WAGENINGEN WORLD
MAGAZINE OF WAGENINGEN UNIVERSITY & RESEARCH ABOUT CONTRIBUTING TO THE QUALITY OF LIFE
no.2 2023

Cut pesticide use: how can we do it?

'On paper, there's a lot to be gained', page 12

Agriculture is thirsty

Demand for water is rising, the supply is falling

Making room for fire

'Keep the landscape open and free of dead matter'

Making paper from grass

Worthless grass from verges can be used for paper

COLOPHON Wageningen World is the magazine for associates and alumni of Wageningen University & Research **Publisher** Wageningen University & Research **Editor-in-chief** Willem Andrée **Editorial Board** Jeroen Balemans, Ben Geerlings, Margit Govers, Ike de Haan, Marieke Reijneker, Antoinette Thijssen **Magazine editor** Miranda Bettonville **Copy editor** Rik Nijland **Translators** Clare McGregor, Clare Wilkinson **Art direction** Petra Siebelink **Design** Geert-Jan Bruins, Monique Chermin **Cover picture** Shutterstock **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 & 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, 7,600 employees (6,700 fte) and 13,100 students and over 150,000 participants to WUR’s Life Long Learning, 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
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FEATURES

PHOTO GUY ACKERMANS

Mobilizing the public is important

'It's high time our food system made a transition towards healthier, fairer and more sustainable impacts. Because numerous global problems such as climate change, water shortages and loss of biodiversity are linked to the way we produce and consume food. On the health side, we are seeing a shocking increase in obesity and type 2 diabetes worldwide, while millions of people lack access to sufficient healthy food.

'The way the food system works is not a law of nature but the result of political choices. All too often, politicians would rather point out the responsibilities of market players or the consumer than develop a better-functioning food policy. It takes political nerve to do things like put a price on pollution, change what you use subsidies for, or start providing school lunches.

'It certainly won't be easy to move governments in that direction. Food is related to things like trade and agriculture policies, European and national government bodies are involved at various levels, and lobby organizations are urging action too.

'The good news is that agriculture and food haven't been so high on the agenda for a long time, at the local, national and international level. More and more towns and cities, including Wageningen, have invested in a local food strategy. And at the European level, we have the Farm to Fork Strategy, which is a first step in the direction of a join European food policy.

'Citizens can be influential, more so than they sometimes realize. We know from political scientists that mobilizing the public is incredibly important for getting issues on the political agenda. Climate protests are the main reason why the European Commission developed its Green Deal agenda. If citizens show they're serious, governments will start committing themselves and working on a sustainable future.'

Jeroen Candel, associate professor of Public Administration and Policy, was one of the speakers at the opening of the academic year

INFORMATION TECHNOLOGY

Supercomputer upgraded

WUR has invested over two million euros in the supercomputer Anunna. The computer can now handle more data and has more graphical processing capacity for dealing with images. This investment will let WUR make greater use of artificial intelligence. Anunna is part of the European network of supercomputers and is available for users outside WUR.
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PLANT SCIENCES

New institute for photosynthesis

The Jan Ingenhousz Institute officially started operating in Wageningen in early October. This new cluster of plant scientists in various disciplines aims to accelerate research on photosynthesis. For decades, scientists have been looking at ways of making plants use sunlight more efficiently for growth. If successful, this would hugely increase crop yields. To force a breakthrough in this research, 62 million euros is being invested in the new institute over a period of ten years. WUR is contributing 12 million euros and two private financers the remaining 50 million euros. Over 30 PhD candidates and 60 postdocs will work on the research programme over the next few years.
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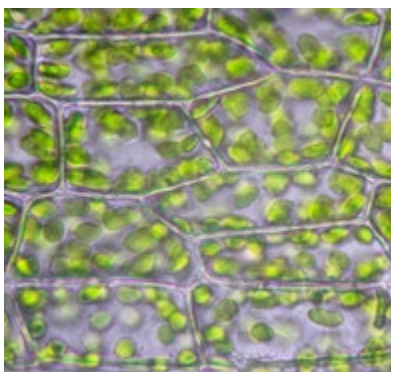

PHOTO SHUTTERSTOCK

VIROLOGY

PHOTO ALAMY

Testing a vaccine for Rift Valley fever

Wageningen Bioveterinary Research will conduct human trials of a candidate vaccine it developed for Rift Valley fever in East Africa. The EU and the Coalition for Epidemic Preparedness Innovations have provided 25 million euros for the test.

Rift Valley fever is caused by a virus that can be transmitted through mosquito bites or contact with the infected body fluids or tissues of livestock. The World Health Organization considers the development of a vaccine to be a top priority.
Rift Valley fever mainly occurs on the continent of Africa. The disease causes severe symptoms in sheep, goats and cows. In humans, an infection leads to a high fever, severe headaches and flu-like symptoms, but severe and potentially fatal complications are also possible.
A consortium of companies and research institutions will be formed to study the effect and safety of the vaccine by testing it on people at risk of infection in the regions where the disease is most prevalent. 'These studies will help speed up the development of the vaccine,' says Paul Wichgers Schreur, who developed the hRVFV-4s vaccine and heads the consortium.
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PLANT BREEDING

Investing in resilient crops

The Dutch Research Council (NWO) will invest 15 million euros over the next ten years in a research programme for rapidly developing crops that can withstand climate change and are less dependent on fertilizers and pesticides. The new research institute CropXR, a collaboration between university research groups from Wageningen, Utrecht, Amsterdam and Delft, will implement the programme. Dozens of other public and private partners are involved too, including applied universities, biotechnology companies, the processing industry and plant breeding companies.
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NATURE

Tougher threshold values introduced for nitrogen

Nature is even more sensitive to nitrogen levels than was thought. In collaboration with other research institutions, WUR has therefore developed tougher threshold values for nitrogen deposition.

The government has stipulated critical deposition values (CDV) for each habitat type that is sensitive to nitrogen, such as purple moor-grass meadows. If the nitrogen deposition exceeds that value – which is the case in many nature areas – the quality of the nature declines.

Two years ago, a team from WUR and the research institution B-Ware headed by Wieger Wamelink of Wageningen Environmental Research showed that key plant species were sometimes already disappearing before the CDV was reached. The threshold value is therefore sometimes too high to prevent damage. A large empirical European study reached the same conclusion last year.

