WAGENINGEN WORLD
MAGAZINE OF WAGENINGEN UNIVERSITY & RESEARCH ABOUT CONTRIBUTING TO THE QUALITY OF LIFE
no.2 2021

‘Two text messages a week can make a world of difference’

Weather information helps farmers in Africa, page 34

Promoting a healthy lifestyle
‘We must make sure choosing healthy options becomes easier’

Biodiversity in the meadows
Dairy farmers seek business model for creating more herb-rich grassland

Wildebeest betrays poachers
The movements of hoofed animals alert park rangers to poachers

16
CHOOSING HEALTHY OPTIONS
The coronavirus pandemic has made people more aware of the importance of health for resistance to diseases. 'We've got to make it easier to make healthy choices,' says Professor Emely de Vet.

22
WILDEBEEST WARNS OF POACHERS
The movements of hoofed mammals give away the presence of poachers – who are not targeting them but elephants or rhinos. Park rangers are alerted and can intervene in time.

34
FROM SOWING CALENDAR TO SMS
A farmer who knows when it's going to rain can take better decisions. And now that climate change is making the weather in Africa and Asia more unpredictable, weather forecasts via apps and text messages can help farmers be prepared.

COLOPHON Wageningen World is the quarterly magazine for associates and alumni of Wageningen University & Research. **Publisher** Wageningen University & Research **Editor-in-chief** Willem Andrée **Editorial Board** Jeroen Balemans, Channah Durlacher, Ben Geerlings, Ike de Haan, Jac Niessen, Marieke Reijneker, Antoinette Thijssen **Magazine editor** Miranda Bettonville **Copy editor** Rik Nijland **Alumni news** Anja Janssen **Translators** Clare McGregor, Clare Wilkinson **Art direction** Petra Siebelink, Wageningen University & Research, Communication Services **Design** Gloedcommunicatie Nijmegen **Cover picture** Getty **Overall design** Hemels Publishers **Printer** Tuijtel Hardinxveld-Giessendam ISSN 2212-9928 **Address Wageningen Campus**, Droevendaalsesteeg 4, 6708 PB Wageningen, telephone +31 317 48 40 20, wageningen.world@wur.nl **Change of address alumni** alumni@wur.nl **Change of address associates** wageningen.world@wur.nl, mentioning code on adress label **Change of career details** alumni@wur.nl

WAGENINGEN UNIVERSITY & RESEARCH

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, 6,800 employees (6,000 fte) and 12,900 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.

WAGENINGEN WORLD ONLINE
Wageningen World is also available online. All the editions can be found in browsable PDF form at **www.wur.eu/wageningen-world**
Subscribers can also opt for a digital subscription. Digital subscribers receive the magazine four times a year by email. Reading online is better for the environment and the climate. To switch from a paper to a digital subscription, go to: **www.wur.eu/ww-subscription**

carbon neutral
natureOffice.com | NL-077-434311
print production

FSC
www.fsc.org
MIX
Paper from responsible sources
FSC® C007225

4 **UPDATE**
News in brief about research and developments at Wageningen University & Research.

10 **BIODIVERSITY IN MEADOWS**
There is very little role for biodiversity in dairy farming. But that is starting to change with initiatives such as 'On the way to planet-proof', the Biodiversity Monitor for Dairy Farming, and precision grassland management. The search is on for new business models.

20 **THE ORIGIN OF LETTUCE**
People started breeding lettuce varieties 6000 years ago using prickly wild lettuce in the Caucasus. The route ran via butterhead lettuce in Europe to iceberg lettuce in America, genetic analysis has shown.

26 **DECIPHERING ALLERGIES**
Immunologists are looking for new ways of identifying and treating food allergies. This entails a lot of research into the underlying causes. Why are processed foods more allergenic, for example?

32 **THE DISCOVERY OF THE 'SEVENTH PATHWAY'**
Scientists have been speculating for decades about a new biochemical pathway by which bacteria capture carbon dioxide. Irene Sánchez-Andrea found the pathway in the course of a 'hobby project'.

FEATURES

40 **REPTILE FAN STERRIN SMALBRUGGE**
Researcher, writer and presenter Sterrin Smalbrugge has always thought it strange that some animals have a higher 'cute factor' than others. 'I want to emphasize the sociable side of animals.'

44 **LEAVING MONEY TO THE ANNE VAN DEN BAN FONDS**
A lot of alumni are full of admiration for the Anne van den Ban Fund; some even include it in their wills.

46 **ALUMNI**
News for and about Wageningen alumni.

48 **PERSONALIA**
Information about the lives and careers of Wageningen graduates.

51 **THE SWITCH**
Alumni with careers outside the Wageningen domain.

PHOTO RUUD PLOEG

More organic

'The European Commission says that the agricultural land devoted to organic farming needs to have increased from 8.5 per cent to 25 per cent by 2030. In the Netherlands, organic farming methods are used on 3.7 per cent of the land, despite several incentive schemes for organic farming. More than 20 years ago, for example, the Dutch government introduced incentives for farmers to switch to organic methods but neglected to stimulate demand. This created a surplus that kept prices low for organic farmers. So, about 15 years ago, a lot of attention was paid to stimulating demand. The market share of organic produce then grew significantly, but it didn't come near the target set at that time of 10 per cent. The balance between supply and demand is fragile. Dutch organic farmers face high land prices and are partially dependent on exports, which makes them extra vulnerable to market disruptions.

'The EU wants to subsidize farmers who switch to organic, and to boost the demand for organic products. But to make really big progress, the price difference between conventionally farmed and organic products must be drastically reduced. A reduction in VAT is not enough. I think we should also recompense farmers for ecosystem services such as biodiversity and carbon sequestration.

'Another bottleneck is the availability of nutrients. Organic farming excludes the use of artificial fertilizer and relies on nitrogen fixation by legumes and on reusing waste streams such as manure. But until the use of the "human manure" waste stream is legalized, the target of 25 per cent organic is not likely to be feasible.

'It is also questionable whether the underlying goals such as lower greenhouse gas emissions, improved resilience, less pollution and more biodiversity can be achieved with 25 per cent organic farming. Organic farming is ahead on many of these points, but that is not enough to achieve sustainability targets. So we need a revamped form of organic farming that performs better on sustainability across the board.'

Wijnand Sukkel, senior agro-ecology researcher at Wageningen University & Research

VIROLOGY

New vaccine for Rift Valley fever

A candidate vaccine for the Rift Valley fever virus is safe and effective in pregnant sheep, according to research by Wageningen Bioveterinary Research (WBVR) in partnership with vaccine developer BunyaVax and pharma company Ceva Animal Health.
The Rift Valley fever virus is transmitted by mosquitoes and can infect ruminants and humans. Sheep are particularly susceptible to the virus. The candidate vaccine uses an active but greatly attenuated version of the virus. Such vaccines are usually highly effective after just one dose. The vaccines currently available for Rift Valley fever can be transmitted to the foetus, which can lead to stillbirths, congenital abnormalities and spontaneous abortions. The new vaccine appears to be perfectly safe for pregnant animals, even in high doses. The study also shows that just one dose gives full protection. The vaccine was developed by WBVR.
Info: jeroen.kortekaas@wur.nl

PHOTO SHUTTERSTOCK

CORONAVIRUS

PHOTO SHUTTERSTOCK

Covid-proof restaurant layouts with the help of a smart app

Scientists at WUR, Delft University of Technology and Erasmus Medical Centre have developed an online tool for designing Covid-proof interiors. The 'SamenSlimOpen' app lets restaurant owners calculate the risk of infection from changes to factors such as the layout, ventilation or number of guests.

The tool combines virological and epidemiological knowledge with data from studies of how people move around rooms. This makes it possible to determine what combination of measures minimizes the risk of spreading the coronavirus in a given interior, explains project manager Quirine ten Bosch from WUR.
Restaurant owners can use the app to estimate how many people could become infected in their restaurant if an infectious person is present. They can then play with variables such as the layout, ventilation, the number of guests and the installation of screens to get the number of infections as low as possible. The app also shows whether an infected person can pass the disease on to someone at another table.
The tool has been available for restaurants since the start of May and is being developed further for other indoor spaces such as offices, shops and classrooms. With some adjustments, the tool could also be used for other respiratory tract infections.
Info: www.samenslimopen.nl, quirine.tenbosch@wur.nl

PHYSICAL CHEMISTRY

New method compares texture of meat and meat substitutes

The texture of meat substitutes is related to their mechanical structure. To test this structure, Sven Boots and his colleagues in the Physical Chemistry and Soft Matter group designed a measuring system. A probe with a ball-shaped tip measures the resistance to pressure, an indicator for the rigidity and consequently the mouthfeel. The spherical probe prods the product in steps of 0.5 mm. 'This results in a mechanical map,' says Boots.
A quantitative analysis is then performed on the maps of meat and meat substitutes to compare them. Boots' colleagues will be investigating the effect of production variables such as temperature and protein content on the maps. That information could help food producers improve their products.
Info: sven.boots@wur.nl

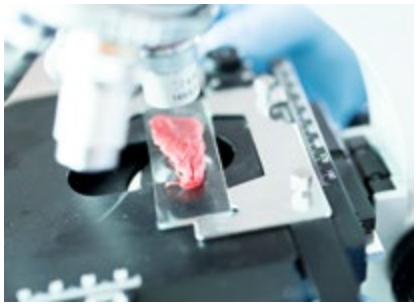


PHOTO SHUTTERSTOCK

CORONAVIRUS

WUR sets up platform aimed at preventing pandemics

WUR has set up the research and investment platform ERRAZE@WUR with the aim of learning from the coronavirus crisis and stopping new pandemics in time. The programme combines relevant knowledge from various disciplines.

ERRAZE — Early Recognition and Rapid Action in Zoonotic Emergencies — is a Wageningen platform bringing together virologists, ecologists, economists, animal scientists and communication scientists, among others, says programme coordinator Joukje Siebenga. 'We want to be better prepared for the next outbreak of a dangerous, contagious virus and reduce the chance of such an outbreak where possible.' WUR wants to prevent future pandemics from having the same devastating effects as Covid-19 and in particular to better understand zoonoses — pathogens that can be transmitted from animals to humans. 'Wageningen Bioveterinary Research already does a lot of research on zoonoses – how they infect the host and how they spread,' says Siebenga. 'We also know a lot in Wageningen about the ecology of wild and domestic animals, about the agrifood system, the economic impact of an outbreak and risk communication. We are now combining all that knowledge.'

For example, WUR wants to get a better picture of places where wild animals come into contact with farm animals, pets and people. This includes not just wet markets where live wild animals are sold but also areas in tropical rainforests where livestock farming is on the rise, and intensive livestock farming in the Netherlands. Using knowledge about climate change and changes in land use, the scientists will be able to keep track of shifts in these hot spots.

The WUR knowledge obtained through ERRAZE@WUR can also help detect unknown viruses faster by focusing surveillance on the hot spots, for example targeting virus families with a zoonotic risk. That requires more collaboration between virologists and epidemiologists on the one hand and behavioural scientists and economists on the other.

Info: ludo.hellebrekers@wur.nl

PHOTO ILRI / CHRIS JOST

PHOTO PTI

WAGENINGEN ACADEMY

Summer school on Dutch greenhouse horticulture

Wageningen University & Research is the 'knowledge heart' of Dutch greenhouse horticulture, which is the most advanced and productive in the world. This summer, scientists of Wageningen will share their unique knowledge with international students and researchers during the Online Summer School Greenhouse Horticulture. This is the first time that the summer school will be given in a virtual format. Particular attention has been paid to developing a programme that relates to and is interesting for protected cultivation with less technology than is usual in the Netherlands, so it can be applied directly in the participants' own countries and situations.

www.wur.eu/summer-school-greenhouse-horticulture

FOOD SECURITY

Toolbox for improving food systems

WUR and the KIT Royal Tropical Institute have developed practical aids for improving food systems. Policymakers, NGOs and researchers can use the toolbox to analyse food systems in low- and middle-income countries and reach well-founded decisions on what changes to make. The analysis takes into account not just food security but also sustainability, pricing and health.
Info: herman.brouwer@wur.nl

AGRICULTURE AND CLIMATE

Helping African agriculture adapt to climate change

A multidisciplinary Wageningen research team will help farmers and the buyers and customers for agricultural and horticultural products in Africa deal with climate change. In a four-year project, the team will investigate the concrete effects of climate change on 15 agricultural products spread across the continent. Feasible and practical approaches will then be developed for climate mitigation and adaptation to guarantee food security. The other partners in the project alongside Wageningen are the Dutch development bank FMO, Heineken International, the African Cotton Foundation and Export Trading Group.
Info: willem.ruster@wur.nl

PHOTO ANDRE SILVA PINTO / SHUTTERSTOCK.COM

BIOTECHNOLOGY

Sensitive Covid self-test in a coffee capsule

Wageningen scientists developed a cheap, sensitive Covid self-test in a coffee capsule, which they have dubbed CoronaEspresso.

PHOTO WUR

Vittorio Saggiomo at the laboratory of BioNanoTechnology came up with the device together with Professor Aldrik Velders. The CoronaEspresso uses the LAMP (Loop-mediated AMPlification) technique to detect genetic virus material. Like the PCR test, this technique is much more sensitive than conventional antigen self-tests, says Velders. 'Usually, only severely infected people test positive with an antigen test.'
The LAMP technique works at a stable temperature of 65 degrees Celsius. When Saggiomo was forced to stay at home last year during lockdown, he started tinkering with ordinary things around the home. In his design, an empty coffee capsule serves as a minilab. It is filled with wax that melts at 65°C and floats in a pan of hot water (just taken off the boil). A 3D-printed lid with holes holds four mini test tubes in place for the reaction. After 25 minutes, the solution colour shows whether a sample is infected. 'Trials with samples of infected people that we did together with TNO gave the same results for our test as for the PCR test,' says Velders. 'TNO is currently carrying out more quantitative comparisons of the sensitivity.'
PCR equipment can easily cost 30,000 euros whereas Velders estimates that the CoronaEspresso can be manufactured for 30 eurocents. What is more, the capsule can be reused and recycled, whereas the existing self-tests are single-use only.
However, the method is not yet sufficiently robust for self-testing at home. Several preparatory steps are required in various test tubes before the actual amplification of the genetic material (the LAMP) can take place. Velders: 'Something can go wrong with every step — especially with untrained users. That's why we are looking for funding for research on a method in which all processes take place in the same test tube.' The researchers think the test will be particularly valuable in remote areas and impoverished countries.
Info: aldrik.velders@wur.nl

EDUCATION

Wageningen still first for agriculture and forestry

As in previous years, WUR came top in the 'Agriculture & Forestry' category in the QS World University Rankings by Subject 2021. A total of 1453 universities were evaluated in 51 categories. The university climbed from eighth position to fifth in Environmental Sciences and from 19th to 17th in Veterinary Science. The general QS rankings will be published later this year.
Info: vincent.koperdraat@wur.nl

ENVIRONMENT AND HEALTH

PHOTO SHUTTERSTOCK

More Covid infections when pollen count rises

There is an association between pollen in the air and increases in the number of Covid infections. This finding is from a global study in which the Environmental Systems Analysis group was involved.

A team of 150 scientists investigated pollen counts from 130 stations in 31 countries, including the Netherlands, during the coronavirus outbreak. The increase in the number of infections only accelerated once the pollen concentration rose. The researchers suspect that the virus benefits from a weakened immune system due to exposure to pollen. It is known that this happens with other respiratory tract viral infections, such as the common cold — including in people who are not allergic to pollen.

The pollen effect was seen around the world at the start of the epidemic, the researchers note in an article published in *PNAS* in March 2021. The infection figures increased after an increase in the pollen count with a four-day lag. On average, a rise in the pollen concentration of 100 pollen grains per cubic metre caused the infection rate to grow by 4 per cent. Further research is needed to determine whether the association is causal.

Info: arnold.vanvliet@wur.nl

BIODIVERSITY

Eco label for solar parks

The *Zon in Landschap* consortium is set to develop a quality label for solar parks. The idea is that this EcoCertified Solar Label will show whether a given solar park helps improve biodiversity and maintain soil quality. Recent Wageningen research shows, for example, that only three of the 25 solar farms in the Netherlands are optimally managed to benefit biodiversity. Over the next four years, the criteria for obtaining the label will be developed based on scientific evidence. In the consortium, which consists of WUR, TNO, Holland Solar, Eelerwoude and NL Greenlabel, Wageningen will be responsible for the scientific evidence. The label will be developed by NL Greenlabel.

