of climate-active gases between the polar ice, the ocean and the atmosphere. He will perform model analyses in Wageningen using data collected on the *Polarstern*, with the aim of improving climate models.

PHOTO MARCEL BAKKER

Simon Groot, winner of Wageningen's M-BASE award in 2015 and founder of East-West Seed, has become the first Dutch person to receive the World Food Prize. The prize, which was being awarded for the 34th time, was given to plant breeder Groot (84) for his successful efforts to offer better economic prospects for small farmers in more than 60 countries. 17 October 2019.

Prof. Peter Oosterveer, WUR Rural Sociology of the Western Regions 1982, has received an NWO grant to work on food systems for healthy diets in partnership with the International Food Policy Research Institute (IFPRI). Oosterveer is a professor holding a personal chair in the Environmental Policy group at WUR. 1 October 2019.

Lucas Noldus PhD, WUR PhD 1989, has been appointed professor holding an endowed chair in Behaviour, Information Technology and Innovation at Radboud University in Nijmegen. The chair is funded by Noldus Information Technology in Wageningen. Lucas Noldus is the founder and CEO of this company. 1 September 2019.

Atze Schaap MSc, WUR Zootechnics 1984, has been appointed climate and biodiversity programme manager at ZuivelNL, an organization that aims to encourage collaboration in the dairy supply chain. Schaap was the corporate director for Dairy Development and Cooperative Affairs at FrieslandCampina. 1 October 2019.

Elise Talsma PhD, WUR Human Nutrition 2004, has received an NWO grant to collaborate with the International Food Policy Research Institute (IFPRI) on sustainable and healthy diets in Vietnam and Bangladesh. Talsma is an assistant professor in the Human Nutrition chair group. 1 October 2019.

Annemieke van Vleuten MSc, WUR Animal Sciences 2007, became the road cycling world champion in the women's race in the UK. After cycling out in front for more than 100 kilometres, the Wageningen cyclist crossed the finishing line alone in Harrogate. 28 September 2019.

Maarten Voors PhD, WUR International Development Studies 2006, has won the Best of UNICEF Research Award with a study of the effect of emergency aid in Congo (see also page 7). 16 October 2019.

Prof. Edze Westra, WUR Molecular Sciences 2007, has been appointed professor of Microbiology at the Centre for Ecology and Conservation (CEC) and the Environment and Sustainability Institute (ESI) at the University of Exeter in the UK. 11 October 2019.

Frank Zanderink MSc, WUR Forestry 1989, has become director of the Rugvin foundation, which aims to conduct research into the diversity of species, population dynamics and behaviour of cetaceans in the North Sea and Eastern Scheldt estuary. 1 October 2019.

PHOTO NOFIMA

Anna Sonesson PhD, WUR PhD 2002, is the new research director of the Breeding and Genetics division at Nofima, the Norwegian research institute for fisheries and aquaculture. 21 October 2019.

IN MEMORIAM

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

Ms N. Dijkstra BSc. WUR Nutrition and Health 2017. 2 October 2019.
Mr F. Gietema MSc. WUR Tropical Land Development 1970. 21 August 2019.
Mr B.A. Horstman MSc. WUR Tropical Plant Breeding 1954. 3 August 2019.
Mr A.J.A. Hulshoff MSc. WUR Agricultural Plant Breeding 1957. 17 March 2019.
Mr F.H. Kolb MSc. WUR Tropical Forestry 1960. 13 April 2019.
Mr G.J.A. Koppert PhD. WUR Human Nutrition 1981. 17 March 2019.
Ms B.E.M. Maris-Kuijf MSc. WUR Human Nutrition 1999. 24 October 2019.
Ms H. Nagujja. WUR Leisure, Tourism and Environment 2018. 19 October 2019.
Mr G.A. Oosterbaan MSc. WUR Agricultural Plant Breeding 1958. 8 June 2019.
Ms J.T. Oudega MSc. WUR Forestry 2004. 1 October 2019.
Mr R.F. Paes. WUR PhD candidate. 10 October 2019.
Mr A.P.G. Poyck PhD. WUR Tropical Plant Breeding 1953. 18 August 2019.
Mr A.J. Rothuis PhD. WUR Zootechnics 1984. 25 October 2019.
Mr J.L. Stegeman MSc. WUR Food Technology 2005. 7 August 2019.
Mr R. Veerman MSc. WUR Zootechnics 1996. 29 January 2018.
Prof. M.J. Vroom. WUR Landscape Architecture 1958. 28 August 2019.
Mr R.R. Wientjes MSc. WUR Plant Breeding 1980. 29 July 2019.

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.