At the request of the Ministry of Agriculture, Wamelink, working with the Netherlands Environmental Assessment Agency, brought the Dutch threshold values into line with the new, binding European information.

The new values mean that nitrogen compound emissions from farming, industry and traffic need to be reduced even further than previously thought. Wamelink: 'The CDV is already being exceeded in many areas. That gap will become bigger due to the tougher norms. So the challenge for the future will be greater.' The Netherlands has 81 habitat types that are sensitive to nitrogen. Based on the new information, the CDV will remain the same for 47 types, will be higher for two and lower for 37. In October, RIVM incorporated the new threshold values in AERIUS, a computer model that determines whether proposed projects will produce too much nitrogen for the nature.

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CLIMATE

ILLUSTRATION WUR

A green Europe within a century

Another century down the line, Europeans will be working with nature to combat the effects of climate change and enable biodiversity to flourish once again. That is the vision of the future that was presented by Tim van Hattum, Climate programme leader in the Environmental Sciences Group, in his Mansholt lecture on 20 September in Brussels.

Together with colleagues and 50 students, Van Hattum drew up a report presenting the broad lines of a nature-based and nature-positive Europe in 2120.

The report is inspired by the successful NL2120 project of three years ago, which sketched a vision of the future for the Netherlands. 'But nature doesn't keep to national borders,' stresses Van Hattum. 'The question kept cropping up: shouldn't we be doing this on a European scale?' In the annual Mansholt lectures in Brussels, WUR presents its vision on European issues relating to food, agriculture and sustainable livelihoods.

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WAGENINGEN ACADEMY

Learning from Lighthouse Farms

Wageningen Academy has launched a new programme designed to inspire farming professionals and policy-makers. The programme provides detailed information about the lessons learned from the 'Lighthouse Farms', successful farms that have found radical new approaches for a sustainable global food system.

Rogier Schulte of Farming Systems Ecology and partner company Deloitte have assessed how the lessons from these Lighthouse Farms can best be aligned with the transitional agendas of the professionals who work with farmers. That will let the entire wider sector become involved in the agricultural transition and share responsibility for this. The programme is not just about the theory; the practical implications for farms are also a key part of this programme.

For more information, see www.wur.nl/academy

GENETICS

Gene puts fungi on the attack

A Wageningen PhD candidate discovered a gene in fungi that plays a role in the recognition of competitors. Even fungi of the same species but from a different culture are perceived as 'foreign' and treated accordingly. 'A mushroom farmer who mixes compost from different producers will have a problem,' explains Ben Auxier of the Laboratory of Genetics. 'Hardly any fungi grow then. You can easily end up with harvest losses of 90 per cent because individuals from the two cultures attack one another.'
In April, Auxier got his doctorate for the discovery of one of the genes that plays a role in recognizing the other as 'foreign'. 'We think there are more of them, but this is a start'. Knowledge of how the recognition mechanism works may open up new possibilities for the breeding of mushrooms, says Auxier.
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ANIMAL ECOLOGY

Pipistrelle migration over the sea revealed

Nathusius' pipistrelle bats prefer to cross the North Sea just before a full moon, according to research by Sander Lagerveld of Wageningen Marine Research.

PHOTO ALAMY

For four years, he studied where and when the bats fly over the sea. Headwinds are not a problem. If the crossing takes longer than one night, the bats spend the day on an oil platform, wind turbine or ship.

Nathusius' pipistrelles *(Pipistrellus nathusii)* travel long distances between their summer areas in north-eastern Europe and winter territory in southern and western Europe. Most of the migration is across land but the bats are also capable of crossing the North Sea. The bats are encountering more and more wind farms on their route, and rotating wind turbines can be fatal for bats. Lagerveld's research is aimed at developing measures to minimize the number of victims, for example stopping the turbines if bat migration movements are expected in the vicinity of a wind farm. The results were published in early September in the journal *Environmental Monitoring and Assessment.*
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ANIMAL DISEASES

New variant of bluetongue virus

The bluetongue virus that has been circulating in the Netherlands since September is a new variant that was not present in previous outbreaks of the disease. This conclusion was reached by the National Reference Laboratory for vector-borne viral animal diseases at Wageningen Bioveterinary Research. Bluetongue virus is a disease found among ruminants, and mainly affects sheep. The pathogen behind the previous outbreak in the Netherlands, in 2006, was bluetongue virus serotype 8. This time, it is serotype 3, which is also found on Sicily and in Israel and Africa. The Dutch variant is genetically different, however. 'It's a case of a unique variant of this serotype. We can't be 100 per cent sure where the virus came from, geographically,' says Melle Holwerda, head of the reference laboratory.
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AGRICULTURE

Farmers encouraged to produce more

Banks and companies that advise farmers focus on innovation and high production levels. Nature-inclusive farming is hardly promoted at all.

That is shown by an analysis published in September by Wageningen Environmental Research and Wageningen Economic Research that was commissioned by the Ministry of Agriculture, Nature and Food Quality.
Making agriculture more nature-inclusive is a key aim of the government. That requires a large group of farmers to switch to this approach. But the choices farmers make are affected not just by government policy, but also by their customers, suppliers and banks.
The researchers looked at the communications material of these parties, such as newsletters, brochures and flyers. Judith Westerink: 'We examined what message was being conveyed in the text and images.'

According to the researchers, companies and banks may be less likely to promote nature-inclusive agriculture in their communication partly because other forms of future development tie in better with their own business models.
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PHOTO SHUTTERSTOCK

CLIMATE

Africa not always made cooler by more greenery

Projects to increase greenery in Africa sometimes lead to warmer surroundings, concludes a Wageningen PhD candidate from satellite images.

In Africa, especially in the Sahel and southern Africa, greenery is used to combat land degradation and reduce the effects of heatwaves, erosion and drought.
Jessica Ruijsch, a PhD candidate in the Water Systems and Global Change chair group, used satellite images to map the greening hotspots; there is no central record of these efforts.