Info: alex.schotman@wur.nl

PHOTO SHUTTERSTOCK

MARINE ECOLOGY

Fishing net debris in sea mainly from repair work

PHOTO SHUTTERSTOCK

Most fishing net debris on beaches in the Arctic and North Atlantic consists of pieces of net that were cut off during repairs. This conclusion comes from a major analysis of waste led by WUR researcher Wouter Jan Strietman.

A total of 211 pieces of trawler net larger than 50 cm were studied with the help of local fisheries experts. A further 2908 smaller pieces of net were also investigated. They were collected on beaches in Greenland, Iceland, Jan Mayen, Spitsbergen, Norway, the Netherlands and Scotland. By systematically analysing the mesh size, traces of cuts and tears and other clues, the team worked out that fishing net waste mainly consists of loose pieces of nets used in bottom trawling.

If they are not picked up and stored in time, the pieces end up in the sea, deliberately or otherwise. 'The most effective measure for preventing such waste on beaches is to improve the collection and storage of net waste on board and to provide good waste collection facilities in ports,' says Strietman.

Info: wouterjan.strietman@wur.nl

VIROLOGY

Laser prevents spread of bird flu

Lasers keep wild birds away from poultry farms, thereby preventing the transmission of bird flu, a study by Wageningen Bioveterinary Research shows.

Migrating birds can spread the bird flu virus through their excrement. It was already known that laser beams can keep wild birds away from airfields and rubbish tips. Last winter, the Wageningen research institute installed a laser on a mast in the chicken run of a laying hen farm. In the evening and at night, the laser shone on the chicken run, while during the day it also lit up the surrounding fields.
Camera images showed that when the laser was not there, wild birds regularly visited the chicken run, especially at night. They foraged for food and swam in pools. The next day, the hens drank from the pools. Bird flu can be transmitted to the chickens by this route. The laser prevented visits by wild birds to the chicken run almost entirely (99.7 per cent). The sweeping laser also kept the surrounding fields clear. A permit is required for the use of lasers.
Info: armin.elbers@wur.nl

PHOTO WUR

BIOTECHNOLOGY

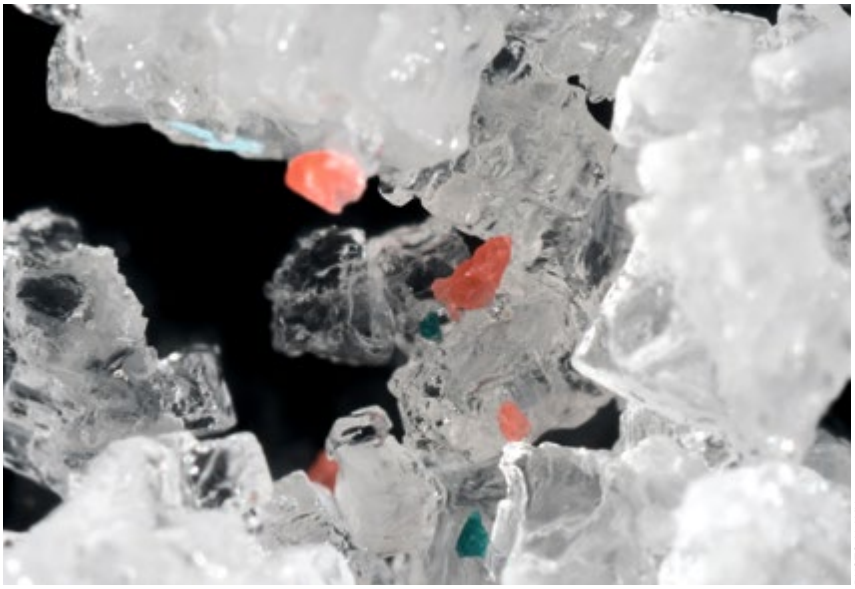


PHOTO ALAMY

Humans consume less than one salt grain of microplastic per week

Wageningen researchers have calculated that most of the world's population ingest less than one salt grain of microplastic per week. It is not yet known what risks this entails.

Microplastics are minute particles that are found in clothing and cosmetics, for example, or are created when plastic breaks up or fragments. Researchers in the Aquatic Ecology and Water Quality Management group developed a mathematical model of humans' exposure to microplastics. This model is innovative in that it allows for uncertainty and variation in the presence of microplastics in the air, drinking water and so on. The model calculations show that most of the world's population ingest about 0.0041 milligrams of microplastic per week — less than a grain of salt. This figure could be up to 676 milligrams of microplastic for 1 in 20 people, depending on their dietary habits and the concentrations in food products. The simulations predict that the average person will accumulate 12.3 milligrams of microplastic in the course of their life. But only 41 nanograms will actually be absorbed by the body. Furthermore, microplastics do not play a big role in the uptake of toxic substances such as lead or benzopyrene, as many researchers had expected.
The model uses measurement data on microplastics in the air, water and eight different food products. These products make up 20 per cent of an average diet. 'There is no data for many products about how much microplastic there is in them,' explains Bart Koelmans, professor of Aquatic Ecology and Water Quality Management. 'But the values for measurements using human faeces show that the model is reasonably in line with the real world.'
Koelmans cannot yet say anything about the health risks of the calculated exposures. 'To determine that, we first need to know the concentration at which the particles have an effect.' The research was published on 16 March 2021 in *Environmental Science & Technology*.
Info: bart.koelmans@wur.nl

LIVESTOCK FARMING

Methane inhibitor works better on cows with maize diets

Research shows that DSM's animal feed additive Bovaer reduces methane formation in Dutch dairy cows by 27 to 40 per cent depending on the cow's feed.

The effect of the additive has been investigated around the world in a series of studies, says researcher André Bannink. 'But each research group finds a slightly different effectiveness.' One explanation is that what the cow eats matters. To test that hypothesis, Wageningen Livestock Research set up an experiment with 64 Holstein-Frisian dairy cows under normal farming conditions.

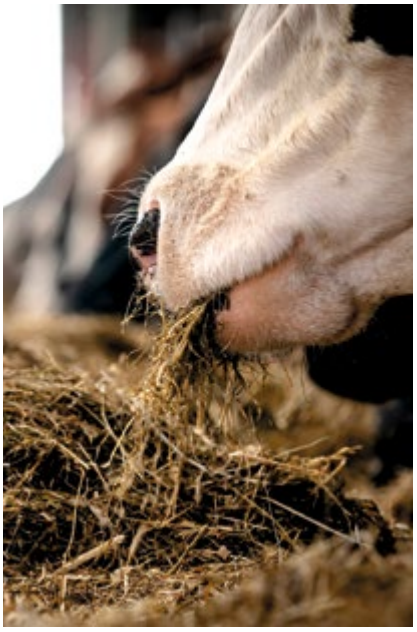


PHOTO ANP

The methane reduction was determined for three variants in the ratio of grass and maize silage in the roughage and for two dosages of Bovaer (60 ppm and 80 ppm) for which DSM has applied for EU approval.

'Bovaer is effective in inhibiting methane formation and that effectiveness does indeed depend on the feed rations,' says Bannink. A low dosage of Bovaer (60 ppm) reduced methane emissions per kilo of feed by 27 per cent when there was no maize silage in the feed and by 35 per cent with the highest proportion of maize silage. The equivalent percentages were 29 and 40 per cent with a high dosage of Bovaer (80 ppm). There are no known negative effects of Bovaer, says Bannink.

The active ingredient in the additive, 3-nitrooxypropanol, inhibits an enzyme that methane-forming microorganisms in the rumen need for converting hydrogen into methane. 'If the cow is given a different ration, the fermentation conditions in the rumen change too,' explains Bannink.

Info: andre.bannink@wur.nl

BIOBASED MATERIALS

PHOTO SHUTTERSTOCK

Biodegradable net developed for turf

Wageningen Food & Biobased Research (WFBR) has developed biodegradable nets for turf. Turf producers place plastic nets in the soil to support the growth. The nets are usually left in the soil. This new net serves its purpose for 12 to 14 months, after which it degrades fully, which means it does not pollute the environment. The material contains bio-PBS, a biobased polymer that the chemicals company PTTMCC makes from succinic acid. The Italian net manufacturer Tenax made some test nets from this material.

A trial with these nets has been running since September 2020 on the fields of the Hendriks turf company. If the trial is successful, Hendriks wants to use the nets for growing turf for sports pitches, says project manager Wouter Post of WFBR.

Info: wouter.post@wur.nl

DNA ANALYSIS

DNA reveals origins of ancient wood

Researchers at the Thünen Institute of Forest Genetics and the universities of Copenhagen and Wageningen have managed to extract DNA from the wood of old buildings and shipwrecks. They could use this aDNA (ancient DNA) to determine the origin of the wood.

The origin of wood from centuries past is usually determined by studying the annual rings but that is not always possible. It is difficult to extract enough genetic material. Structures usually use the dark wood from the middle of the tree trunk, which contains a lot of chemical compounds that hamper DNA extraction.

Despite this, the researchers were able to develop two protocols for extracting DNA from oak. They used sources such as wood from the 700-year-old shipwreck Mönchgut Ostsee VII, found off the coast of North Germany.

Info: paul.copini@wur.nl

PHOTO SHUTTERSTOCK

Flowers return to the meadows

One quarter of the land surface of the Netherlands is dominated by meadows with cows on monocultures of English rye grass. There is very little role for biodiversity in dairy farming. But that is beginning to change with initiatives such as 'On the way to planet-proof', the Dairy Farming Biodiversity Monitor, and precision grassland management. The search is on for new business models.

TEXT RENÉ DIDDE **PHOTO** RUBEN SMIT

What could be lovelier than the traditional Dutch landscape with cows grazing in green meadows edged by the flowering banks of ditches with culverts and bridges? A cultivated landscape with wide vistas as well as natural features such as hedges and hedgerows. It's been this way for centuries but nowadays this meadow landscape is not as rich in nature as it might appear. 'The fundamental quality of the agricultural ecosystem in dairy farming has deteriorated badly in recent decades; that has got to be improved,' says biologist Anne van Doorn. The monoculture of high-yield English ryegrass, the lack of herbs and the impoverished state of the soil life all illustrate the condition of the agro-ecosystem today, says Van Doorn, nature-inclusive agriculture project leader at Wageningen Environmental Research. 'We have strong evidence that insect numbers are plummeting in the Netherlands, and we know that for sure in the case of grassland butterflies, among other species.'

The most obvious indicator of the status of biodiversity may be the rapid decline in the field bird population, particularly the Dutch national field bird, the black-tailed godwit. A 'plan of attack' was launched at the end of last year to protect this beautiful breeding bird, whose numbers have been falling for decades in spite of all sorts of measures taken to improve its habitat, which consists of wet, herb- and insect-rich grassland. The eggs in the ground nests and the chicks fall victim to early mowing, drought and food shortages, or they are easy pickings for predators such as foxes, martens, crows and birds of prey.

> 'Farmers' professional expertise is in demand again'

FIXING CARBON

And yet it puts this story in perspective to hear from Jelle Zijlstra of Wageningen Livestock Research that the biodiversity on dairy farms is in better shape than it is on land used for arable farming, flower bulbs and horticulture: 'Long-term grassland captures a lot of carbon and has a rich soil life. That makes it a richer ecosystem than you find in fields that are ploughed and sown every year.'

Yet Zijlstra too sees that biodiversity plays very little role in the management of most grassland and maize cultivation at the moment. Farmers drive heavy machinery over the still sodden ground in the early spring, compacting the soil. 'That causes an oxygen shortage for billions of soil organisms and closes up the passages that creatures like earthworms depend on.' Ammonia emissions from barns and manure storage cause nitrogen precipitation in a radius ranging from 100 metres to several kilometres. The overdose of nitrogen damages vegetation and causes species that thrive on nitrogen-rich soils, such as brambles and stinging nettles, to overwhelm specialist species. So there is much to be done. The dairy sector takes up the most space in the Netherlands: 50 to 60 per cent of agricultural land – which comes to roughly one million hectares of grassland, and one quarter of the country's land surface – is used for 1.6 million cows, most of them Holstein-Friesians. This dairy cow needs large quantities of English ryegrass, which produces the biggest yields on large plots that are well-drained and can easily be irrigated in times of drought. 'And then there is the need for maize as supplementary coarse feed,' says Zijlstra. 'That makes ploughing, sowing, weedkilling, irrigation and harvesting necessary every year again, which does the biodiversity and the soil no good at all.'

SUSTAINABILITY GOALS

But the past five years have seen the launching of many initiatives to improve biodiversity on dairy farms, says Zijlstra. 'Partly through our research, on the approach to sustainability goals in the dairy sector for example, we now find more attention being paid to herb-rich pasture, and more agricultural nature management. To speed up this process, the focus of payments to farmers based on EU agricultural policy needs to shift to the environment and biodiversity, and we need a bigger joint effort from farmers, nature management, water boards,

PHOTO SHUTTERSTOCK

Mowing less and fertilizing the edges of fields can get grasses and herbs flowering again.

provincial government, dairy producers, and retailers,' says the researcher.
Within the dairy industry too, steps have been taken to improve biodiversity in recent years. The dairy multinational FrieslandCampina led the way in establishing the 'On the way to PlanetProof' system in 2018, which incentivizes farmers to dedicate more hectares to nature management, herb-rich grassland and permanent grassland with a label under the auspices of Stichting Milieukeur. Farmers are also encouraged to grow more feed on their own farms. Wageningen Economic Research and Wageningen Livestock Research have supported this development with aids such as indicators for identifying long-term environmental gains on dairy farms.
Only companies that meet criteria on greenhouse gases and nitrogen emissions can participate in the PlanetProof scheme. 'That reduces the dairy sector's negative impact on biodiversity,' says Zijlstra. The cows must have access to pasture on at least 120 days per year, with a maximum of 10 cows per hectare. Spraying former pastureland with glyphosate has also been forbidden since 2020. Zijlstra is hopeful. 'PlanetProof is a driver on the market for getting consumers to contribute to investments that dairy farmers have to make in order to work on biodiversity. Several retail chains have already started their own programmes, which also establish biodiversity-related criteria and enable farmers to get a higher milk price.'
Another instrument for promoting biodiversity is the Biodiversity Monitor for Dairy Farming, developed since 2015 by institutes including Wageningen and the Louis Bolk Institute for FrieslandCampina, Rabobank and the WWF. The monitor makes use of key performance indicators (KPIs). These are indicators for such things as environmental pressure, the percentage of herb-rich grassland on a farm, or the number of landscape features that are maintained. The aim of measuring these things is to provide dairy farmers who book measurable biodiversity gains with new business models, for example because water boards, estate managers, provinces, lessors, and even banks reward the dairy farmers for their progress in these areas, says Anne van Doorn. Accumulating these kinds of rewards is a principle from the Delta Plan for Biodiversity Restoration of 2018. 'Trial projects are running in Drenthe and Brabant,' says Van Doorn. 'On a small scale, the Rabobank offers a cut in interest to initiatives that pay extra attention to biodiversity. Eventually, the bank aims to upscale this incentive.'

LESS MOWING

Biodiversity is in a bad way, but the situation is not hopeless, agrees Gerard Migchels of Wageningen Livestock Research, who leads a project on Green Enterprise with Livestock. He firmly believes the tide is turning. At the dairy innovation centre Dairy Campus in Leeuwarden, Migchels demonstrates how biodiversity can be improved. He gestures expansively towards the >

PHOTO GUY ACKERMANS

ANNE VAN DOORN,
project leader, nature-inclusive agriculture at Wageningen Environmental Research

PHOTO GUY ACKERMANS

JELLE ZIJLSTRA,
dairy economist at Wageningen Livestock Research

now still monotonous fields with a carpet of uniform green grass that are soon to be transformed into more herb-rich grassland with flowery edges. Flowering plants are good for insects and therefore for birds. Herb-rich grassland also enriches soil life, delivers stable yields and is more resilient to droughts, says Migchels during a guided tour.
His project 'Towards more biodiversity with precision' started at the Dairy Campus last autumn. 'Around the edges of the fields we are going to fertilize less or not at all, and mow less as well, so that grasses and herbs can start flowering.'