Prize for moss-covered walls

Rianne Vastenbouw BSc, WUR BSc Nutrition and Health 2017 and currently an MSc student in Sustainable Food Systems and Agroecology, and three other students from different countries won the Copenhagen Open Innovation Call on 11 October 2019. Their collective, 4MOSST, received the prize for their idea of letting moss grow on urban walls as a way of improving air quality and reducing urban warming. 4MOSST wants to develop a paste-like substance with moss spores, a binding agent and protection from damp. This can be applied to external walls (not in full sun), where it grows into a layer of green moss.

Pig manure to stop the noise

Six WUR MSc students won the Dutch heat of the Biobased Innovation Student Challenge Europe (BISC-E) with their soundproofing material Biosilence, made of pig manure. They came second in the European final in Berlin on 24 October 2019. The international team came up with the idea in their search for organic material for better soundproofing of homes and offices near airports. They press and dry the fibres that are left over from the manure processing. The pig manure fibres could replace rock wool as an insulation material.

BOOKS BY ALUMNI

Jacoba Lampert MSc, WUR Landscape Architecture 1976, followed her husband to Africa with their two children in June 1967. She describes her experiences in Zambia and Tanzania under the pseudonym Coosje van Holland in the book *Naar Afrika* ('To Africa'). In the mountains of Tanzania, Coosje worked on a UN development project for large-scale sheep farming. But the book is also about her family life, the many relocations and the loneliness. Publisher: Palmslag, 20 euros.

Prof. Anton J. Haverkort, WUR Agricultural Plant Breeding 1978, has written the *Potato Handbook*. This reference work in English was published in 2018 and is now being translated into French and Spanish. The book, which weighs 1.6 kilograms and has over 600 pages, covers the anatomy of the potato plant, the seed material, cultivation and processing. Both advanced production systems and small-scale cultivation methods are considered. Publisher: Aardappelwereld, 98 euros.

KLV

KLV | WAGENINGEN ALUMNI NETWORK

KLV dissolution process has started

In the annual general meeting (AGM) of the alumni society KLV on 2 July 2019, an overwhelming majority of the members present voted in favour of the proposal to start preparations to dissolve the society. There is no longer a future for KLV, in part because Wageningen University has established its own fully-fledged alumni policy in the past decade.

The dissolution process was initiated this autumn. All regular KLV activities will continue until the society is actually dissolved, which will probably be in autumn 2020. With the consent of the AGM, the board has worked out proposals for bringing everything to an end with due care and sufficient safeguards for the involvement and wishes of members. A decision has been taken to continue the 14 study groups and networks. KLV will now discuss with them what they need in terms of support and exchanges with one another, and how University Fund Wageningen can facilitate this. KLV's remaining assets will be placed in a named fund or foundation and spent in line with KLV's objectives as set out in its articles of association. The money will be used for example for the support of the study groups and networks. It will also create room for new and existing initiatives that complement Wageningen's alumni policy. Plans for this will be worked out in detail in the coming period.

To find out more, watch the video on www.wur.nl/klv in which KLV chair Han Swinkels explains the dissolution process. The web page also gives answers to frequently asked questions about the dissolution.

KLV Wageningen Alumni Network is Wageningen University & Research's alumni society with around 7000 members.

www.klv.nl

KLV

Goof Hofstede

Plant Breeding, 1972

In the photo from left to right: Henk van Schaik, Goof Hofstede, Sietske van der Meer and Antoinette van Banning on their hike through Italy.

PASSION FOR Hiking

Every week Goof Hofstede and his wife Sietske van der Meer (WUR Plant Breeding 1972) walk a section of a long-distance path in the Netherlands. 'It keeps you fit, you have a bit of a chat, and you see a lot of the Netherlands. One of my favourite paths is the Big Rivers path from Rotterdam to Cleves, in Germany. So beautiful! It brought me in contact with my great-grandfather's history. He was a willow cutter near Rotterdam, in wetlands that are still maintained today. In April, we walked from Assisi to Rieti in Italy. We were invited by friends, Henk van Schaik (WUR Water Purification 1973) and Antoinette van Banning (WUR Tropical Plant Science 1973). We were a bit daunted at first because you had to carry 10 kilos on your back for eight days. But it wasn't that bad: you chat as you walk and hardly notice you are carrying 10 kilos.'

If you are a KLV member with a passion, or know someone who is, send an email to secretariaat.klv@wur.nl.