PHOTO ANP

Ruijsch discovered that about 2.1 per cent of the continent, some 40,000 square kilometres, has become greener at the local level. In May, she published her findings in *Environmental Research Letters*. In the article, she concludes that actively planting trees, bushes and grass generally works better than leaving the restoration to nature. The latter approach is often more effective for larger areas, however, although it takes longer for the vegetation to increase.
Ruijsch also used satellite images to work out where the projects led to cooler weather and where to warmer weather. 'Vegetation can affect evaporation, which has a cooling effect, and the albedo, a measure for the amount of sunlight reflected off the Earth's surface,' explains Ruijsch. Dark surfaces absorb light and are generally warmer, while light surfaces reflect light and tend to be cooler. 'I was surprised to see the relationship between vegetation and temperature differed a lot between locations. The extra vegetation made some areas cooler while other areas became warmer.'
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WATER PURIFICATION

Magnet extracts phosphate from wastewater

PHOTO SHUTTERSTOCK

Magnets can remove phosphate more sustainably from wastewater, with more potential for reuse, shows research by Wageningen Food & Biobased Research in partnership with various companies.

At present, phosphate is extracted from wastewater by using iron and aluminium salts to make it sink or by using biological processes with bacteria. These processes are effective, but it is hard to reuse that phosphate.
In the newly developed process, magnetite particles play a crucial role: after they are added to the wastewater, the phosphate sticks onto the particles through adsorption. The magnetite is then separated from the water with a magnetic field. By changing the acidity, the phosphate can be separated again from the magnetite.
Phosphate can thus be extracted from the water and reused in a circular process without adding chemicals.
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INNOVATION

App analyses tomatoes

Wageningen Plant Research has developed an app that can determine the size and shape of a tomato in a matter of seconds. The app can be used by researchers and plant breeders to assess the extent to which new varieties deviate from existing varieties. That is currently done by hand, which is time-consuming and less objective. The app records variables such as the volume, weight and adhesion of the stalk. It also provides information about the shape of the fruit. *Info: dan.rustia@wur.nl*

PHOTO SHUTTERSTOCK

GEO-INFORMATICS

Predicting illegal felling with big data

The global nature organization WWF plans to use the application Forest Foresight to combat illegal felling. This intelligent system uses big data, for example from satellite images, to predict incidents of illegal deforestation in tropical forests. The system may warn about the construction of roads, which is often the first step in a felling operation. Roads are necessary for transporting heavy machinery to the tract of forest to be felled.
WUR's Laboratory of Geo-Information Science and Remote Sensing was involved in developing the system. Pilot projects were run in Gabon and Kalimantan, where Forest Foresight keeps an eye on 8 million hectares of forest. These projects paved the way for 33 interventions to prevent deforestation. WWF hopes to reduce illegal deforestation in tropical forests by 30 per cent with the aid of Forest Foresight.
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PLANT PATHOLOGY

New defence mechanism against potato blight found

Wageningen researchers have worked with university colleagues in Tübingen and Norwich to shed new light on the defence mechanisms of potatoes against the disease caused by *Phytophthora*.
To trigger resistance to the disease, the plant first has to recognize the pathogen. It does that with receptors in the cell that are coded by resistance genes. 'Plant breeders develop resistant varieties by selecting for these genes,' says researcher Vivianne Vleeshouwers of the Laboratory of Plant Breeding. 'The problem is that *Phytophthora* constantly breaks through that resistance.'
In research published in early September in *Science*, the research team showed that newly identified receptors on the outside of the cell play a role in recognizing the disease. 'We found variants of these receptors, with varying recognition patterns, in wild potato plants from the Andes,' says Vleeshouwers. This may offer plant breeders a new option for developing resistant potato varieties.
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PHOTO ALAMY

GENETICS

Harmful fungus is genetically flexible

***Aspergillus fumigatus* mixes up its DNA through sexual reproduction. A citizen science project has been set up to get more information on the spread of this fungus, which can be harmful.**

Aspergillus fumigatus is found all over the place. We breathe in the fungal spores every day. That is not a problem for healthy people, but the fungus can harm seriously ill patients, says Eveline Snelders, assistant professor in the Laboratory of Genetics. In hospitals, infections are treated using azoles, antifungal chemical compounds. 'The problem is that the fungus is increasingly developing resistance.'
One likely reason for this is the widespread use of azoles in agriculture and horticulture, says Snelders. 'Piles of waste, where the fungus naturally thrives, are hotspots for selection for resistance. And that has consequences that extend to hospitals.'

PHOTO SHUTTERSTOCK

Once a patient is infected, it is difficult to use DNA investigations to find out where the resistant fungus came from. That is because *Aspergillus* mixes up its genes far more during sexual reproduction than is the case with similar organisms. This funding comes from a study Snelders and her colleagues published in *PLoS Biology* in September.
To get a better understanding of the incidence of resistance to azoles in various parts of the Netherlands, Snelders and her colleagues started a citizen science project last autumn. For one month, 500 people hung up a plastic insect trap at home with an adhesive strip that could catch the fungal spores. The adhesive strips were sent back to Wageningen in November for resistance testing. The first results are expected in the first quarter of 2024.
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MARINE ECOLOGY

Seals susceptible to disease keep their distance

Harbour seals that rest on sand flats lie twice as far away from one another as grey seals. That could reflect a difference in the susceptibility to diseases.

PHOTO ANP

Researchers at Wageningen Marine Research and the Netherlands Institute for Sea Research noticed this difference between the two species when studying aerial photos of the Wadden Sea. According to marine ecologist Anne Grundlehner, 'It is possible that the larger distances between the harbour seals are an evolutionary response to the susceptibility of the species to pathogens.' Outbreaks of the seal virus have caused populations of harbour seals to halve, whereas grey seal populations were relatively unaffected.
The differences between the two species of seal can be used for species identification. Seals can be seen from space, explains Jeroen Hoekendijk, a PhD candidate at WUR, but not well enough to determine the species. 'By making use of these spatial patterns, we now have a new tool that can help us with identifying species in satellite images.'
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CROP FARMING

Yardlong beans in the Netherlands?

Semi-tropical crops such as yardlong beans can grow in the Netherlands in simple tunnel tents. Postdoc Martina Huber wants to talk to migrant communities about whether growing such crops is desirable.