GRASSLAND MANAGEMENT

He calls his approach 'precision grassland management' and hopes it will represent a breakthrough for dairy farmers who want to increase biodiversity but who cannot or do not wish to generate extra income for it through niche market sidelines like farm shops, farmhouse cheese, organic dairy produce or a farm campsite. At least 70 per cent of dairy farmers fall into this 'conventional' category, says Migchels. The key feature of precision agriculture as a way of improving biodiversity is extensification and raising the water table on 25 per cent of the land, enabling a considerable increase in biodiversity, according to the researcher. On the remaining 75 per cent, however, production is increased by fertilizing thoroughly and harvesting grass along fixed tractor paths.
'Using sensors, soil scans, satellite images and drones, we can see exactly which fields need more or perhaps less fertilizer. In consultation with the farm worker, we can adjust the amount of manure that is spread,' says Migchels. 'We think such precise fertilization will make it possible to save on artificial fertilizer. And with better quality coarse feed (maize silage), you can also save on concentrate (soya).'
The same optical techniques are used to mow the extensive fields with great respect for the field edges and the nests of field birds. 'The farm worker can see on the dashboard of his harvester not just the nests but in future also the foraging chicks, so he can avoid them.' Testing of these techniques will continue on 250 hectares at the Dairy Campus until 2024.

FIXED TRACKS

The cows on the Dairy Campus get a precise diet containing more herb-rich grass and less concentrate with soya and brewers' grains that come from elsewhere. The goal is to achieve the same milk yield on herb-rich grassland with lower ammonia and methane emissions. 'The yield the farmer loses on a quarter of his grassland, he recoups on the rest. If that works, his net income stays the same so the additional biodiversity doesn't cost him anything,' concludes Migchels. He thinks that the use of fixed tracks for muck-spreading, mowing and harvesting reduces the compacting of the soil on the more intensive fields, so the soil quality can improve and a higher water table is possible. 'Not only is that good for nature, but it will be less drought-prone too.' If the trial in Leeuwarden is successful, the space for biodiversity will increase fivefold from five per cent to 25 per cent, and 250,000 hectares of grassland in the Netherlands will have been freed up for more biodiversity.
And Migchels is hoping for more. The research includes a study of the hypothesis that the cows will be healthier on the herb-rich diet, saving the farmer on veterinary costs. He also foresees a diversification in cattle breeds in future. 'We won't just welcome more robust breed like Jerseys and Blaarkops, but we shall also breed within the standard Holstein-Friesian lines and select for animals that maintain their milk yields optimally on a more herb-rich diet.'
More emphasis on biodiversity also has direct consequences for the raw nerve in the agricultural debate of today: the nitrogen crisis. Emissions of nitrogen in the form of

> ‘The yield the farmer loses on a quarter of his grassland, he recoups on the rest’

PHOTO GUY ACKERMANS

GERARD MIGCHELS,
project leader, green livestock farming at Wageningen Livestock Research

ammonia can be reduced by putting cows out to pasture, says Jelle Zijlstra. ‘Ammonia is formed when the cow’s faeces and urine come together. Out in the meadow, the cow poos on the left and urinates on the right, so less ammonia is formed than in the barn,’ he explains. ‘And more outdoor grazing is more in line with the cow’s natural behaviour. This local fertilization also increases the soil’s water-retaining capacity, so that field birds can find more food.’
Spreading manure that has been diluted with water on days when it is not too windy or too hot can reduce nitrogen emissions by 20 per cent, showed earlier research by Wageningen Livestock Research. Less protein-rich feed and more grazing can add another 15 per cent. Nitrogen emissions in the barn can be reduced too, using low-emissions flooring, for example. The 500 cows on the experimental farm are testing a variety of different kinds of flooring and the ammonia and methane emissions are being monitored.

REFORMING AGRICULTURAL POLICY

For years, the government too has been searching for economic incentives for more biodiversity on farms. The obvious option is to reform European agricultural policy, including the subsidies, to make it a greener system with more positive incentives for biodiverse dairy farming. In the period 2015-2020, 30 per cent of the income support for farmers was to be made dependent on their meeting green targets such as reserving five per cent of their land for biodiversity.

‘Five per cent is the absolute minimum if you want to have any effect. And the rule only applied to farmers with more than 15 hectares of arable land, so farmers with a lot of grassland didn’t get any incentives at all,’ says Anne van Doorn. ‘What’s more, there were no specific, measurable goals.’
In a fresh attempt to green EU agricultural policy, seven trial projects have been running in the Netherlands since 2019. In 20 collectives, 500 farmers, including non-dairy farmers, examine area plans and ‘measures menus’, including a points system for evaluating measures. This is a different system to the key performance indicators of the Dairy Farming Biodiversity Monitor. ‘The idea is that the systems should be combinable,’ says Van Doorn. Apps have been developed too that give the farmer an idea of whether the measures are adequate for complying with the three pillars of a new agricultural subsidy policy: the green criteria for qualifying for the ‘basic premium’, the criteria for more far-reaching measures that give you an ‘eco premium’, and the criteria laid down for agricultural nature management. ‘It is all in the trial stage right now,’ says Van Doorn.
She adds: ‘The trial projects are going well, and the nice thing is that farmers’ professional expertise is in demand again. Not just about milk production but also their knowledge about the soil and soil processes, ecology and feed rations. We forgot about that in all those years of focusing on maximizing production.’ ■

www.wur.eu/biodiversity

PROFESSOR EMELY DE VET:

‘A healthy lifestyle is a luxury not everyone can afford’

The coronavirus pandemic has made people more aware of the importance of health for resistance to diseases. But knowing the theory does not automatically lead to healthy behaviour. ‘We’ve got to make it easier to make healthy choices,’ says Professor Emely de Vet. Financially as well.

TEXT ALEXANDRA BRANDERHORST **PHOTOGRAPHY** MARCEL VAN DEN BERGH

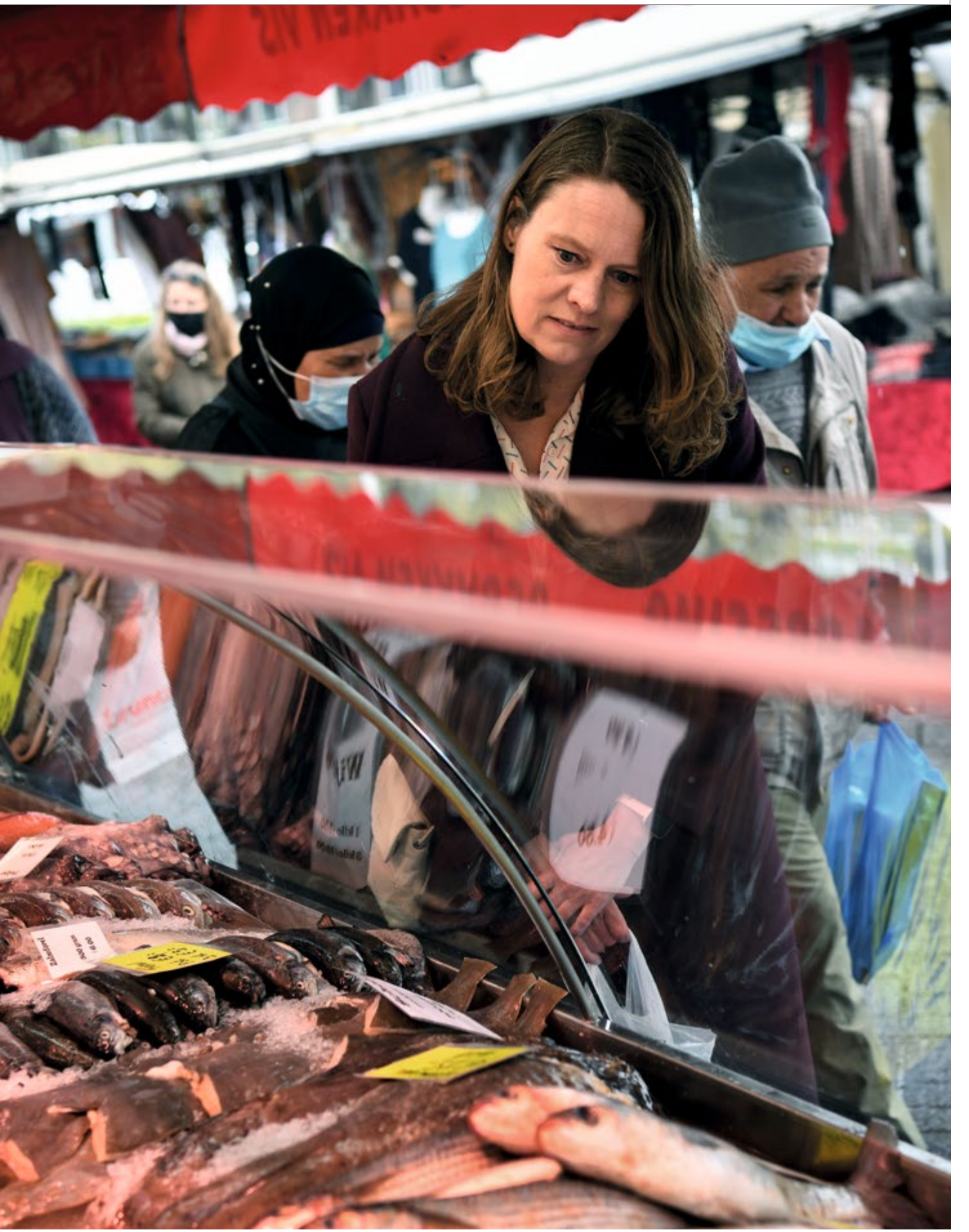
‘It is incredibly important that we work on a healthier lifestyle,’ says Emely de Vet, Wageningen professor of Consumption and Healthy Lifestyles. ‘Even without the coronavirus crisis, lifestyle-related diseases such as type 2 diabetes, cardiovascular diseases and obesity put our healthcare system under enormous pressure. And now the health service is very stretched, partly because people with severe overweight or other lifestyle-related conditions are more likely to end up in intensive care.’

How big is the problem?

‘Even before the pandemic, the Institute for Public Health (RIVM) estimated that more than 60 per cent of Dutch adults would be overweight by 2040. And Covid-19 is exacerbating the problem. Because of the lockdown, people are getting less exercise and the Covid kilos are piling on. The prognoses of Covid patients with lifestyle-related conditions are clearly much worse. This effect is also partly age-related: Covid-19 is often more acute in the elderly.
But all those lifestyle-related conditions tend to come with ageing too, so it’s a double whammy. A healthy lifestyle is just as important for old people, so they can be free of health problems for as long as possible.’

What does a healthy lifestyle look like?

‘It is important to eat well, following the guidelines for a healthy diet, and you should get at least 30 minutes of moderate exercise such as walking or cycling on at least five days a week. Preferably you should also do some intensive activity such as sport twice a week. How much time you spend sitting plays a big role too: a lot of sitting is bad for your health. Doing sport three times a week does you less good if you spend the rest of your time sitting down than if you lead a more physically active life. And there is no place for smoking and alcohol in a healthy lifestyle, while getting enough sleep and relaxation is important. People who go short >



‘A healthier diet means going against the tide’

of sleep may be more inclined to reach for fatty and unhealthy food.’

A healthy diet, enough exercise and sufficient sleep: it doesn’t sound complicated. So why is it so difficult for a lot of people?

‘That’s because of a combination of factors influencing our lifestyle. It is largely a societal problem. We get less exercise because more and more people spend all day seated, working on a computer. Because we travel further to work than we did 50 years ago, for instance, we go by car instead of by bike. And as long as most of what is sold or on special offer at the supermarket falls outside the guidelines for a healthy diet, it is difficult for people to make healthier food choices. Food choices are nearly always based on established habits prompted by the environment. A healthier diet is not simply a question of choosing something else. It requires people to swim against the tide.’

Can anything be done about that?

‘To start with, the places we get our food from, like supermarkets, canteens and catering outlets, should offer healthier food. And municipalities need more scope for controlling what food is on offer, by using zoning, for example, to ban fast food outlets from a 500-metre radius around schools. Getting rid of VAT on fresh fruit and vegetables also makes it more financially attractive to eat more healthily. An additional tax on unhealthy products, a sugar or fat tax, is not a magic bullet but does help, as research has shown. Central government should also act to regulate things like a healthier composition of products and smaller portion sizes in packets.

‘Compared with other countries the Netherlands is not very proactive. The United Kingdom and Chile, like a lot of countries, are working on reducing the consumption of soft drinks and have a sugar tax. As a result, producers in these countries are doing their best to market soft drinks with less sugar in them. In March, researchers from my group and from Utrecht University published an advisory report with recommendations for these kinds of measures, so that the EU can support the member states in creating a healthy food environment.’

Taxes, zone restrictions for food outlets and more regulation. This all goes much further than information about a healthy diet.

‘Fifty years ago, health education focused on informing the individual, with folders and the Dutch “wheel of five” food groups, for example. By now it has become apparent that these things only reach people who are capable of understanding and applying the information. What we have learned from behavioural research now enables us to reach more groups in ways more compatible with people’s actual behaviour. We all know that knowing the theory doesn’t always lead to healthy behaviour, and that applies to us too. With a view to gaining a better understanding of how we could achieve that, we are working with people from different disciplines such as health scientists, psychologists, sociologists, educationalists, and anthropologists. This is a tough puzzle that we can only solve together. But it is precisely the complexity of this field that continues to interest me.’

Studies worldwide show that people with lower levels of education and income are more likely to suffer from health problems such as obesity and type 2 diabetes, and more often have an unhealthy lifestyle. Why is that?

‘A healthy lifestyle is not a priority for people stressed by money worries, unemployment or other problems. Stress and a shortage of money induce short-term thinking, so people opt for whatever is immediately easy and rewarding. That makes you more vulnerable to unhealthy choices, which is further reinforced by the fact that unhealthy choices are also cheaper than healthy ones: healthy

products such as fruit and vegetables are more expensive than unhealthy, processed food. A healthy lifestyle is a luxury that not everyone can afford. And the social context – family, colleagues and friends – contributes too.

'For me it's about justice in a way. The lives of people on lower incomes and with less education are seven years shorter on average, and they are in good health for nearly 19 fewer years than those with higher educational levels. I think it's absurd that we have those kinds of differences in the Netherlands. The main emphasis at present is on medical treatments for conditions. We should be paying more attention to prevention. Targeted policies can help us create equal opportunities, reduce health discrepancies, and make healthy lifestyle choices feasible for everyone.'

Where does that passion for social justice come from?

'I come from a working-class background, and I was the first in my family to go to university. My father and other family members worked shifts in a factory. I know how high the ivory tower can be, full of scientists and professionals who mean well but are not in touch with ordinary reality. Because of my background, I am not quick to judge others and the choices they make. People from more intellectual circles sometimes speak scornfully about people from less highly educated classes. "Every kilo goes in through the mouth" is a Dutch saying I hear even doctors repeating. But it's so much more complex than that.'

If the social context has such a big impact, how can we change anything?

'Old habits die hard, and that applies to our eating habits too. If children learn an unhealthy lifestyle from an early age, it is not easy to repair the damage later. Research shows that bad eating habits and overweight at a young age are good predictors of overweight later in life. That is why I argue for dietary education in schools. Many schools are joining in with the Wageningen Taste Lessons programme, or EU School Fruit, in which schools get free fruit and vegetables for the pupils. Attention paid to a healthy diet in schools has the biggest impact on children who don't get fruit or vegetables at home. It would be best if diet and health were standard parts of the curriculum, so that all children learn about a healthy lifestyle from a young age.'

And how can the health service help people who have overweight and health problems now?

'The health service offers effective lifestyle programmes these days, such as SLIMMER. Wageningen made a big contribution to developing this two-year programme, covered by the basic health insurance, for people with overweight and a raised risk of diabetes. Once they've been referred by their GPs, participants get guidance from physiotherapists, dieticians and lifestyle coaches to help them eat more healthily and get more exercise. The programme cuts the risk of getting diabetes by about 50 per cent. Hopefully programmes such as SLIMMER will be offered more widely in the coming years.'