Visit our website www.klv.nl

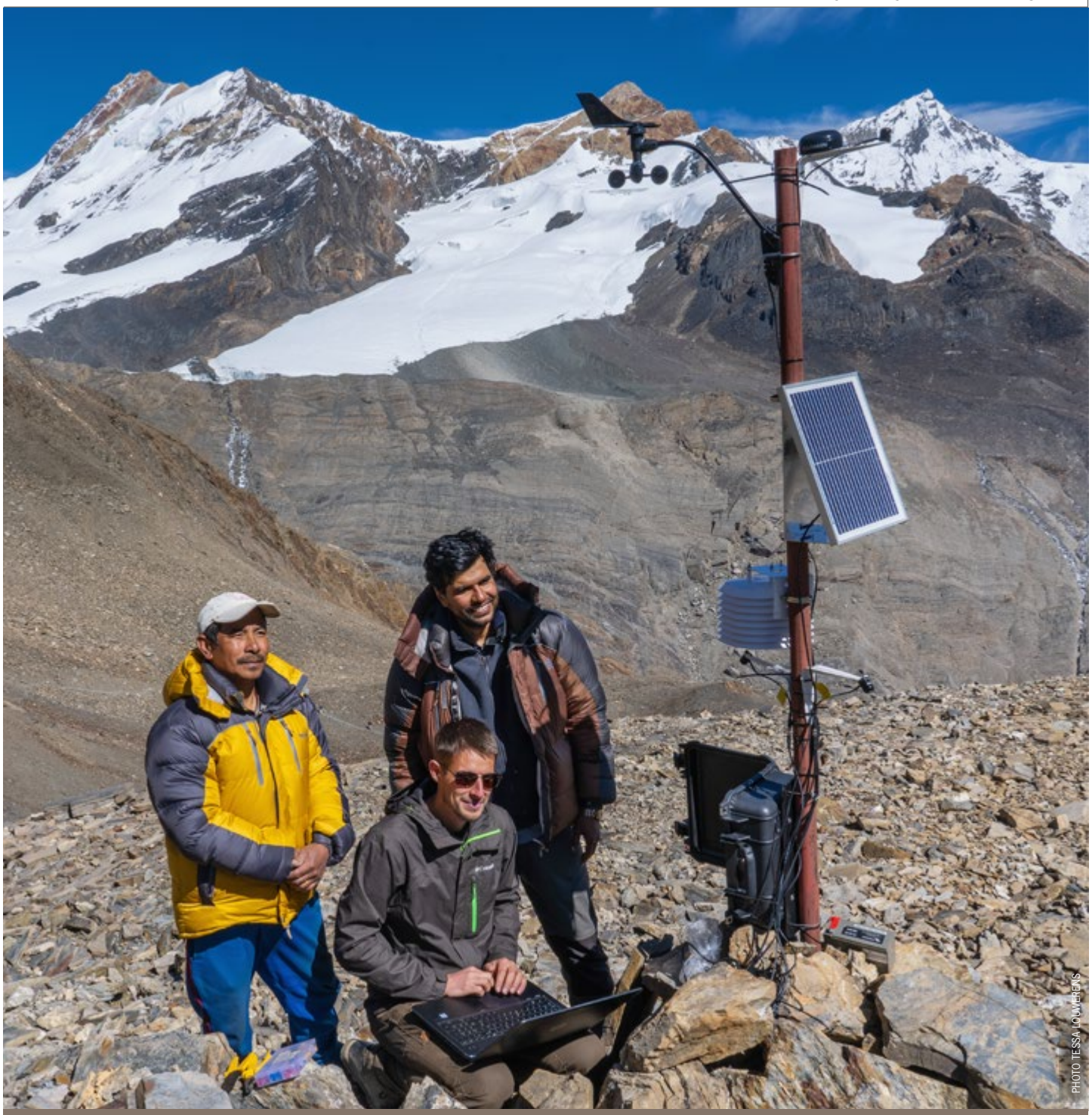


PHOTO TESSA LOUWERSE

Reading weather stations for snow leopard research in Nepal

'At 5300 metres you become incredibly stupid,' says technician Yorick Liefting of the Resource Ecology chair group. 'You even make mistakes following a simple protocol or tying two red wires together. And you don't realize it yourself so you need several pairs of eyes.'

That's why Ashok Subedi and Om Bahadur Gurung (with the cap) of Nepal's national nature conservation organization are keeping a close eye on how Liefting collects weather data on the Kang La Pass. Alongside his nature conservation work, Subedi is doing a PhD at Wageningen on the movements and distribution of the rare snow panther and its main prey, the blue sheep. That is important knowledge for the country to be prepared for climate change and a growth in tourism in the region.

The research includes the use of model simulations of the energy balance of the leopard and the sheep. These are linked with a thermal map of the mountains which shows the variations in temperature, wind and solar radiation. To obtain these data, 16 weather stations were installed early this year at altitudes of between 3500 and 5300 metres. 'The differences are huge,' says Liefting. 'You can feel hot at 5000 metres, while it is freezing cold on a northern slope 1000 metres lower down.'

Info: yorick.liefting@wur.nl