Huber set up six simple tunnels – tubes covered with plastic – to experiment with growing 48 crops, including yardlong beans, bitter melons, Chinese cucumbers and Thai basil. The tunnels keep conditions more humid and warmer than outside for relatively long periods. That led to big harvests.
At present, most yardlong beans, for example, are imported – which is not particularly sustainable. But Huber does not see cultivation in the Netherlands as necessarily the best option. 'Farmers in Suriname, who are connected to the Surinamese community here via that crop, would lose part of their income. It would have both economic and cultural consequences.'
So should you grow the crop here in the summer and import it in the winter? 'That is not just up to us scientists,' says Huber. 'We should discuss this with the communities.'
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PHOTO SHUTTERSTOCK

DIAGNOSTICS

Students come up with test for brain damage

A team of nine Wageningen students have devised a test to show non-congenital brain damage without the need for expensive scans. The team won second place with that idea in the SensUs Challenge in early September, an annual international student competition run by Eindhoven University of Technology. The Wageningen test detects the presence of GFAP (glial fibrillary acidic protein) in a blood sample. That is a protein normally found in the brain but which also gets into the blood after brain damage, for example after hitting your head in a fall. The more GFAP there is, the worse the brain damage.
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Wageningen World: more sust

PHOTO GUY ACKERMANS

You are reading this magazine because you have a connection with WUR. We aim to engage and entertain you with journalism about our education, research and societal impact, whether you are an alumnus in the Netherlands or abroad, a WUR client or partner, an organization based on our campus, or a resident of the Wageningen area. Your appreciation for our content is evident from the results of last summer's reader survey, and the high response reflects your commitment. We seek to nurture this engagement in a manner befitting the greenest university in the world.

The digital era provides us with the opportunity to connect with our readers and disseminate our stories with minimal environmental impact. We therefore intend to focus increasingly on the online distribution of the *Wageningen World* articles, in line with our sustainable values and mission. On the other hand, like many current readers of *Wageningen World*, we acknowledge the value of the print editions of the magazine.

Therefore, in 2024, two issues of *Wageningen World* will be published: in the run-up to the summer vacation, and before the Christmas period. If you live in the Netherlands, you will receive the print edition of the magazine in the post. That is, unless you already had an online subscription, or would now prefer to do so.

For our international readers, 2024 marks the year when we fully transition to online, making this edition the final print issue. From now on you will receive the magazine by email. We hope that you will continue to follow us online.

Meanwhile, we are working behind the scenes on a new online platform (wur.nl), and we are exploring how the compelling stories we write for *Wageningen World* can find a fitting place in this new environment. We hope that you will join us on this journey and continue to enjoy the rich content that *Wageningen World* has to offer.

Inge Wallage, Corporate Director Communications & Marketing

WHAT WILL CHANGE FOR YOU?

If you live in the Netherlands and have been receiving the Dutch or English print edition of Wageningen World four times a year, **from 2024 you will receive the magazine twice a year. Nothing else will change for you.**

Do you currently receive the print edition of Wageningen World and would you now like to switch to reading it online? Then you can change your subscription at *www.wur.eu/ww-subscription*.

If you live abroad and have been receiving either the Dutch or the English print edition of Wageningen World four times a year, then **from 2024 you will receive the online edition twice a year by email.**

If you wish to continue receiving Wageningen World, **please let us know your email address:** *www.wur.eu/ww-subscription*

ainable and future-proof

HIGH MARKS FOR WAGENINGEN WORLD

In a time of instant byte-sized information and hasty judgements on social media, WUR's alumni and relations take their time to read the measured, in-depth quarterly magazine *Wageningen World*, a reader survey has shown. The paper version scores 8.9 out of 10. Background stories about Wageningen science are especially highly rated.

8.9

SURVEY

1800

Alumni and relations of WUR were invited to take part in a survey. The aim was to find out through which channels they receive news about Wageningen, and what they think of these media.
About 1800 people – more than 90 per cent of whom were alumni, – answered the questions. Quite sufficient to get a representative impression, concludes research agency Newcom, which carried out the survey.

RATING OF MEDIA

7.5 to 8.0

All WUR's channels, such as digital newsletters, the website and social media, come off well, with scores of between 7.5 and 8.0 out of 10.

8.9 to 8.4

The print edition of Wageningen World scored 8.9 and the online version 8.4.

USE OF MEDIA

76%

The print edition of *Wageningen World* is the most popular channel by far, read by 76 per cent of all the media users.

4% to 33%

The use of other media ranges between 4 and 33 per cent.

READING THE MAGAZINE

90%

90 per cent of the paper magazine readers say they read every issue. 77 per cent read almost every word of the magazine.

65%

65 per cent of the online readers say they read every issue, and 43 per cent say they read almost all the articles.

AGE

The preference for the printed magazine is less strong amongst younger readers. For the youngest age group, the under-35s, the paper magazine is still just about the number 1 most-consulted source of information about WUR, but s ocial media are not far behind.