Is there a holy grail?

'There is no single measure, programme or lifestyle change that works for everyone. But a combination of various nudges and measures can help us as a society to move in a direction that promotes healthy living. With several interventions together and a long-term view, you can achieve a lot. As has happened with smoking. Thanks to higher taxes, a smoking ban in many public places and targeted marketing, the norms on smoking have changed.' ■

www.wur.eu/behaviour-health

EMELY DE VET

Emely de Vet has been professor of Consumption and Healthy Lifestyles at Wageningen since 2019. In 2021, she became a member of the Health Council and she holds various scientific advisory posts, including at the Nutrition Centre and the Brain Foundation.

2001 MSc in Health Sciences, University of Maastricht
2005 PhD in Health Sciences, University of Maastricht
2006 Researcher in Social Healthcare, Erasmus University Medical Centre
2006-2013 Assistant professor of Health Promotion and Disease Prevention, VU University Amsterdam
2009-2013 Senior researcher in Health Psychology, Utrecht University
2013-2016 Associate professor of Health Communication, WUR
2016-2019 Personal professor of Health Communication and Behavioural Change, WUR

Tracing the origin of l

People have been developing new lettuce varieties since 4000 years BCE. It started with wild lettuce in the Caucasus. The prickles on the leaves disappeared in the Middle East, and the big, soft leaves of butterhead lettuce emerged in Europe. Only in America did the crunchy iceberg lettuce appear on the scene, genetic analysis has shown.

TEXT NIENKE BEINTEMA

PHOTO ALAMY

Lactuca serriola, the wild lettuce variety which present-day varieties stem from.

From butterhead and oakleaf lettuce to iceberg and romaine: there are hundreds of lettuce varieties nowadays. They all belong to the same plant species, *Lactuca sativa*, which once developed from the wild lettuce species *L. serriola*.

But until recently we had no idea exactly how that process had unfolded. To find that out, Wageningen and Chinese researchers have analysed the genetic diversity of 445 varieties of lettuce from 47 countries, including wild varieties in the Caucuses and the Middle East. They published their research finding in *Nature Genetics* in mid-April. Comparisons of genetic material show that the first cultivated lettuce grew in the Caucasus about 6000 years ago. The main varieties developed later through breeding and selection in the Middle East, then in Egypt, then in ancient Greece and Italy, in Central Europe and finally in North America.

'During the cultivation process, there was strong selection for desirable characteristics such as flavour and ease of growing,' says researcher Rob van Treuren of the Dutch Centre for Genetic Resources CGN, part of Wageningen University & Research. 'But a lot of genetic diversity gets lost that way.' And with it, characteristics that are important to growers, such as robustness and resistance to particular diseases. You can bring those back in the crop through crossbreeding, but to do that you must first find those characteristics.

23,000 SEED SAMPLES

'Wild varieties form an enormous reservoir for that,' says Van Treuren. Sometimes the CGN scientists make trips to collect wild varieties of crops: spinach from Tajikistan, melon seeds from Uzbekistan, leeks from

ettuce

> ‘It is as though we found the key to a treasure trove’

Greece – and lettuce from Jordan, Uzbekistan and the Caucasus. But for the lettuce study published in *Nature Genetics* they did not have to leave home. ‘In Wageningen we have a unique collection that includes a wide range of cultivated lettuces and wild relatives,’ says Van Treuren. The CGN gene bank contains more than 23,000 seed samples of 30 different crops, both wild and cultivated, as well as genetic material from farm animals, trees and shrubs.

The first full genetic map of lettuce was created four years ago for iceberg lettuce from California. This produced what is known as a reference genome: the roughly 2.5 billion building blocks that the lettuce genome is made up of. ‘Thanks to the reference genome, we could compare those 445 varieties relatively easily,’ explains Van Treuren. ‘So we looked for genetic variations: places where the genome of one variety is different to the reference genome.’

FAMILY TREE OF VARIETIES

On this basis, you can also compare varieties with one another, such as the different cultivars, or you can compare cultivars with wild lettuces from different geographic regions. That produces a family tree that shows precisely how the varieties are related. The degree of variation in relation to the wild ancestor reflects the length of time that has gone by since that branch of the family tree started. ‘We now know for example that the first cultivation step was taken about 6000 years ago in the Caucasus,’ says Van Treuren. ‘Farmers used selection to stop the plant distributing its seed on the wind, as the related dandelion does. Seeds that stay on the plant are easier to collect.’

With further breeding and selection, farmers in other parts of the world were able to make improvements to the crop too. Prickles on the leaves disappeared somewhere on the way to Egypt. The big, soft leaves of the butterhead lettuce emerged in Europe. And only in America did the crunchy iceberg lettuce appear on the scene.

HELP WITH BREEDING

The researchers found correlations with lettuce characteristics in the DNA data too, including leaf characteristics, flowering time and resistance to diseases. ‘These relations can help with research and breeding,’ says Van Treuren. ‘And they form the basis for what is known as “marker-driven selection”. Genetic markers are short DNA fragments whose position on the genome is known, and which we also know to be associated with a particular characteristic. A breeder can use such markers to see whether even a very young plant has the characteristic in question. This means you don’t have to wait until the plant is fully grown and produces seeds itself to see the seed characteristics. ‘Such markers can speed up the breeding process tremendously,’ says Van Treuren.

The nice thing about the new study, he adds, is that the data are already freely available. Anyone can use them for research and crop improvement. ‘As a gene bank we strive to make information about our material available to the public so that everyone can benefit from it. Thanks to our sequence data, other users can track down characteristics quickly,’ says Van Treuren. ‘It is as though we had found the key to a treasure trove.’ ■

www.wur.eu/dna-lettuce

Tagged wildebeest alerts park rangers

The movements of hoofed mammals give away the presence of poachers – who are not targeting them but elephants or rhinos. This was demonstrated by a trial with tagged hoofed animals. Park rangers are alerted and can intervene in time.

TEXT ANNE VAN KESSEL **PHOTO** GETTY

The ivory trade ensured the extermination of 90 per cent of the African elephant population over the past century. And even now, about 55 African elephants are killed every day, although rhinos and elephants appear to have benefitted from the lockdowns. In 2019, 594 rhinos were killed in South Africa; in 2020, 394 were killed. But game park managers fear for an increase after the pandemic. In December, when the lockdown was briefly lifted, experts from the South African parks saw an immediate increase in poaching.

The main poaching zone in South Africa is the Kruger Park: a game park on the border with Mozambique that covers an area the size of half the Netherlands. For a few years, heavily armed park rangers have been patrolling the park together with the army. This leads to regular and sometimes deadly clashes with the poachers.

SENSOR UNDER THE SKIN

Scientists have got involved in the escalating battle too. A few years ago, British researchers came up with the idea of implanting sensors under the skins of rhinos and hiding tiny cameras in their horns. The idea was that if anyone came too close to one of the animals, its heartbeat would speed up and the park rangers would receive a signal to go and find it. If they got there too late, the camera would have snapped the poacher. A nice plan, but dangerous too, because what if the poachers hack and read the sensors? Then science will help them instead of the rhino. And there's the question of how quickly rhinos react to their attackers. Rhinos and elephants are rarely predated by other animals and are therefore not particularly alert to danger.

This idea led Wageningen researchers in the Wildlife Ecology and Conservation chair group to think up a different plan. Prey animals such as zebras and wildebeest do react quickly to disturbances and threats such as lions. They probably react to poachers as well, even though they are not targeted by them. So could zebras and wildebeest serve as informers? >

> 'If an animal suddenly starts running in hot weather, there must be something going on'

To figure that out, ecologist Henjo de Knegt and his colleagues set off for South Africa in 2019 with a Dutch Research Council (NWO) grant. In the Welgevonden game reserve in the north-east of the country, they fitted 138 zebras, impalas, wildebeest and elands with a collar carrying a GPS, an accelerometer and a thermometer. 'If an animal suddenly starts running in hot weather, there must be something going on,' says De Knegt.

The data from the transmitters goes first to a mast with a receiver, and from there to a data centre in Europe via a 3G or 4G internet link. The researchers in Wageningen receive, decode, and analyse the data using an algorithm developed in Wageningen.

Fitting the animals with the transmitters was a big job. 'Team members flew over the park in a helicopter with a vet to do it,' says De Knegt. 'When they saw an animal, they anaesthetized it with a dart and sent the coordinates to their colleagues on the ground, who drove there as fast as they could and put the collar on.'

A lot of the animals in the study had come from other parks. 'In Africa, parks exchange animals in order to maintain genetic diversity and to increase or limit populations,' says De Knegt. Some animals were transferred to Welgevonden from other parks, and the researchers made grateful use of them. 'It was relatively easy to fit these animals with a transmitter when they arrived at the park.'

All the animals were brought to a fenced-off section of the park, to restrict the research area. There the researchers and the park staff simulated disturbances, imitating tourists, for instance, who were exploring the park by car or on foot. 'In other experiments, we asked the park rangers from the anti-poaching unit to act like poachers. They know how to move through the bush without being noticed.'

To motivate the park rangers to do their very best not to be spotted, they were told to look for a wildebeest with a red spot on its back.

'We ask the park rangers to act like poachers'

PHOTOS JULIA SCHÄFER

Impalas, zebras and eland antelopes get transmitters in Welgevonden game park in South Africa.

Whoever found it could shoot it and eat the meat. 'At least, that was what the park managers told the park rangers. In fact, there was no such marked animal.'
During one of the first experiments, De Knegt's colleague Jasper Eikelboom pretended to be a tourist. Back in Wageningen, De Knegt looked at the data coming in from the animals' collars. 'After the trip, Jasper was a bit disappointed that he hadn't seen any game. From the data I could see that there was game near him, but that the animals fled before he had seen them.'
With the algorithm, the computer could detect 86 of the 100 simulated disturbances, as we can read in the article published in *Nature Scientific Reports*. The algorithm assessed whether the tagged animals behave abnormally. To establish what their normal behaviour was, the animals were allowed to roam around with the collars on for 11 months, which generated a huge mountain of data.
It was apparent from the experiments that animals sound the alarm when tourists or poachers come within about 500 metres of them. De Knegt: 'The animals are already reacting before the people can see them.'
The concept has already been proven to work, according to De Knegt. But the system is not yet ready for use. In nine per cent of cases, the computer sounded the alarm unnecessarily. And in Welgevonden, there are no large predators such as lions, although other big cats are found there now and then. De Knegt: 'Leopards occasionally come into the park, hunting antelopes and impalas. You can't keep them out with fences.'

IMPALA UP A TREE

The experiments back this up. 'At one point I saw that the signal of one of the impalas stayed at one spot.' That could mean one of two things: either the impala was dead, or its collar had come off. 'I sent Jasper to look. He found the impala hanging in a tree. A leopard must have done that.'
The question is whether the system can distinguish between the way a zebra reacts to a lion and to a poacher. De Knegt thinks it can. 'The more unpredictable something is for an animal, the stronger its reaction. A lion is not entirely unpredictable: zebras and lions have evolved together and have lived side by side for a long time. But they don't meet so many humans so an encounter with humans will prompt a stronger response.'
A new experiment – which has been delayed by the pandemic – should show whether De Knegt is right about this. 'In a Kenyan park we are going to tag not just prey animals but also lions and hyenas.'

> **'There will be a stronger response to a human than to a lion'**

HACKED

The technique offers several advantages over the sensors used on rhinos and elephants. 'If this system gets hacked, the poachers don't gain anything from the data. They know where the prey animals are and where they are themselves,' laughs De Knegt. 'Also, it is easier to tag the prey animals and they are often present in larger numbers than elephants and rhinos. This makes it possible for us to observe changes in behaviour earlier.'
Both techniques have the advantage that park rangers can head straight for the criminals. 'This will mean fewer chance encounters that can lead to an exchange of fire.'
But there are disadvantages too, such as the costs. De Knegt: 'Not only do you need transmitters that have to be put around the animals' necks manually, but you also need receiver stations. These kinds of game reserves don't have electricity, so you need solar panels and batteries.'
What is more, the masts with the receiver stations must be strong enough to withstand a knock from an elephant. 'Our technical partners MTM and IBM installed the masts and antennae for us. In future, the parks will have to organize that themselves.'
The transmitters used in this study lasted a year, but new sensors with solar cells could be operational for several years or even the animal's whole life.

CREATING SAFE HAVENS

Not every park can afford such a system. 'There are parks in Africa where the managers don't even have enough money to buy shoes for all the park rangers,' explains De Knegt. So there's a big chance of poachers shifting their operations to parks without transmitters. The ecologist comments on this: 'Even if that is the case, you are still creating safe havens where the animals can live undisturbed and where you can maintain the genetic diversity.'
But he makes no claim that the sensors provide a one-stop solution to the problem of poaching. 'Poaching is a multifaceted problem, which you've got to tackle on several fronts at once. I hope we have a contribution to make because we don't target the poacher directly.' He is referring to techniques such as drones and fences with sensors, which do target the poachers themselves. 'Such techniques often offer advantages for a few weeks, but you always get into an arms race with the poachers. They think of an answer like a heat-resistant suit or camouflage clothing or just switching off the sensors on the fence. And then you need to come up with something new.' De Knegt hopes the Wageningen solution will last for a long time. 'How can a poacher arm himself against herds of smart animals?' ■

www.wur.eu/innovative-nature-conservation

Deciphering allergies

Wageningen immunologists and Rijnstate Allergy Centre in Arnhem are looking for new ways of identifying and treating food allergies. This requires a lot of research into the underlying causes. Why, for instance, are processed foods more allergenic?

TEXT MARION DE BOO **ILLUSTRATIONS** PIXELS&INKT

1 SHELLFISH
Up to 2% of the world population are allergic to shellfish. People who react badly to shellfish often also react badly to molluscs such as mussels. This is more common in regions where consumption is high.

2 PEANUTS
Between 0.5 and 1% of people in western countries have a peanut allergy. People with a severe peanut allergy can get a reaction just from touching or smelling peanuts.

3 MILK
It is estimated that about 1% of children under the age of two are allergic to cow's milk, and most of them grow out of it within a couple of years. Among adults it affects less than 0.5% of the population.

4 EGGS
An allergy to chicken's eggs is found in about 2% of young children. Most grow out of it, and less than 0.5% of adults are still allergic to eggs. It only takes a tiny amount of egg to provoke a reaction.

8 COMMONLY FOUND FOOD ALLERGIES

It is estimated that about 5% of the world population have a food allergy. An allergy is an abnormal reaction to a food ingredient by the immune system. The commonest allergies are to:

5 NUTS

It is estimated that about 0.5% of the population has a tree nut allergy. People with a nut allergy usually react to several kinds of nut. In the Netherlands, hazelnuts and walnuts are at number 1.

6 FISH

About 0.2% of people are allergic to fish. This is more common in countries where fish consumption is high. People with a fish allergy are often allergic to several kinds of fish, but not to shellfish or molluscs.

7 WHEAT

About 0.2% of people have a wheat allergy. They can react badly to barley as well. The allergy is not the same thing as coeliac disease, a hypersensitivity to gluten, which is much more common.

8 SOYA BEANS

It is not known exactly how common a soya allergy is. It probably affects an average of under 0.2% of the world population. It is more common in populations that eat a lot of soya.

‘The healing properties of raw milk might be destroyed when it’s heated’

Coughing and spluttering, stomach pains, runny eyes or an irritating tickle in the throat: allergic reactions take a variety of forms. Nowadays in the Western world, up to 40 per cent of people say they are allergic to something. It can be difficult to work out how you become allergic, to what exactly, and what you can do about it, says Huub Savelkoul, professor of Immunology at Wageningen. ‘We’ve been doing research on that for many years in Wageningen. On the substances that provoke allergies – allergens – in processed foods, for example. We want to know how those substances change during food preparation.
One example is the way milk is processed, which is the research field of the Wageningen extraordinary professor of Immunology Joost van Neerven, who also works for FrieslandCampina R&D. Van Neerven studies how a milk allergy works, which cells in the immune system play a role in it, and how you can prevent or treat an allergy. ‘It is estimated that one per cent of infants under the age of two suffer from a cow’s milk allergy, and four out of five of them grow out of it by their fourth birthday,’ says Van Neerven.