OUTSIDE THE NETHERLANDS

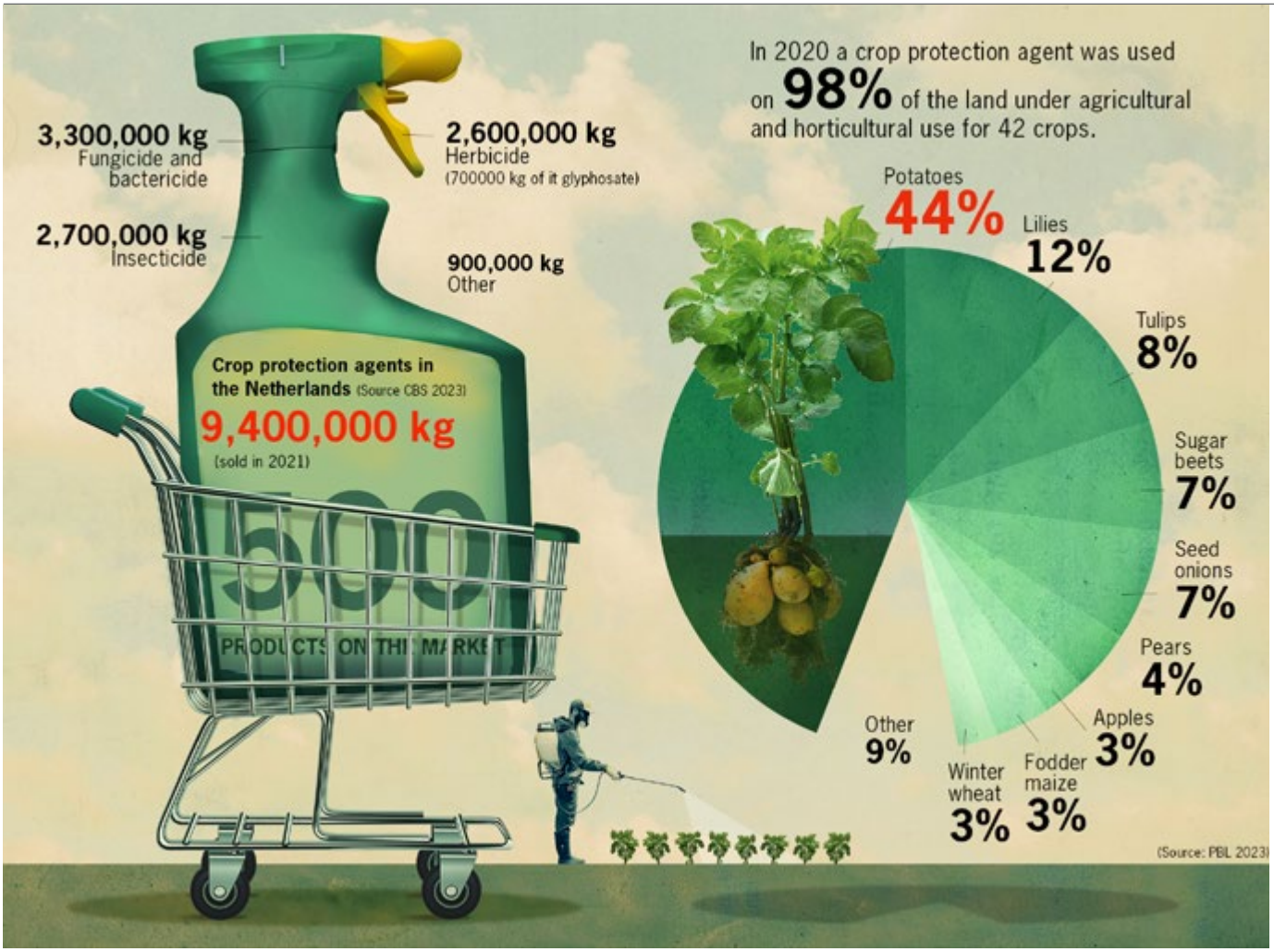
58%

For respondents overseas, the print edition of the magazine is the information channel they use the most, but at 58 per cent, the preference is well below the average (76 per cent).
Many readers abroad make significantly more use of other channels, such as newsletters, the website and social media.

Cut pesticide use, but how?

The European Commission wants to halve pesticide use by 2030. On paper, a lot of progress can be booked through smart innovation, and yet change is often slower than hoped. Successful green innovation requires knowledge of plant cultivation, behavioural science, technology and ecology. 'We want much more of an idea of how farmers think.'

TEXT ARNO VAN 'T HOOG **ILLUSTRATION** RHONALD BLOMMESTIJN



Pesticides have recently become the subject of heated discussions, with the herbicide glyphosate in the spotlight. There are calls in the Netherlands and across Europe for a ban on this substance. At the same time, the European Union aims to halve the use and the risk of all pesticides by 2030, under the new Regulation on the Sustainable Use of Plant Protection Products. The pressure is on to find alternatives so that pesticide use can be cut.

It is clear from the statistics that pesticides still play a key role in arable and fruit farming. Every year more than nine million kilos of pesticides are sold in the Netherlands. Most of these by far are fungicides and herbicides, of which 700 thousand kilos are glyphosate.

Farmers invest in these products to get good harvests and maintain the quality of their crops. If they weren't sprayed with pesticide, Dutch potato harvests would be much smaller due to Phytophtora infestans, and export crops such as flower bulbs would be badly affected by infections with plant viruses.

SURFACE WATER

Logically enough, the use of pesticides leaves traces: you find residues of the substances in food, in the soil and in surface water. That generates risks for biodiversity, because an active substance can be harmful to insects as well. Neonicotinoids, for instance, combat crop damage by insects, but residues of the substance are also toxic for aquatic insects, which are food for many fish. It is true that measurements of pesticides have shown a falling trend since 2014, but the Netherlands is far from complying with the norms that Europe lays down for the ecological quality of surface water.

The highest number and concentrations of pesticides are found in indoor dust samples. Conventional farmers are particularly exposed as was shown by a recent study by professor of Soil Degradation and Land Management Violette Giessen. But hazardous pesticide residue mixtures were detected in nearly all ecosystem matrices. There is no monitoring of the effects of the chronic exposure on ecosystem and human health, says Geissen. 'EFSA predictions on pesticide distribution in the environment after spraying do not include transport by wind erosion from agricultural areas to the immediate vicinity or the transport over long distances. We must assess the exposure and its health effects.'

Geissen coordinates the European SPRINT project that is studying the ecosystem and

human health risks related to pesticide use. Geissen: 'Nobody knows, for example, how much a pregnant woman or a young child can breathe in before getting into difficulties. Because air and household dust are not monitored, we behave as if there isn't a problem. At present there are only norms for residues of pesticides in drinking water, and there are none for air, soil and household dust.'

Nor is any testing done on the toxicological effect of mixtures of pesticides. Research on cells and animal testing could shed light on that, and might eventually produce new toxicological norms, Geissen thinks. 'We are now doing experiments with the gut microbiome and lung and gut cells, which we expose to pesticide mixtures found in household dust. And we look at effects of mixtures in the soil, on the reproduction of earthworms, for example. It is not all that difficult, but you need the will to do it.'

SHARPER CRITERIA

The assessment criteria for pesticides are continually being sharpened up in the light of new research, says Johan Bremmer, senior Plant Health researcher at Wageningen Economic Research. 'We've been going down that path for decades now, for example with DDT in the 1960s following the publication of Silent Spring by Rachel Carson in 1962.'

The two groups of pesticides that are currently under the magnifying glass are neonicotinoids, with their negative impact on insects, and glyphosate, with its potential risks for Parkinson's disease and cancer. There are various options for reducing pesticide use, as Bremmer shows in the 2021 report The Future of Crop Protection in Europe. 'You can opt for more resistant varieties, for mechanical weed control, or for decision-supporting software that helps you apply the right amount of a pesticide at the right moment. This enables you to stop spraying by the calendar, as was done in the past. It means going into your fields more often to assess the crop and take measures in good time. This way, you can save a lot on pesticides.'