THE ROLE OF FOOD-PROCESSING

Gosia Teodorowicz, a researcher in the Cell Biology and Immunology chair group, studies the role of food-processing and the emergence of food allergies. She demonstrated that when milk proteins are heated, they undergo a process called glycation or the Maillard reaction, and she investigated whether this process increases children’s chances of developing a cow’s milk allergy. We see an example of the Maillard reaction whenever we grill meat. When you put a steak on a barbecue, you see it turning from red to brown. ‘That brown colour comes about, in simple terms, because sugars start sticking to the proteins in the meat,’ explains Van Neerven. ‘That adds flavour to the meat, but it might make the proteins that groups of sugars are sticking to more visible to the immune system. It is therefore possible that highly processed food products contain more allergens. This kind of research can lead to the introduction of milder food processing methods, which hopefully can help to prevent food allergies.’
Processed food poses no problem for most people. ‘But if you have a genetically determined tendency to have an allergic reaction, you will develop such reactions faster if your immune system is better able to spot and identify those allergenic proteins,’ says Van Neerven. ‘So the trick is to adapt the processing of our food so that it becomes less allergenic. Peanut allergies, for instance, are common in the western world but very rare in Asia. In Asian cuisine, peanuts are more often boiled, whereas in the West we eat more roasted peanuts. That might play a role.’

TOMATO KETCHUP

Identifying an allergy and studying what can be done about it is the subject of much Wageningen research, says Huub Savelkoul. Because diagnosis is complex. ‘A lot of children get an allergic reaction to tomato ketchup and are advised to avoid tomatoes. But there are hundreds of other substances in tomato ketchup besides tomatoes. If the child is allergic to one of those substances, they might react badly to other foods containing it, so this calls for further investigation. We are contributing to this in Wageningen.’
Or take peanut allergies, which can be serious and are common. There are many different proteins in peanuts, just one of which might be to blame. Conversely, many people with food allergies are allergic to combinations of different substances, such as cow’s milk plus beef or goat’s milk, or for bananas plus latex.
‘Peanut and nut allergies are a key focus of the Wageningen research,’ says Savelkoul. ‘In scientific terms, that is very complex. What is more, it is very common, mainly in children. Actually, you can only research this properly in a hospital. We don’t have the facilities for that at the university. We use blood samples from allergy patients for our research. But we want to be more involved with the patient, so we can help make difficult diagnoses and see whether we can set up a therapy. To that end, we started collaborating with the Rijnstate Allergy Centre in Arnhem 10 years ago.
Janneke Ruinemans-Koerts is a clinical chemist – a specialist in laboratory medicine – at Rijnstate hospital in Arnhem. She often attends discussions about patients at the allergy centre. ‘We consult each other extensively about whether someone is or is not allergic, and what to,

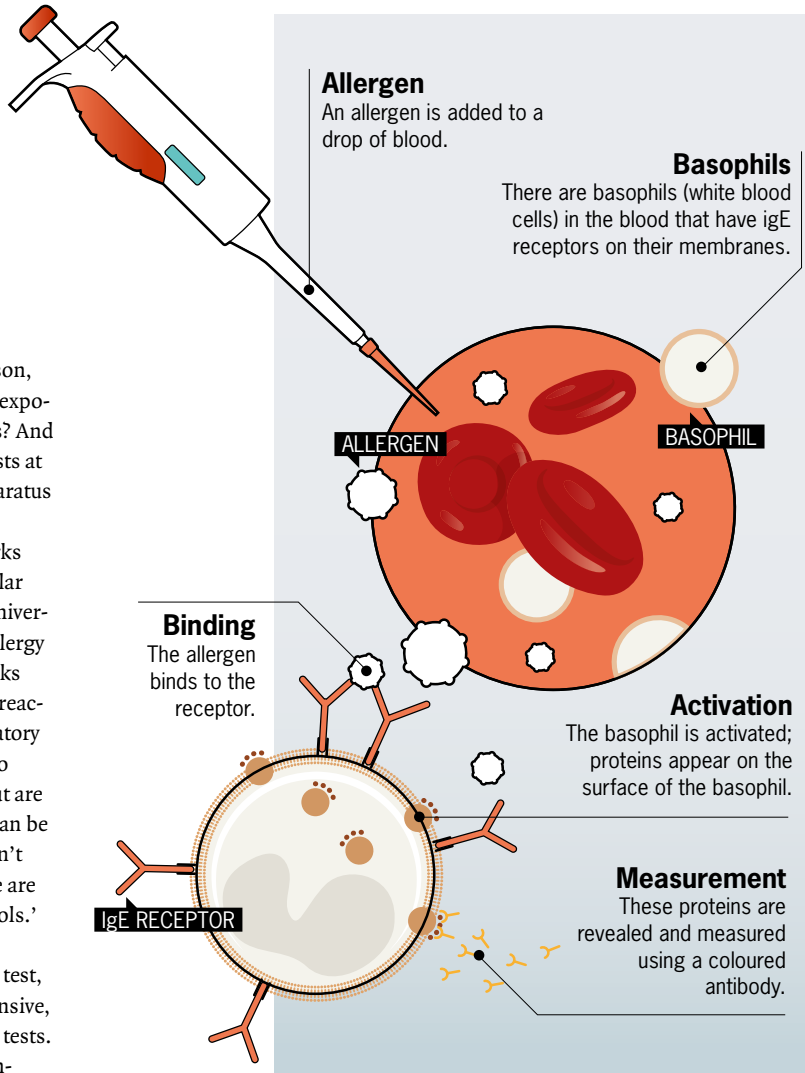
exactly. Do the symptoms occur in a particular season, in response to a particular food, immediately after exposure or only hours later? Can we do additional tests? And can we set up a therapy? We carry out laboratory tests at the hospital, but we don't have the staff or the apparatus to do scientific research.'

For this reason, as of 2021, Ruinemans-Koerts works one day a week at WUR, where she studied molecular sciences and did her PhD in biochemistry. At the university, she does research on new and more specific allergy tests for peanuts, nuts and cow's milk, and she looks into the underlying mechanism at work in allergic reactions. Ruinemans-Koerts: 'There are already laboratory tests for 400 different allergens from tree pollens to chicken protein. Those tests are highly sensitive but are not so specific. People who are extremely allergic can be spotted at once, but a positive result certainly doesn't always mean someone really has that allergy. So we are hard at work on better, more specific diagnostic tools.'

An example is the BAT test that was introduced at Rijnstate in 2015. Wageningen helped develop this test, which could make it possible to do away with expensive, sometimes risky, and unpleasant food provocation tests. In a provocation test, the patient is given steadily increasing amounts of a particular food to eat, to find out which amount triggers the allergic reaction. In the BAT test, a purified form of a food such as a bit of cow's milk protein is added to a drop of the patient's blood.

The BAT test is reliable and much less burdensome than the traditional provocation test, says Ruinemans-Koerts. 'Take a cow's milk allergy, for example. That is most >

'One millilitre of blood is enough to do the new BAT test'

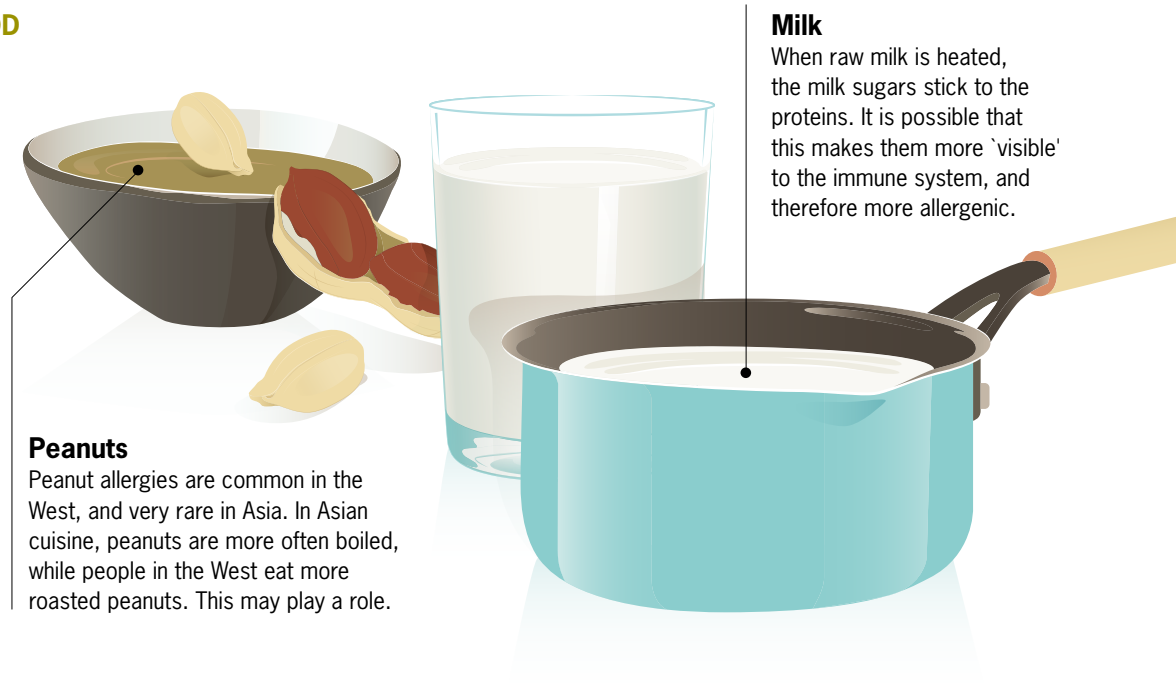


BASOPHIL ACTIVATION TEST

To improve the diagnosis of food allergies, Rijnstate and WUR did further clinical trials with the Basophil Activation Test (BAT). Basophils are white blood cells that are involved in the development of an allergic reaction. They have receptors called IgE receptors on their membrane, which various allergens can bind to. Allergens are foreign substances such as protein fragments from peanuts or pollen dust, which can provoke an allergic reaction. During the BAT, a purified form of a food, such as a bit of cow's milk protein, is added to a drop of the patient's blood. One millilitre of blood is enough. If the basophils in it are activated by an allergen, certain proteins will appear on the surface, which are dyed with a reagent. The level of activity is measured with a flow cytometer.

PROCESSED FOOD IS OFTEN MORE ALLERGENIC

Highly processed food products are more allergenic. Research is being done into why that is.



Milk
When raw milk is heated, the milk sugars stick to the proteins. It is possible that this makes them more `visible' to the immune system, and therefore more allergenic.

Peanuts
Peanut allergies are common in the West, and very rare in Asia. In Asian cuisine, peanuts are more often boiled, while people in the West eat more roasted peanuts. This may play a role.

common among children under the age of four. Babies who are allergic to cow's milk can cry inconsolably and develop skin rashes. Sometimes they vomit or their faces swell from fluid retention. But these are not really specific symptoms; they could occur for other reasons. For a cow's milk allergy test, the baby and a parent must come to the hospital for two days. That is a nuisance and it's also expensive. On one day the child is given cow's milk and on the other a placebo, and no one knows which is which. The new BAT test can be done with just one millilitre of blood taken from a finger, which is certainly less upsetting for children.' With this test, the sometimes severe allergic reaction is provoked in a blood sample instead of in the child. Over the next four years, Rijnstate will be using a grant from ZonMW/ZIN to work with 17 other allergy centres in the Netherlands to find out whether the BAT test for a cow's milk allergy can be rolled out nationally and covered by patients' health insurance.

STORED IN THE FREEZER

Until recently, fresh blood was needed for the test, which had to be done within 24 hours. 'That can be a logistical challenge,' says Ruinemans-Koerts. 'And we sometimes get samples in from other hospitals or surgeries in the region. Luckily, nowadays we can also do the test on frozen serum from the patient's blood. We can keep that in the freezer for years at minus 80 degrees. That means you can do new tests later with new techniques without the person having to come and give more blood. This method has proven just as reliable as the BAT test on fresh blood, and the nice thing is that it requires even less blood, only 400 microlitres per test. The lab technician can also test for several allergens in one blood sample, so we can now test for peanut and hazelnut allergies using the same blood sample.' 'This makes diagnosis more straightforward,' adds Savelkoul, 'and we are now researching whether these BAT tests make the food provocation tests redundant.'

'Our worlds overlap and reinforce each other a lot,' says Ruinemans-Koerts. 'Our hospital laboratory is primarily equipped for serving the clinic; we don't develop new techniques ourselves but we can test existing techniques and make them usable, because Rijnstate has access – if patients give us permission – to properly analysed blood samples from patients in whom an allergy has been identified with a provocation test, and whose symptoms and possible allergies to other substances are documented too. In Wageningen we use these blood samples for further fundamental research into new tests and for research into the mechanisms by which allergies develop.'

Savelkoul: 'For example, we have started a collaboration with Professor Han Zuilhof's Organic Chemistry chair group. In his group he has developed unique technology for making "anti-fouling" surfaces on a nano scale. These are surfaces that nothing sticks to except what we put on them ourselves. These surfaces can bind very specific proteins, and we are now using them to develop faster and more sensitive diagnostic tests that require a

> ‘The idea that you need to be exposed to allergens to get used to them is gaining traction’

tiny amount of blood. We are also working together on synthetic peptides from allergens, which we can use for highly specific diagnoses, but which we are testing for other purposes too, such as a safe application of immunotherapy, with fewer side effects for the patient.’
Immunotherapy is already used occasionally to treat hay fever or house mite allergies. The patient is given a small quantity of the allergen via injections or tablets. ‘Gradually, the immune system will react less and less, and the allergy symptoms will slowly disappear,’ says Joost van Neerven. ‘But for food allergies, these kinds of treatments are still in their infancy.’ There are still many unanswered questions. Which category of patient is most suited to this kind of therapy and at what age? What techniques will you use to monitor the treatment? How can you predict at an early stage whether it is going to work? And why does it work in one person and not in the next?

EARLY EXPOSURE

Recent studies have also shown that the early introduction of food allergens into the diet of very young children seems to protect them against developing food allergies. Van Neerven: ‘If your aim is never to develop a food allergy, you shouldn’t eat. But according to recent studies, early exposure to all sorts of food allergens for babies under the age of one is particularly important for preventing them from developing food allergies. It is thought that it helps teach the immune system in the gut not to react. Too early exposure is risky too, but according to the latest guidelines, babies of between three months and one year should taste tiny mouthfuls of all kinds of foods to train their immune systems.’
Native Americans develop oral tolerance for poison ivy, a climbing plant that causes serious skin reactions, by chewing on the leaves of the plant. Van Neerven: ‘Twenty years ago, the consensus was that allergic people should avoid the products they are allergic to as much as possible; now the idea is gaining traction that maybe you should be exposed to traces of allergens so as to get used to them.’

RAW MILK

We know that children who grow up on a farm are less prone to developing asthma and other respiratory tract allergies than city children. That was put down to early contact with animals, barns, manure and the soil when the children play out of doors. These things stimulate their immune systems a lot. But it turns out there is a link between the raw milk drunk by children brought up on a farm and their lower rates of asthma and hay fever. Van Neerven: ‘This has especially been noted on small farms in southern Germany and Austria. An epidemiological study is not a nutrition trial, and we can’t do controlled studies in which we get test subjects in the lab to drink raw milk, but the effect has been confirmed by more than 10 large-scale epidemiological studies.’ The effect may start during pregnancy, given that pregnant women farmers drink raw milk too, and it continues in the child’s first two years.
The secret of raw milk is under investigation. It has been established that human breast milk contains about 200 components on top of the usual lactose, proteins and fats that – in miniscule quantities – have a beneficial effect on the development of the child’s immune system. Van Neerven: ‘We reckon that similar components are already present in cow’s milk, to protect the calf. We have studied a number of these components, and they influence the cells of the human immune system. But their beneficial effect might get lost when the milk is heated. In the Netherlands, the sale of raw milk for consumption is forbidden for reasons of hygiene. Milk must be pasteurized at a minimal temperature of 72 degrees. But this might provide some starting points for improving the formula milk given to babies that can’t be breast-fed.’ ■

www.wur.eu/allergyresearch

Discovering the 'seventh

Scientists have been searching for decades for a biochemical pathway by which bacteria capture CO_2. Irene Sánchez-Andrea found the pathway in the course of a 'hobby project', and received University Fund Wageningen's Research Award for her discovery.

TEXT ALBERT SIKKEMA **PHOTOGRAPHY** ERIC SCHOLTEN

Some organisms can capture carbon dioxide (CO_2) and convert it into the organic carbon compounds they need for their growth. Until last year, six carbon fixation pathways were known to scientists. The most familiar of these pathways is the Calvin cycle used by plants in photosynthesis. Less widely known are the other conversion pathways used by bacteria and bacteria-like organisms called archaea for their growth. This microbial CO_2 fixation is very important in the oceans, for example.

SPECULATION

Ever since the 1980s, there has been speculation about a seventh mechanism for capturing carbon dioxide, says Fons Stams, chair of the Microbial Physiology group at the Laboratory for Microbiology when Irene Sánchez-Andrea developed the experiments and discovered the pathway in *Desulfovibrio desulfuricans*, a bacterium that lives in sediments and soils under anaerobic conditions. Stams started studying these bacteria back in 2008, and at that time he and his colleagues thought *D. desulfuricans* needed organic matter to grow. But Sánchez-Andrea discovered that this microorganism can thrive on just the combination of hydrogen, sulphate and CO_2, all inorganic compounds. After three years of laboratory experiments and computer analyses, the pathway that the bacterium uses to make carbon building blocks out of CO_2 was mapped out.

Sánchez-Andrea received University Fund Wageningen's Research Award 2021 for the discovery of this seventh pathway – the 'reductive glycine pathway' – during the University's Dies Natalis (Founders Day) in March. 'It was my hobby project alongside my main research which focuses on metabolic conversions and pathways used by sulphur-cycling microorganisms', says Sánchez-Andrea. 'It was very time-consuming, and we faced a lot of challenges, such as making sure the growth medium didn't contain any organic compounds. Chemicals or the glassware that you routinely use in the lab can contain organic compounds, but we couldn't afford any contamination.' She collaborated with researchers at the Max Planck Institute in

Irene Sánchez-Andrea does research on the CO_2 conversion route in the bacterium *Desulfovibrio desulfuricans*.

pathway'

Potsdam who were also looking for the seventh pathway, and with researchers at UC Berkeley who have specialized knowledge on the detection of the products of metabolic processes. The results were published in *Nature Communications* in October 2020, with Sánchez-Andrea as lead author. The discovery of the pathway is not only a scientific achievement but may also be of use for tackling climate-related problems and for developing a biobased economy. Converting CO_2 into carbon compounds requires an external source of energy, but *D. desulfuricans* appears to convert CO_2 into biomass and chemicals in a relatively energy-efficient manner. Sánchez-Andrea aims to take the research further by culturing the bacterium on a large scale to produce useful chemicals such as biofuels. 'We can grow the bacterium in the lab. The next step is to expand the range of products by getting the bacterium to make more compounds. We also want to see whether we can introduce this pathway into other bacteria that grow easily in bioreactors, in the hope of producing chemical building blocks on a large scale with little energy, while capturing CO_2 at the same time.'
The Research Award jury praised Sánchez-Andrea's work: 'This is a terrific example of curiosity- and hypothesis-driven fundamental research with great potential for applications.' ■

'We hope to be able to produce chemical building blocks and capture CO_2 at the same time'

www.wur.eu/co2-fixation

WEATHER INFORMATION HELPS FARMERS IN AFRICA AND ASIA

From crop calendar to text messages

A farmer who knows when it's going to rain can make better decisions. And now that climate change is making the weather in Africa and Asia more unpredictable, weather forecasts via apps and text messages can help farmers be proactive. The technology works, as several projects have shown. The question now is how this development can be upscaled.

TEXT ARNO VAN 'T HOOG **PHOTO** ANP

PHOTO BARON LATTIMORE, XACKLEY! STUDIO

WEATHER FORECAST BY SMS IN ETHIOPIA

Few sesame farmers in Ethiopia have a smartphone but most do have a mobile phone. In the G4AW project, weather information from satellites and other sources is transformed into a compact text message in the local language.

'For the sesame farmers in Ethiopia, the start of the rainy season used to be a reliable fixture. If you sowed when the rains came, things usually worked out well,' says Wageningen-trained meteorologist Gerrit Hiemstra. But now the sesame farmers face change and uncertainty. 'Nowadays the start of the rainy season is much more variable, and sometimes there is a false start: the rains seem to come, but then it is dry for a while again. Farmers have then wasted all their seed and they don't always have the money to sow again. Then there is no harvest that season. The farmers lack access to usable and detailed weather information, which could help them avoid harvest failures.'

In the past five years, Hiemstra and his meteorology and climate change consultancy company Weather Impact have worked on weather information services within the Dutch project G4AW: Geodata for Agriculture and Water. The aim of G4AW was to supply farmers and fishers in Ethiopia, Burundi, Indonesia and Myanmar with usable weather and agricultural information, partly based on geodata from Dutch satellites. Wageningen Environmental Research coordinated the project G4INDO for rice farmers on Java and, together with Weather Impact, was involved in the G4AW project CommonSense in Ethiopia.

'Two text messages a week can make a world of difference'

It's the 'last mile' that's important in these projects, says Hiemstra. How do you get weather information to the farmer? 'For the Ethiopian sesame farmers, we opted for sending text messages. Two text messages a week can make a world of difference, if you previously had to go by the calendar, the wind and bird migrations.' Most sesame farmers don't have a smartphone but do have a mobile phone. 'So we put the data from satellites and other sources into a compact message. In the local language too. About 40 languages are spoken in Ethiopia, many of them with their own script. A weather text message in Amharic looks really special. It sounds simple: sending an individual text message to 10,000 sesame farmers twice a week, specific to their location. But you need to know exactly where a sesame farmer lives. Collecting that data is a challenge in such a big country, where not everyone knows what a map is and how the place they live is shown on the map.'

The project was a collaboration between a sesame farmers' organization, the ministry of agriculture, a telecom provider, and researchers. Hiemstra: 'It takes several parties to get a project like that off the ground. You need the cooperation of various government services, and they are not always used to that. It just does take time and effort to build up those kinds of relations.' Such institutionalization is indispensable, though, for sustaining and improving a weather service in the long term. For good reason, that is one of the main conclusions in Weather Impact's report on the Ethiopian project, on which geo-information specialist Tomaso Ceccarelli of Wageningen Environmental Research worked on as well.

LACK OF WEATHER STATIONS

The Dutch meteorological organization KNMI has dozens of weather stations, a rain radar and wind meters, and farmers, businesses and amateur meteorologists collect precipitation and temperature data too. That knowledge is used to improve weather

PHOTO METEOBLUE

DESIGNING TOGETHER IN BANGLADESH

In the Waterapps project in Bangladesh, agricultural weather information was designed in consultation with the users. The information is delivered via text message and an app, and is discussed in field schools and app groups.

models and to check whether forecasts are accurate. That knowledge is only available in Ethiopia to a limited extent because of an acute shortage of weather stations. There have been attempts to evaluate the forecasts using precipitation measurements, says Hiemstra. 'But then you are dependent on a handful of weather stations in a country twice the size of France. That lack of measuring data on the ground is a hindrance. It makes much of Africa a kind of blank space for atmospheric modelling. People are working on that, but it is a structural problem that is not easy to solve. The scale of the continent is deceptive too. The whole of Europe, the United States, China and India would fit into Africa. That makes it hard to come anywhere near the density of rain meters that there is in Europe.'

According to Hiemstra, the development of meteorology is lagging behind in many countries due to poor organization and a lack of financing. The same goes for the weather services for the sesame farmers. The evaluation shows that the farmers are satisfied. In the report on the project, Yelale Amebachew explains that television used to be the only source of weather information. He used the text messages to postpone sowing in the spring until the rains came, and to protect the harvested sesame and millet in the field with plastic against wind and rain. Hiemstra: 'If you can keep this up, it can really make a difference to sesame farmers. But keeping it up is precisely the problem. At some point, the research project will be over, and the money will be finished. The service stops then. Who is going to carry on providing this service? For hundreds of thousands of participants, the basic costs of the weather service are less than one euro per year per farmer. But the total costs mount up, of course.'

RESERVE A TRACTOR

Access to useful weather information could help improve food security in many countries in Africa and Asia, agrees professor Fulco Ludwig of Wageningen's Water Systems and Global Change chair group. He supervises PhD students in countries including Ghana and Bangladesh who do research on developing weather services geared to local farming communities and their needs and daily decisions. 'In Ghana, for instance, reserving a tractor is a critical moment for preparing the fields, because there is a shortage of machinery. That makes it important to know in advance when the rainy season will start and when you need to plough and plant.'

In recent years, Ludwig and his colleagues were involved in coordinating the Waterapps programme financed by the Dutch Research Council, NWO. Waterapps aimed at developing tailormade water information services for the urbanizing deltas of Accra in Ghana and Khulna in Bangladesh, to improve water and food security there. In delta regions, both periodic drought and heavy rainfall and flooding pose risks. Timely and precise forecasts help local communities to plan better, even in emergencies.

Various organizations collaborated in the Waterapps projects, including Wageningen researchers and PhD students, Wageningen Academy, local universities, governments and agricultural and meteorological services. The aim was to develop mobile information technology for sharing knowledge and weather forecasts. 'In Bangladesh, that led to a system of forecasts that were sent out by text message and discussed in weekly field schools. In Ghana, app groups were set up in which farmers discussed what they did with the forecasts.'

SILTED-UP RIVERS

By participating in projects aiming at more personalized weather forecasts, users learned to make better plans and decisions and to deal with climate change. Local knowledge about weather systems has become less reliable and people have >

PHOTO GETTY

PREDICTING SHOWERS WITH GSM MASTS

Telephone companies regularly check the signal quality, inadvertently also measuring whether it is raining, as rain diminishes the signal transmission between masts. 'For about 15 years, researchers have been trying to estimate precipitation by the way that telephone signal gets dampened,' says Ruben Imhoff, a PhD researcher at Deltares and WUR. 'Just like the rain radar, we are aiming to use these data for a short-range forecast of how showers develop. That is called nowcasting. You forecast the direction of movement and the development of the showers over the next few hours. We are already used to that on the KNMI's rain radar service, but we want to see if it can be done using this method too. The degree of precision depends on the location. There are a lot of masts in urban areas, but not in the IJsselmeer or the Wadden Sea, for example.

The water boards are particularly interested in more precise forecasting of extreme rainfall in the summer, so they can start draining polders in time. 'The weather models the water boards currently use are sometimes out by dozens of kilometres. It just is difficult to predict rainfall accurately.'

The new rain-measuring technology could also be of interest for countries where no precipitation radar is available, but mobile phones are. 'We know the measuring technique works in the Netherlands, but my colleagues are now testing it in Nigeria and Sri Lanka, where there are different weather systems. Showers can brew up in half an hour, and it rains much more heavily in tropical regions, so you need to find out whether the method estimates and forecasts precipitation reliably under those conditions too.'

a greater need for something to hold on to, says Ludwig. For example, in certain low-lying rice-growing areas of Bangladesh where irrigation channels and rivers are silting up due to drought. 'Every season, farmers face the choice: am I going to irrigate with saltwater this week, or shall I wait for the rain? If you know when it will rain, you can make that decision. As soon as rice plants germinate, they become sensitive to salt. But if you know it's not going to rain for a while, and everything is drying out, you would be better off irrigating a little bit. A lower yield is better than a failed harvest.' This influences choices like which crop to grow, which depends on how much rain is expected. Maize with a short or a long growing season, for example, says Ludwig. 'If there is not much rain coming, a variety with a short growing cycle is better. The weather forecast is important for the timing and dosage of fertilizer and insecticides, too. Spraying crops with pesticides just before a rainy day is not a good idea. Farmers in Bangladesh say they save money because of the better forecasts, by using smaller amounts of pesticide for instance.'

INTERPRETING DATA

App groups and field schools play a key role in the establishment of weather forecasting services, says Ludwig. You can't just introduce agricultural weather services from an app store in Europe. 'Designing and training – capacity building – in consultation is crucial,' he says. 'In the course of this project, we realized that taking part in the process of designing a weather service was an important learning experience for the participants. That is essential to fully understanding the weather information you receive. You need to interpret data, such as a 20 or 90 per cent chance of rain, which doesn't tell you exactly when the rain will fall. Or to realize that long-range forecasts are always less reliable. Through these kinds of app group, local of-

> ‘Am I going to irrigate with saltwater, or do I wait for the rain?’

ficials from the meteorological service also learn what kinds of weather information farmers need. In many countries, meteorological services still work closely with the agricultural sector.’

It is often somewhat younger and better educated farmers’ sons who pioneer these kinds of development, explains Ludwig. ‘Of course, you do need to be able to read and write. And more technology in agriculture also makes it a more attractive sector to work in.’

PhD student Talardia Gbangou published an article together with Ludwig on success factors in the project, after asking 22 farmers in Ghana about their experiences. The study revealed that as well as better day-to-day decisions, the stepwise structure of the project, gaining an understanding of the margin of error in weather forecasts, and the contact with colleagues all had positive impacts. Personal contact also increases trust, says Ludwig. At one point, a cyclone was on its way. The standard forecasts in Bangladesh sound the alarm three days ahead. ‘That is actually too short notice to respond. Thanks to a better model, we saw the storm coming seven days ahead. The communities we were working with were warned and went into action straightaway, removing trees and branches, and bringing cattle and feed inside before the area was flooded. They listened to our forecast because they knew us. If we had only offered a texting service or an app, we wouldn’t have achieved that.’

ECONOMIC INCENTIVE

So the system using apps and text messaging works, says Ludwig, although there is certainly room for improvement to the available data and forecasts. ‘In many countries there are hardly any observations such as rain measurements, and that makes it difficult to improve meteorological models or to test whether forecasts are correct.’ What is more, what farmers need most is usable weather information about two weeks in advance. In many emerging countries, meteorology mainly focuses on producing accurate daily forecasts for the aviation sector, says Ludwig. There is a more obvious economic incentive in air travel than in agricultural activities.

In Ethiopia, the G4AW projects wanted to develop a sustainable business model, says Hiemstra. ‘That was successful in nearly all cases. The technology works, and all that’s needed is a new financier or a market player who wants to invest. Long-term financing and continuity are the real bottlenecks in these kinds of development. The farmers can’t afford it, or barely, so it’s of little interest to a company. The Ethiopian government isn’t getting involved either, because it suffers a chronic shortage of funding. The same goes for the regular meteorological service in many countries. Meteorology is seen as an expense that doesn’t pay off directly.’

‘The biggest challenge is that of continuity,’ confirms Ludwig. ‘We have tried it now in a number of farming communities in Ghana and Bangladesh. Who is going to pay for the follow-up? The government or the market? The question is how you can go on upscaling and improving this development. How do you create weather products and users’ groups that can work with apps and training modules more independently? That is what I am pondering now.’ ■

www.waterapps.net
www.wur.eu/g4aw-commonsense

ONLINE COURSES

WCDI runs a range of international courses on climate change and food security.
www.wur.eu/wcdi

PHOTO GUY ACKERMANS

FULCO LUDWIG,
professor of Water and Climate Change at Wageningen

PHOTO THOMAS VAER

GERRIT HIEMSTRA,
meteorologist and co-founder of Weather Impact consultancy

‘REPTILE-MAD’ STERRIN SMALBRUGGE:

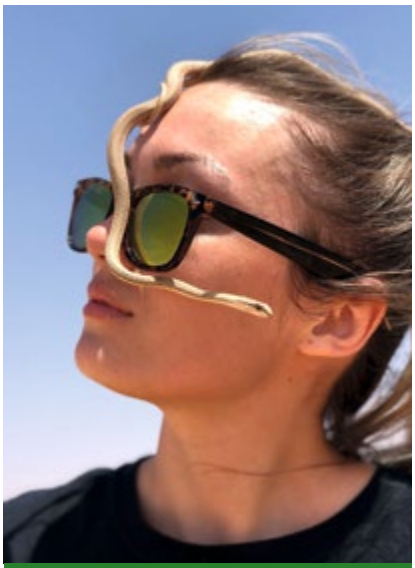
‘I speak up for animals that people are scared of’

She travels around the world to film and help protect reptiles. And she got into the news this year with a study of immaculate conception in king cobras. Writer and presenter Sterrin Smalbrugge has always thought it strange that some animals have a higher ‘cute factor’ than others. ‘I want to emphasize the sociable side of animals.’