Without chemicals you won't be able to keep your climate goals on track'

Yet halving pesticide use – even in combination with innovations and new farming techniques – can be expected to affect crops like wheat, maize, tomatoes and grapes, shows a scenario study by Bremmer and his colleagues. Depending on the crop, the harvest can fall by up to 30 per cent, in the olive sector for example. And a drop in yields leads to additional imports and price rises.

VARIATION IN USE

Some time ago, one of his colleagues looked into the variation in pesticide use between farms, says Bremmer. 'The amounts could vary by a factor of five between the farms using the most and those using the least. Whether that is still the case should be investigated. Imagine if the farmers and horticulturalists who use the most started performing as well as those using the least. Maybe you could then quite easily achieve the 50 per cent reduction the EU wants. You might think: the rest must just make a bit more effort. But it's not as simple as that, because it has a lot to do with experience, entrepreneurial skills, risk assessment, and bearing in mind costs and clients' requirements.'

A farmer or grower also needs hands-on experience of where the limits lie. 'When do you spray your crops, and how much? If you don't want to use herbicides, you are more dependent on the weather. Because if it starts raining after you've weeded, the weeds can put down new roots. So there are a lot of things you have to factor in. You can't learn all that in a single season,' says Bremmer. From this year, Bremmer is the coordinator of the EU's Horizon Europe project SUPPORT, which does research on why agricultural practices lag behind when it comes to using environmentally friendly innovations. 'There have been quite a lot of developments but they don't find their way into farming practice. Why is that? That is a crucial question that we'd like to answer in order to be able to advise on how to stimulate the transition to using less pesticide.'

The SUPPORT project studied the farming of eight different crops – including olives, strawberries, maize and potatoes – in 10 European countries, focussing primarily on the human dimension. 'The underlying discipline is behavioural economics. We look at the role of the family, for instance. Or the influence of advisors, purchasers and consumers. How much scope does the bank allow for investing or taking risks? So we want to get much more of an idea of how farmers think. What exactly do farmers do? >

‘Polarization makes a nuanced discussion almost impossible’

And what influences their decisions?’
At the same time, there is plenty of scope for innovation through some surprising new farming systems. This is happening through initiatives like the green crop-protection project Kennisimpuls Groene Gewasbescherming, says Bert Lotz, Applied Ecology team leader at Wageningen Plant Research.

COMBINING STRATEGIES

With input from crop experts and farmers, new and more robust and resilient farming systems have been designed that require much smaller amounts of pesticide. Lotz: ‘We do that by combining ecological and technological strategies. We do as much as possible to block the life cycle of the main diseases, pests and weeds. If we still need to control them chemically, we aim to do so using precision techniques.’ Dutch apple orchards, for example, are suffering from about 20 species of fungus that cause rot. So apple farmers spray their crops with fungicide about 25 times in the growing season. Moisture plays a key role: wet weather makes most fungal spores germinate. Lotz: ‘If you can keep the apple tree and the fruit dry, you have a simple strategy for breaking the life cycle of fruit rot fungi.’
A solution that was developed by WUR researchers at the experimental site for fruit research in Randwijk is a mechanical screen that closes before it rains. This so-called ‘convertible roof’ keeps the apple tree dry so you don’t have to spray as often. ‘The convertible roof works well but there is one fungus, powdery mildew, that goes on growing in dry conditions. You can target that specifically by spraying infected branches very precisely, using much less fungicide. To manage without any fungicides at all, you need apple varieties that are resistant to mildew.’

APHIDS

Another farming system has been developed for lilies. Lily bulbs are currently propagated out of doors and are regularly sprayed against aphids, because aphids can transmit plant viruses, and viruses are an obstacle for export of the bulbs.
In the new system, lilies are first propagated virus-free by means of tissue culture, after which they spend their first growing season in the greenhouse, where they are shielded from aphids. Lotz: ‘That gives you bulbs that are theoretically free of plant viruses. After that you only need one more season of outdoor cultivation and there’s no need to get rid of every single aphid in that year. Which makes a big dent in the amount of insecticide used.’ This farming system may also reduce fungicide use by 25 to 50 per cent.
The first experiences with these farming systems for apples and lilies have been positive, says Lotz. ‘There has been a noticeable reduction in the use of crop protection agents, and therefore a much smaller environmental burden. It is too early to declare the newly developed prototype cropping systems to be the ideal solution, because we need to continue testing them for a few more years. But we do think they have strong potential.’

BIG AGRIBUSINESS

There are all sorts of possibilities for reducing the use of pesticides, but it is becoming increasingly difficult to have a substantive discussion on the subject, notes Pieter de Wolf, who does research on field crops at Wageningen Plant Research. ‘Polarization has made a nuanced discussion on the usefulness and necessity of pesticides

HOW DOES EUROPE MEASURE PESTICIDE USE?

Fifty per cent less pesticide use by 2030 sounds straightforward, but the methodology is complex. Pesticide use is charted using what is known as the Harmonized Risk Indicator, which divides pesticides into four risk categories: low-risk, regular, candidates for substitution, and banned substances, which are only permitted if an exemption is granted.
The substances categorized as needing substitution are licensed for sale for a maximum of seven years, until suitable alternatives become available. ‘Regular’ products are licensed for 15 years.
To monitor the reduction in the use of pesticides, European countries are required to report the number of kilos sold in the country. The weighting factor is 1 for low-risk substances, 8 for regular substances, 16 for candidates for substitution, and 64 for banned substances. The number of kilos sold has to be multiplied by the weighting factor to get the total use per country. Any change in amounts used is compared with the average in the reference years 2015 to 2017.

almost impossible. Glyphosate has come to stand for big agribusiness, and all that is toxic, chemical and unnatural. People frame things in terms of absolute good and bad: you are for or against pesticides. If, based on my expertise, I don't want to rule out any use of glyphosate whatsoever, I get accused of aligning myself with the producer, Bayer. When all I'm doing is using my expertise to provide an estimate of the possible consequences of a ban.'