TEXT MARIANNE WILSCHUT

A 16-year-old poodle called Rocky is the only pet in the house in Rijssen in the rural east of the Netherlands where ecologist and herpetologist Sterrin Smalbrugge (27) lives with her parents and sister. There are no terraria full of snakes or other reptiles. Quite surprising for someone who presents an educational show about reptiles, plays the main role in the Videoland programme *Reptile-mad*, has written two children’s books about reptiles, and is an ambassador for *National Geographic Junior*. ‘For most of the year I live with my boyfriend in the Sierra Nevada in Spain,’ says Smalbrugge. ‘So it’s not practical to keep pets here in the Netherlands.’ But don’t expect to see any terraria or caged animals at her home in Spain either. ‘We’ve turned our house and its grounds into a paradise for nature. We’ve created a pond for toads and a rabbit warren, and hung up bat nesting boxes. In the evening we often switch off Netflix to enjoy our own gecko soap on the walls of our house. All sorts of intrigue goes on between those creatures.’

When Smalbrugge was a child, she and her father used to watch *The Crocodile Hunter* on Animal Planet, which was presented by Steve Irwin, an Australian animal expert with a penchant for reptiles. ‘I’m in love with all animals, and I get on better with them than with people. But I always thought it was strange and unfair that some animals have a higher cute factor than others. Why do children have posters of lions or pandas on their walls and not of snakes? Steve Irwin was crazy about reptiles and I still remember an episode in which he, a tough crocodile hunter, wept buckets over the death of >



STERRIN SMALBRUGGE

Sterrin is currently doing PhD research in the Wageningen Wildlife Ecology and Conservation group, on the ecological trap hypothesis. She has written two children's books: *Sterrins reptielenreis* (Sterrin's reptile journey), 2019, and *Het grote reptielenboek* (The big reptile book), 2021. She also performs in educational live shows about reptiles, played the main part in the Videoland programme *Reptielengek* (Reptile-mad), and is an ambassador for National Geographic Junior.
Education: WUR MSc Forest and Nature Management 2018

'I'm not trying to say: look how brave I am with these dangerous animals'

a crocodile. That made a big impression on me. He was my hero. When he died while filming, I decided at the age of 12 that, just like Steve, I wanted to speak up for animals that people are scared of.'

On his programmes, Steve Irwin was inclined to jump on the animals and fight with them, albeit playfully. Freek Vonk does the same. What is your presentation style?
'The focus on TV is usually on the animals' sharp teeth and other dangerous facts about them. To me it's more important to highlight the sociable side of animals. The way the crocodile's sharp jaw is used to carry its babies around, for instance. I'm not trying to say: look how brave I am with these dangerous animals. If you take away that over-the-top masculine bravado, girls can also think, hey, I could do that too.'
And my priority is the reptiles' wellbeing. During the live performances, I always tell the audience that I will take the animals away again if I see they are getting stressed. And I rotate them so they don't have to go on tour very often. The animals that come along are kept at at Reptiles Twente, where they are very well looked after.'

Even as a student in Wageningen, you gave well-attended lectures about reptiles.
'That's right. I gave lectures about the king cobra and the hidden power of reptiles, and I held an evening on the anatomy of snakes. Those lectures were a real baptism by fire but even though I was nervous, I was very keen to do it. If I wanted to pass on my knowledge about animals, I had to get up and do it. It helped to do it with my Animal Sciences teacher Arie Terlouw. He gave me fantastic guidance. There wasn't a herpetology department, but I took zoology courses with him and he sat with me for hours to expand my knowledge about reptiles. In that sense I was an atypical student. I hardly ever went out on the town. My aim was to graduate with distinction and apart from attending classes, I spent most of my time studying so I could learn as much as possible about reptiles.'

Why did you choose Wageningen, even though the focus there wasn't on reptiles?
'Leiden was a more obvious choice in that respect, but I looked into it in depth and attended a lot of open days. As a result, I knew when I was still at secondary school that I wanted to go to Wageningen. I think it's important to study animals as part of the ecosystem. Wageningen has a very good ecology department, and pays attention to the interaction between humans and animals. Besides, there is a lot of scope for personal supervision by teachers there. That is also why I am now doing my PhD with Frank van Langevelde in the Wildlife Ecology and Conservation Group. That personal contact is truly unique to Wageningen. When teachers see that you have a real passion for something, they give you plenty of scope

for cultivating it. The more the university grows, the harder it gets for teachers to give students that kind of attention.'

A few years ago, you said too little research was done on reptiles. Have things improved since then?

'Luckily there have been some new discoveries since then, especially about the social life of reptiles. We now know, for instance, that Cuban boas hunt in groups, and that they even communicate with each other as embryos in the egg, through their heartbeats. And it is also known that the pinecone lizard, a large lizard that looks like a walking pinecone, is monogamous all its life. But there is still a lot of unexplored territory. We don't even know the size of the populations of many species. That is part of what makes working with reptiles so nice – there is still so much scope for new, ground-breaking discoveries. I can really recommend it to students.'

Like the research you worked on into the immaculate conception among king cobras, which was published in Nature Scientific Reports this year?

'I got a phone call in 2015 from someone I know who keeps snakes and had a king cobra that had laid eggs without having had any contact with a male. I went to pick up the eggs with my then boyfriend, snake expert Romilly van den Bergh, and put them in the incubator. Two embryos from the 24 eggs proved viable. Both embryos, both males, survived for a few days. DNA research showed that what had taken place was parthenogenesis: immaculate conception. In parthenogenesis, during meiosis (the ripening of the egg cells), it is a polar body (a by-product of meiosis) that merges with the egg, rather than a sperm. This happens in a different way every time, so that 24 unique gene packages were created, two of which turned out to be viable. We already knew that a few other species of snake, shark and lizard could reproduce without a mate, but this had never been proven in a king cobra before. We learned more about how the mechanism works during this study, which made it special.'

I gather king cobras are good mothers?

'They are the only species of snake that makes a nest for the eggs and guards it. Now their habitat in South-east Asia is under pressure, partly because of the expansion of palm oil plantations, cobras are moving into farmland, where they run the risk of being killed by farmers. I made a documentary for The Conservation Front about Bali Reptile Rescue, which tries to save these snakes. The Conservation Front is a nature conservation organization I set up with wildlife photographer Jason Savage. As we were filming, Shinta, the woman behind Bali Reptile Rescue, passed me the hook so I could catch the snake. That was my first rescue operation, and it had me in tears afterwards. The documentary, which can be seen on YouTube, is the only one we've made so far because of Covid-19, but we want to make more about local organizations that work to conserve species whose habitat is under threat. I myself have made a few minidocumentaries and I travel around the Netherlands and Europe for my programme Reptile-mad, making items about unusual reptiles such as wild chameleons. There are interesting reptiles close to home as well, and you don't have to travel to exotic places to find them.'

'I'm in love with all animals'

Sterrin with a jungle nymph

Is your PhD research about reproduction in reptiles?

'No, that is about the ecological trap hypothesis. Animals use evidence from their surroundings to find new habitats, but they can make wrong choices if a habitat seems more attractive than it really is. Dead reptiles and amphibians are often found in irrigation channels and water troughs for livestock. I want to find out what triggers attract them to such places, and why they die there. In my spare time and on holiday, I'm always nosing around wells and water tanks, saving reptiles and amphibians. I am busy with reptile conservation all the time.' ■

LEAVING MONEY TO THE ANNE VAN DEN BAN FUND

‘Educating people is the best form of aid’

A lot of alumni are full of admiration for the Anne van den Ban Fund; some even include it in their will. ‘Helping someone get a good education is one of the most worthwhile investments you can make.’

TEXT ANJA JANSSEN **PHOTOGRAPHY** GUY ACKERMANS

When the Anne van den Ban Fund was set up in 1992, Nathalie (49) was a student in Professor Anne van den Ban’s Agricultural Extension chair group. The alumna (Rural Development Sociology, 1995) remembers chatting to the co-founder of the fund, who had already retired then, and who died in 2016. ‘Anne van den Ban was always up there with the “gods” for students of extension science. He did a lot for the subject area.’

The fact that she had met Van den Ban personally was a factor when Nathalie, who works at WUR, and her partner Rob were looking for a charity to take up in their wills. The Anne van den Ban Fund enables promising students from developing countries to do a Master’s degree at Wageningen. ‘The main reason it appeals to me is that through education you give people the chance to improve things in their country themselves. In the long run, that is the best form of aid.’

Nathalie and Rob (Molecular Sciences, 1993) decided to make their wills about five years ago. A few deaths in their social circle made them think, says Rob (52), who is currently taking a break after a career as an ICT manager: ‘It makes you think about what lies ahead for you.’ Nathalie: ‘We have no children. We travel a lot, and something can always happen when you do that.’ Along with family members and the Anne van den Ban Fund, they have also included a human rights organization in their wills.

‘The fact that we’ve put our last wishes on paper will provide clarity for our next of kin,’ says Rob.

Nathalie and Rob met as students. During an internship in Nepal, where Nathalie did research on the way the agricultural extension service worked, she realized that the work could also be done by a Nepalese if they had the right training for it. So she started donating regularly to the Anne van den Ban Fund. ‘I hope as many motivated people as possible get the chance to study at Wageningen. I foresee that their knowledge and experience will spread like wildfire because they in turn will train new people.’ Rob agrees wholeheartedly. ‘Helping someone get a good education is the most worthwhile investment you can make.’

FREEDOM

Alumnus Thijs Jansen (72) included the Anne van den Ban Fund in his will as well. ‘I am very much in favour of the way it enables talented young people to do a Master’s in Wageningen. I have much to thank Wageningen for myself, and I would wish the same for other people,’ says Jansen, who graduated as an agricultural economist in 1974. ‘I loved the freedom you had to plan your own degree path, as well as the practical experience you got during your six-month internship, and the wide range of

Anne van den Ban, the co-founder of the fund named after him, surrounded by students who came to Wageningen on a grant.

backgrounds in the student community.'
One of the other charities Jansen has included in his will is the Prostate Cancer Foundation. 'I have lived with prostate cancer for 21 years now. It was caught early, and I was lucky that I repeatedly benefitted from new developments in medicine. The black cloud that hung over me then disappeared a long time ago.' When Jansen dies, his estate will go to his wife. They have no children so after her death, the charities will receive their remaining property.

ACADEMIC PERFORMANCE

Jansen could not have come to Wageningen if there hadn't been a government system of grants and loans. 'The size of your grant depended on your academic performance. In my first year I got 2900 guilders but because I had to repeat two first-year courses, I only got 10 guilders in my second year. My parents managed to supplement that.' In his third year, Jansen got a grant of 3000 guilders. 'And later I got jobs on the side as well, so my parents didn't have to pay much towards my costs.'
Jansen took more than seven years to complete his degree. 'That was normal in those days. I was on the board of KSV for six months and I took extra courses. Partly because of that, you could get a broad education.' That meant Jansen could work for many different organizations after graduating. He worked as an economics teacher, as a civil servant in the ministry of Economic Affairs, and as an independent pensions advisor for works councils.
Jansen wishes Anne van den Ban students the same freedom he enjoyed to map out their own path. 'The fund finances a degree programme and after that, they're on their own. You hope they will help address the needs of their countries. But for me, the principle is: you finance a degree and then they are free.' ■

DONATING THROUGH A WILL

The Anne van den Ban Fund supports high-potential Master's students from developing countries so they can contribute to the sustainable development of their country after graduating. Since it was established in 1992, the fund has provided 319 students with a grant.
For more information on donating through a will and for the relevant brochure: *www.universityfundwageningen.eu/legacy*

More information on the Anne van den Ban Fund: *www.annevandenbanfund.eu*

The New Network aims for a healthy and fair economy

The New Network was set up in June last year by five study circles and networks that used to be part of KLV. Professionals from other academic and applied universities, professional associations and farmers' organizations can also join. 'There is a real need for an interdisciplinary approach to finding solutions to societal problems.'

'The New Network brings individuals and groups together so that they can determine a concrete approach for transitioning to an environmentally healthy and socially fair economy,' explains the chairperson Jelleke De Nooy-Van Tol. 'For example, what should agriculture look like in future? We are organizing the conference Farmers in the Netherlands on this topic on 3 September.'
The idea for the New Network arose during the process of dissolving KLV, when five study associations and networks met up: the Dutch Zootechnics Society (NZV), the Land and Water Network (NLW), the Study Circle for Development Issues (SKOV), IT Professionals in Agriculture (VIAS) and the Network for Wageningen University Alumni Women (VWI). 'The chairs discussed the need for some way of meeting up beyond the boundaries of their own network or study circle,' says Noud Janssen (NZV).
The New Network Foundation was set up to achieve this. Professionals working in food production, life sciences and environmental sciences can join, including people from other academic and applied universities, professional associations or farmers' organizations.

One of the things the New Network has been doing is working on the Sustainable Development Goals. From left: Patricia Lemmens, Pauline Schakenbos, Marjan Vrins and Jelleke de Nooy-van Tol.

'Lots of groups don't find the time to link up with each other'

'There is a real need for an interdisciplinary approach to finding solutions to societal problems,' says De Nooy. 'Not just in the affiliated study circles; I also hear this in the Food Transition Coalition, where I've been involved in the transformation of the food and agriculture system. Lots of groups are working on new approaches such as agroforestry, strip cropping and nature-inclusive agriculture. However, they don't find the time to link up with each other, which would let them become stronger.' Jansen: 'It is also important to connect up those innovative initiatives with the ordinary farmer in the countryside and other players in the food supply chain.'
To facilitate such connections, the New Network organizes monthly gatherings for people to meet up and workshops on major themes in society. For example, on 15 April there was a workshop on the EU policy aimed at making food production more sustainable, in which livestock farmers talked about their practical experiences. The network is also making a series of podcasts about how to network and it is collaborating with the Groen Kennisnet knowledge database.
The meetings and workshops — online so far — are well attended. An average of 25 to 30 people join the meetings, and 80 to 100 attend the workshops. The number of subscribers and donors is lagging behind, though. The board members do this work alongside their day jobs and do not have time to focus on fundraising. 'We therefore want to appoint a manager in short order who can develop the organization in professional terms,' says De Nooy.
A subscription to the New Network costs 50 euros a year (20 euros for students). It is also possible to support the network with a donation.
Info: https://nieuwenetwerk.nl

NETWORKING

Alumni meet in person in Beijing

In early April, the Wageningen Alumni China Chapter organized a meet-up in the Chinese capital, Beijing. Thirty alumni were at last able to meet up in person.

The host was Liu Chunming, who recently became dean of the department of Advanced Agricultural Sciences at Peking University, and was previously a WUR researcher. The alumni paid a visit to the university's history museum and to Weiming Lake on campus. Then there was a meeting — without any need for face masks or social distancing rules — about the Chinese alumni network's plans. In a discussion led by Han Beizhong (chair of the China Chapter) and Zhang Cheng (a board member), the alumni talked about setting up new regional networks in the cities of ZhengZhou and Xi'an. Networks were already set up in 2019 in Nanjing and

Wuhan. Networks in different regions are needed because the country is so large and there are now more than 2000 Chinese alumni.

Info: alumni@wur.nl

REQUEST

Contact details and interests

The WUR alumni office asks graduates to notify it of any changes to their details, such as their email or postal address or employer. 'We use these details to tailor our communications with our alumni, for example by inviting them to events in their region,' explains Eline Nell from the alumni office.

'If alumni tell us about their interest in the Wageningen themes of the climate, biodiversity, food production, healthy and safe food and the circular economy, we can invite them specifically to activities dedicated to that theme.'

Change details: www.wur.eu/changecontactinfo

EMERGENCY FUND

Friends of UFW support students in need

The Friends of University Fund Wageningen have donated 10,000 euros to the emergency fund for students.

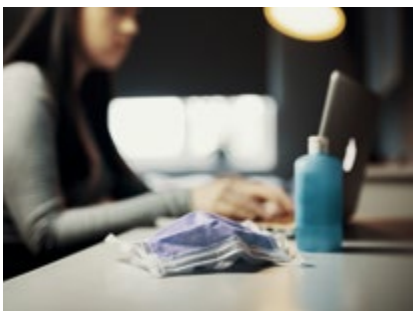


PHOTO SHUTTERSTOCK

The Friends support activities for students and young alumni. In addition to causes such as the Thesis Awards that they give to annually, they also support one special project per year. This year, it is the emergency fund for students who are in dire financial need because of the coronavirus pandemic. 'This fund lets them graduate after all and start their careers,' says fundraiser Arianne van Ballegooij of UFW. She expects to continue receiving applications for aid from the emergency fund up to September 2021. That is why a second round of crowdfunding is currently taking place for the fund.

To donate: crowdfunding.wur.nl/project/noodfonds

WUR CONNECT

Wageningen Experience Day
Wageningen Campus
2|10|2021

Save the date!

The Wageningen Experience Day is due to take place on the afternoon of Saturday, 2 October 2021. It will be an open day when all Dutch and international alumni can meet up online. Put the date in your diary!

Finding an internship

Alumnus Ermis Panagiotopoulos found an intern for his company Natural Mineral Waters Europe in Brussels via WUR Connect. 'A win-win for the company and the student,' says the sustainability manager. 'It can be stressful looking for an internship to complete your Master's.' MSc student Devin de Burlo has now started the internship — online for now.

Video chats

It is now easy to contact an alumnus or student live on WUR Connect. Go to 'who's online' in the feed at the top, search for a person and start a video chat.

Job vacancies

The 'Jobs' section in WUR Connect has interesting vacancies in the Wageningen sectors and gets a lot of views from students and young alumni.

App

If you prefer to network via your phone, use the WUR Connect app.

www.wurconnect.nl

Hubert Andela MSc, WUR Zootechnics 1987, has been appointed director as of 1 June of ZuivelNL, the organization for Dutch dairy farmers and dairy companies. Andela was previously director and secretary of the employers' association Koninklijk Nederlands Vervoer (KNV). 15 March 2021.

Prof. Raoul Bino, WUR PhD 1986, senior strategic advisor to the WUR Executive Board, has been appointed academic advisor to the Starry Night Foundation, an initiative of the Chinese agricultural technology platform Pingduoduo and Zhejiang University in Hangzhou. The organization aims to encourage social responsibility and scientific research. 18 March 2021.

PHOTO RESHORE

Living breakwater

Frej Gustafsson MSc, WUR Aquaculture & Marine Resource Management 2020, and Mitchell Williams MSc, WUR aquaculture & marine resource management 2020, won the 2020 Green Education Impact Prize in the scientific education category with their living breakwater. Their floating construction not only protects the land but also provides a home for oysters, mussels and seaweed in the form of cages and underwater ropes. Gustafsson and Williams worked together on this in the start-up ReShore. 'We want to offer tailored versions,' explains Gustafsson. 'For example, the North Sea doesn't have enough seagrass, which is a habitat many creatures can live in. So we can then adapt the breakwater to let seagrass grow under it.' ReShore has won various awards for start-ups, including the WWF's INNO Student Challenge and the prize awarded by the general public in the 4TU Impact Challenge. 4 March 2021.

Postcards from Wageningen

Nutthaya Siri-udomrat MSc, WUR Tourism, Society and Environment 2019, project assistant at Travelife, created a series of postcards with black-and-white drawings of distinctive Wageningen buildings and places. 'I started two years ago when I was looking for a postcard to send home and couldn't find one that showed how lovely Wageningen is,' says Siri-udomrat, who is from Thailand. Drawing has been her hobby since she was a girl and she learned architectural drawing during her Bachelor's in Architecture. The postcards showing the market, Hotel de Wereld, De Vlijt windmill, the floodplains and the Forum on campus can be purchased at *www.etsy.com/shop/DhammadaStudio*

Jeroen Dijsselbloem MSc, WUR Economics of Agriculture and the Environment 1991, chair of the WUR Supervisory Board and of the Dutch Safety Board, has been appointed chair of the commission for the National Growth Fund, which assesses investment proposals and advises the government about them. 30 March 2021.

Corné van Dooren PhD, WUR Human Nutrition 1989, has started as a senior advisor on sustainable dietary patterns at the WWF in Zeist. He worked as an expert on sustainable diets at the Netherlands Nutrition Centre for 14 years. 1 May 2021.

Gisella Frijlink MSc, WUR Food Technology 1991, is the new director of NIZO in Ede. Frijlink had been employed since October as the interim commercial director at this food and health research institute. 12 March 2021.

Ngo Thi Phuong Dung PhD, WUR Biotechnology 1998, was awarded an honorary Prime Minister's Certificate of Merit on the 55th anniversary of Can Tho University in Vietnam. 31 March 2021.

Marleen van den Ham MSc, WUR Forestry 1996, Rivers programme manager at the nature management agency Staatsbosbeheer, is the new director of Stichting Nationale Boomfeestdag. 1 April 2021.

Jan Karel Mak MSc, WUR Environmental Protection 1983, chair of University Fund Wageningen, has stepped down after nearly 22 years as CEO of the engineering firm Deerns in The Hague. He will continue there as a member of the executive board. 1 March 2021.

Anne-Marie Neeteson MSc, WUR Zootechnics 1983, has been appointed chair of the Working Group on Animal Health & Welfare at the International Poultry Council (IPC). Neeteson is Global Vice President for Welfare & Compliance at the Aviagen Group (poultry breeding). 10 February 2021.

Martin Vervoorn MSc, WUR Zootechnics 1995, has received the Professor Hudig Award for his efforts in applied agricultural research in the Netherlands and Europe. Vervoorn received the prize on stepping down as director of Eurofins Agro. He is now a director of the animal feed producer Coöperatie De Valk Wekerom. 1 March 2021.

Riske van Vliet, WUR BSc student of Food Technology, and her international team 'I Like to Move It, Move It' won the Cornell Institute for Digital Agriculture Hackathon, an event for university students from all over the world. The team won 2000 dollars for their app for minimizing food loss in agriculture and maximizing profits. 7 March 2021.

PHOTO HAS HOGESCHOOL

Reggy van der Wielen PhD, WUR Human Nutrition 1989, has been appointed president of the board of governors of HAS University of Applied Sciences. He was director of Research & Technology at FrieslandCampina. 10 May 2021.

Prof. Chris Zevenbergen, WUR Biology 1985, will be working on sustainable urbanization of delta regions in his new job as professor of Delta Urbanism at the Faculty of Architecture at Delft University of Technology. Zevenbergen will also remain professor of Flood Resilience in the Coastal and Urban Risk and Resilience group of IHE Delft Institute for Water Education. 1 February 2021.

Reptile tour with Sterrin

Sterrin Smalbrugge MSc, WUR Forest and Nature Conservation 2016, and illustrator Wendy Panders have published *Sterrins Reptielenreis* ('Sterrin's reptile tour'). The reptile reference work for young and old alike is full of facts and trivia. The book covers the various reptiles that live in each continent. It also includes interviews with experts. See also the interview with Sterrin on page 44. *Luitingh-Sijthoff, 20.99 euros*

PHOTO DRAGONWORLD

IN MEMORIAM

Alumni and current and former employees of Wageningen University & Research who have recently passed away.

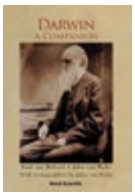
Mr F. Aldenberg, former lecturer in design in the Landscape Architecture chair group. 25 September 2020.
Mr Bokdam PhD, WUR Forestry 1970. 22 January 2021.
Ms G.E.J. Bos-Breukelaar MSc, WUR Domestic and Consumer Sciences 1992. 17 January 2021.
Mr H. Broeshart PhD, WUR Tropical Plant Breeding 1949. 7 March 2021.
Mr A.A. Dees MSc, WUR Rural Economics 1968. 1 February 2021.
Mr J. Dommerholt PhD, WUR Zootechnics 1971. 2 December 2020.
Ms A.M.S. Douwes Dekker MSc, WUR Rural Economics 1962. 5 December 2020.
Mr W. de Groot MSc, WUR Tropical Plant Breeding 1960. 11 February 2021.
Mr P.M. Gruental Klestadt MSc, WUR Tropical Plant Breeding 1961. 30 December 2020.
Mr A.P. Hidding MSc, WUR Forestry 1957. 3 July 2020.
Mr H.R. Heida MSc, WUR Rural Sociology of the Western Regions 1970. 19 March 2021.
Ms M.L. van der Heiden MSc, WUR Earth and Environment 2018. 15 November 2020.
Mr J.F.J. Hoefmans MSc, WUR Rural Sociology of the Western Regions 1963. 11 March 2021.
Ms J.C. Hudson-Johanns MSc, WUR Tropical Plant Breeding 1965. 23 January 2021.
Mr J.J. Jansonius MSc, WUR Tropical Rural Economics 1963. 26 March 2021.
Mr A.K. Minks PhD, WUR Phytopathology 1962. 12 February 2021.
Mr E.J. Oosterloo MSc, WUR Dairy Production 1974. 8 March 2021.
Mr G.V. de Rooij MSc, WUR Food Technology 2001. 12 March 2021.
Ms I.S. Steenwinkel MSc, WUR Domestic and Consumer Sciences 1990. 19 April 2021.
Mr J.A.J. Stolwijk PhD, WUR Tropical Plant Breeding 1951. 17 February 2021
Mr C. Zawe PhD, WUR Soil and Water 2000. 25 January 2021.
Mr G. Zemmelink PhD, WUR Zootechnics 1965. 12 February 2021.

If you wish to inform us of the death of a fellow student or family member, you can send an email to alumni@wur.nl or inform the alumni department at University Fund Wageningen, Droevendaalsesteeg 4, 6708 PB Wageningen.

RECTIFICATION

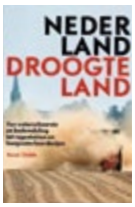
Due to an unfortunate misunderstanding, **Mr F.W. Berkers MSc,** WUR Aquaculture & Marine Resource Management 2014, was erroneously included in the list of recently deceased alumni in the previous issue of Wageningen World.

Darwin from A to Z



Paul van Helvert MSc, WUR Phytopathology 1985, patent expert at WUR and a Darwin collector, has written *Darwin. A Companion* together with John van Wyhe on the life, work and influence of Charles Darwin. A list of all 350 individuals who visited Darwin, 38 theories about his illness, all the plants named after him — no matter how weird and wonderful, it's all in there. The book is a revised and extended version of the 1978 book *Charles Darwin. A Companion by Richard Broke Freeman. World Scientific, 44.95 euros*

Store water to solve Dutch drought



René Didde MSc, WUR Environmental Protection 1986, spent over a year as a journalist investigating the burgeoning problem of drought in the Netherlands and the possible solutions. It resulted in the book *Nederland Droogteland* ('The Netherlands, land of droughts'). 'The Netherlands has a precipitation surplus of 300 millimetres,' says Didde. 'So I thought: what drought? But as it turns out, that rain falls in winter when we don't need it. We have to store that surplus until the dry periods start.' There is no shortage of technological solutions — the book is full of them. 'We also have enough money to implement them, but the Netherlands lacks the political and administrative will to do that.' The spatial setup also needs to take account of the natural water level, for example by no longer building homes six metres below sea level. 'The provincial authorities and water boards should take the lead. I hope my book will add to this debate.'

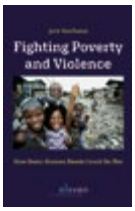
Lias, 19.99 euros

Ode to fungi

Dominique Clement MSc, WUR Rural Sociology 1991, and Antoon Kuhlmann MSc, WUR Forestry 1972, have put together *Paddenstoelen in kunst, cultuur en natuur* ('Fungi in art, culture and nature'), a book of stories and photos. In addition to the photos Clement took of fungi and Kuhlmann's short stories, the book also contains photos of fungi in art and culture around the world. Kuhlman: 'It is a wide-ranging book. Our message is that you should go outside and see for yourself how amazing fungi are. That will give us a new generation of nature conservationists.'

KNNV, 24.95 euros

'Tackle secret banking'



Prof. Joris Voorhoeve, WUR Tropical Rural Economics 1971, shows in his book *Fighting Poverty and Violence* that the entire population on the planet can have clean water, sanitation, enough to eat and basic primary education and healthcare. 'To my surprise, after looking at a large number of studies by international and scientific organizations on how much that would cost, I worked out that it would be no more than two per cent of the gross world product,' said Voorhoeve at the book launch. According to Voorhoeve, that two per cent is available. The main problem is the abuse of power. 'The best instrument for achieving improvements is major tax reform. Start with the big players, do something about secret banking, track down dirty money, tackle the underworld.'

Voorhoeve is chair of the supervisory board of Oxfam International. His previous jobs include professor of International Organizations at four universities, a Member of Parliament and minister of Defence.

Eleven International Publishing, 39 euros

Marriages of art and science

Peter de Jaeger MSc, WUR Rural Sociology of the Western Regions 1982, journalist and author, considers the cross-fertilization between art and science in the richly illustrated book *Kunst & Wetenschap* ('Art & science'). He looks at unusual projects such as a rabbit that lights up green, a dress made of cow manure and tattooed pigs. 'The cross-fertilization benefits both art and science. It leads to projects that would never have seen the light of day otherwise.'

Fontaine, 25 euros

Amber looks back

Christa Florschütz MSc, WUR Phytopathology 1981, retired sustainability analyst, has written the novel *Er was eens … Amber kijkt terug* ('Once upon a time… Amber looks back'). Amber inherits a book that is about Merel and takes place in 2015, the year she was born. When Amber reads it, she realizes how much has changed since then. The themes in the stories about Amber and Merel are climate change, lifestyle and spirituality.

Boekscout, 20.99 euros

‘I never considered the fire brigade until I saw a recruitment ad in a career magazine’

Inez Rijnhart MSc, team leader, Environmental Safety

Food Technology, 1995

‘When I was younger, I wanted a physically demanding job. But the army and the police weren’t options because I don’t like guns. I never considered the fire brigade until after I graduated when I saw a recruitment ad in *Intermediair* (Dutch career magazine): Would you like to be a fire officer? I thought: hey, that would be just right for me. You’re doing something for society, you need to be sporty, technical and highly educated, and you work as a team. Back then, it was difficult to find work in food technology. After a tough selection procedure, I was admitted to the officer training programme.’

‘It started at a very practical level: uniform on, helmet on, hose in your hand and train. You were also taught the theory, how the fire brigade works, and you did internships at fire stations. I benefited a lot from the technical courses I had done in my degrees. Later, I was able to use my knowledge of chemistry when I became an advisor on hazardous substances for the fire brigade.’

‘Nowadays I work for the Haaglanden Security Authority on the proactive side: thinking ahead about how to take account in the Netherlands of potential risks such as hazardous substances. I get a lot of satisfaction from managing a team. I’m definitely in the right job here.’

‘Looking back, I’m pleased that after getting an applied degree in food technology I went on to do another degree. I was still young and didn’t know what I wanted. In Wageningen, I had time to become more mature and discover the wider world.’

PHOTO HARMEN DE JONG

PHOTO REEFOLUTION FOUNDATION

Kenyan coral reef restored with bottles and concrete

Off the coast of the Kenyan village of Shimoni, coral experts Ronald Osinga and Ewout Knoester and a team of students have brought back 1000 square metres of coral. The original reef had disappeared or been destroyed by trawling nets.

The team started collecting bits of coral from the seabed five years ago, and getting them to grow on what they called 'nursery trees'. 'We now know that glass bottles embedded in concrete work well as a base for this coral to grow on,' says Osinga.

To make the coral attractive to fish as well, hollow concrete structures are installed in which fish can shelter. That is important because fish and other animals clean up the coral by feeding off it, explains Osinga. So you need to make sure that biodiversity is thriving. 'The reef is least vulnerable then. If one fish species gets diseased, another species will take over and clean the coral by feeding off it.'

Osinga says it will take about 20 years for the reef to mature and the biodiversity to be fully developed. The researchers are working with the local population on this project, with four local people trained to carry out reef restoration. If the new reef is designated a park, it will help secure the local population's livelihood because the reef can be protected and attract tourists. Divers can also be charged entrance fees to the park. The project was made possible by a donation from a European donor through University Fund Wageningen.

Info: ronald.osinga@wur.nl