De Wolf does not think a ban would be a sensible move at present. 'It will work against you because farmers will just use other chemical substances, many of which are often less effective and riskier for humans and the environment. And the non-chemical alternatives have their disadvantages as well. You can fight weeds with mechanical or thermic methods. But then you badly disturb the soil and use a lot of energy. If you don't want any more chemicals at all, you won't stay on track with your climate targets, for instance.'

DISAPPOINTMENTS

De Wolf is a project leader at the Farm of the Future in Lelystad, where new farming systems are tested. These include the use of robots and artificial intelligence for identifying weeds and spraying them with herbicide one by one.

In recent years, small groups of Dutch farmers started using the first versions of these robots, sensors and software. But the technology did not prove sufficiently reliable. 'A farmer soon finds that he has to keep a constant eye on a robot, and feels he'd be better off just driving a tractor himself. So the equipment gets dumped in a corner of the barn. Disappointments put paid to any enthusiasm for such innovations. The question is how we can develop those kinds of automatized applications so that you can use them on a large scale.'

The key to this technological development lies in smart software, thinks De Wolf. The algorithm that drives the robot and identifies weeds must be trained using a big database of photos of the crops and weeds found in Dutch fields. 'Those images ensure that the algorithm can very quickly decide whether a plant should be removed or can stay put. A computer algorithm sees a plant as a different species in each phase of its growth, so it needs training: this is a weed, and that's a crop. You have to fill the database with photos annotated by humans, and that is extremely labour-intensive. This kind of agricultural technology really needs to be stimulated with a research agenda and targeted financing.'

STRIP FARMING

Another cropping system that is being tested on the Farm of the Future is strip farming, in which crops such as potatoes, wheat, onions and carrots are grown in alternating strips on the same plot. The field is no longer a monoculture, and the crops are not all harvested at the same time. De Wolf: 'First impressions are that strip farming promotes biodiversity because there is always a crop in the field that provides shelter and food for insects and birds. There is also more opportunity for the natural enemies of pests, and it prevents some plant diseases from spreading as well. But one of the downsides is that we provide year-round food and shelter for mice this way. The Colorado beetle flourishes as well, because it survives the winter in the soil and when the next season starts the potatoes are not far away. Each cropping system comes with its own problems, says De Wolf. 'By switching from large fields with just one crop to strip farming, you find some problems become easier to manage, while others actually get bigger. So I don't think you can ever get away without any measures against diseases, pests and weeds. The question is how to do it as sustainably as possible, with minimal impact on soil, water, biodiversity and energy consumption. The lesson so far is: you can manage with fewer chemicals, but you can't do without them entirely.' ■

www.wur.eu/glyphosate

From research to entrepreneurship

Every year, about 10 Wageningen scientists launch a start-up or a spin-off. WUR aims to double that number. But how do you get from an idea to a business, and how do you get it financed? Four entrepeneurs describe their journey from dreams to entrepreneurship.

TEXT TANJA SPEEK

Innovations only prove their worth when they are put into practice. Which is why Wageningen University & Research invests about 1.5 million euros a year in courses and programmes on entrepreneurship, in support to spin-off development programmes, and in grants. WUR students, PhD researchers and recent graduates are also welcome at StartHub, a programme for the development of entrepreneurial competencies, among other things. Researchers can get support from StartLife, a national programme for new and established entrepreneurs in the food and agriculture sectors. Every year, dozens of students, PhD candidates and other researchers approach one of these programmes with their ideas. Nevertheless, start-ups often get stuck in the phase of developing their idea into a working prototype or service concept. The problem is often lack of financing: they are not yet of interest to investors, who prefer to invest in companies with impressive results. 'It proves to be a challenge for start-ups to find financial support in the earliest ideas phase,' says Lies Boelrijk, director of University Fund Wageningen. 'It's difficult to get a loan, or your company is not interesting enough for investors yet. We want to help by offering a donation or a loan from a new fund that's going to be established.' This fund is intended to help in the early stages, to enable a start-up to fine-tune the business model, for example, or to gather knowledge.
Four entrepreneurs talk about their ambitions and how they realized them.

www.wur.eu/entrepreneurship

FUND FOR FRESH IDEAS

University Fund Wageningen aims to launch a fund in mid-2024 to help start-ups in the early stages. Lies Boelrijk, director of University Fund Wageningen: 'We are keen to talk to readers who would like to contribute to this fund, either financially or with knowledge and experience.'
www.universityfund-wageningen.eu

PHOTO GIJS VAN OUWERKERK

LUC SCHERES, of Surfix Diagnostics, founded in 2011

‘I could ring them with my questions 24/7’

‘I started with Surfix in 2011, during the financial crisis. StartLife, the ‘incubator & accelerator’ for start-ups, was still in its infancy, so the landscape for beginning entrepreneurs was very different back then. There weren’t as many support programmes, nor as many options for starting capital, and few other academics dared to take the plunge.

‘In 2010, I got my PhD in the Organic Chemistry group on a topic related to nanocoatings, and then went on to a postdoc at Eindhoven University of Technology. But going into business appealed to me, right from childhood. My father gave me a couple of sheep to keep the grass short around the house, and I was allowed to sell them. That’s when I learned my first lessons in closing deals.

‘After my PhD I soon got talking to two experienced entrepreneurs, strategic investors. Most investors are primarily interested in the profits on their financial contribution. But strategic investors are players who want to expand their portfolio or who stand to benefit themselves from the technique you want to develop in your company. They invested in my company and also helped me tremendously with their knowledge of the business world. They helped with everything: administration, insurance, websites, HR policy. I could ring them with my questions 24/7.

‘Surfix started out as a company that puts nanocoatings on materials, such as protein-resistant layers, or layers that work like a kind of glue for sticking biomolecules to a biosensor to create a “lab on a chip”. Now we have specialized in the development of new diagnostic tools based on photonics, detection with light. Our nanocoatings are still essential there.

I am not the CEO anymore. I’ll always be a technical guy, so I’ve passed on that job to someone else, and I’m the technical director. Acquiring new financing is a big part of our work. Entrepreneurship is in my DNA.’ >

PHOTO GUY ACKERMANS

NIEK SAVELKOUL, CEO of Scope Biosciences, founded in 2019

‘After six months we could raise our first glass of champagne’

‘At Scope Biosciences, we make diagnostic tests that you can do quickly on location. To locate diseases in crops, for example. The plan came up after a game of squash at the Bongerd sports centre with three other alumni I knew from our participation in iGEM, a Biotechnology student competition. We were also working on diagnostic tests then too, but for infectious human diseases. ‘One of the team members started a PhD in Microbiology. That group is steaming ahead with research on the CRISPR-Cas technique, with which you can cut and paste DNA efficiently and safely. Suddenly we saw the potential to use that technique to conduct diagnostic tests much faster and more precisely that was hitherto possible. We went to talk to StartLife about launching a company. We learned a lot there, about obtaining financing among other things.

‘There were lots of nerve-wracking moments in the early years, about whether we could manage financially. We soon got money through the Call for Innovation, an initiative by the Agrotechnology & Food Science group at WUR to study the feasibility of start-ups. That enabled us to cover the costs such as salaries and laboratory expenses for the first few months. Two of us set to work in the lab to find out whether our idea was technically feasible, while two followed StartHub’s incubator programme for students and graduates.

‘Six months after our launch we could raise the first glass of champagne in a toast. Things were coming together. We discovered that our idea of using a specific type of CRISPR for diagnostics did work and that we could apply for a patent. We also got financing from the Dutch Research Council’s Take-Off Grant.

In 2021, we also won the Atlas Invest Entrepreneurship Grant, a fund set up by an alumnus. We got 35,000 euros, which enabled us to continue and more importantly boosted confidence among the investors we were seeking to get on board.’

DIMITRIS KAREFYLLAKIS, CEO of Time-travelling Milkman, founded in 2020

‘Learning new skills really appealed to me’

‘At Time-travelling Milkman, we make plant-based dairy substitutes creamier. A lot of attention is paid to the proteins in these products, but it is the fat in them that makes them creamy. We know how to imitate those fat droplets using European seeds, such as sunflower seeds.

‘The company is building on my PhD research. I was already thinking then about what I wanted to do next. Maybe a postdoc or a job with a big company. But I felt that I could have a bigger impact by launching a start-up for this product. Going into business is a completely different ballgame. The fact that you have to learn a lot of new skills to do it really appealed to me.’

‘StartLife gave us a loan of 10,000 euros on favourable terms, such as a low interest rate and only starting to pay it back after two years. Then came a subsidy of 55,000 euros from Eurostars, a European programme for

innovation in small to medium enterprises, and later another grant of 40,000 euros from the Dutch Research Council. That helped us take the first steps. I could employ someone and could hire experts to help me with financial and legal advice.
'Now we have obtained a grant of 925,000 euros from the Eastern Netherlands region. With that, we can invest in upscaling our production.
In programmes like StartHub, you learn to start small and to imagine your ideal client at that moment. For us, an example was the now famous restaurant De Nieuwe Winkel in Nijmegen, where the food is entirely plant-based, and includes crops from local food forests. They have two Michelin stars. Of course, we're hoping for bigger clients, such as Unilever, so we can have a real impact. But it takes time before big players like that have confidence in a small company.'

PHOTO GUY ACKERMANS

PHOTO GUY ACKERMANS

MARJOLEIN HELDER, CEO of Plant-e, founded in 2009

'We started selling products very quickly'

'Plant-e makes electricity using living plants. The electricity comes from bacterial processes in the soil. We can't generate a lot of electricity, but the supply is very reliable and continues all day. So it's a system that's mainly suited to supplying electricity for lamps and sensors.
'I set up the company when I was six months into my PhD research. I never saw myself as a scientist. From the start of this PhD project, the aim was for a company to come out of it eventually.
'About six months after I had started my research, the patent for the technology had to be established internationally. That is very expensive and at that time, the university did not see an obvious market and didn't want to take that step. Then came the question of whether we wanted to take it over. We could only do that if we set up a company. I was happy to do so and I took the lead in starting Plant-e together with my co-supervisor David Strik.
I was able to combine setting up the company with my PhD research, thanks to which I had an income, at least.
But setting up a company is costly – buying a patent for instance. There weren't yet any supportive initiatives like StartLife and StartHub, specifically for WUR. We could borrow money through the national Technostarter scheme for tech start-ups. The handy thing about my PhD research was the courses I could take on subjects such as entrepreneurship.
'Unlike most starters, we started selling products very early on. We didn't depend on investments in the first phase. That sometimes had an inhibiting effect, and sometimes we couldn't take certain steps because there was no money for them. At the end of 2021, we got a prestigious EIC Accelerator Grant from a European innovation programme, with which the company grew to a staff of 15. We are in the midst of a serious investment round now, which is due to finish at the end of this year.' ■

More room for fire

Wildfires, from Australia to Siberia, are in the news more often every year. In Europe too, nature areas catch fire with increasing frequency. What is behind this, and what can be done about it? You'd rather keep the landscape open and free of dead matter.'

TEXT NIENKE BEINTEMA **PHOTO** VICKI SMITH/GETTY IMAGES

Disaster strikes more and more often. The eucalyptus forests of Australia, the Canadian taiga, the heathland in Brabant. Even the Siberian tundra is burning, bleaching and smouldering. All this is putting more and more CO_2 into the air worsening the greenhouse effect and giving us even hotter and drier summers, causing even more fires.

What is to be done? Invest more in firefighting? Not necessarily, say Wageningen experts. Instead, they argue for a completely different approach targeting prevention and a 'resilient landscape'. One of these experts is Cathelijne Stoof, a wildfire specialist in Wageningen and the project leader of PyroLife, an international training programme on wildfire management for PhD students. The other is Guido van der Werf, who specializes in the interactions between wildfires and the climate. He started in Wageningen on 1 September 2023, as a personal professor of Wildfires and the Carbon Cycle.

'People always see fire as a bad thing,' says Van der Werf, 'whereas fire is also a very useful part of the natural cycles on Earth. Fire clears away dead matter and ensures a rapid recycling of nutrients. It clears the way for new life, literally and metaphorically. In earlier times, people made use of fire by periodically burning land, but on a small and manageable scale. Nowadays people know very little about fire. They have lots of wrong ideas about it.'

Stoof: 'That is also because of a massive bias in the reporting: the evacuation of holidaymakers on Rhodes was in the news for days, the wildfire in Algeria which killed 34 people hardly at all. People are often surprised to hear that Africa has the most fires. And on the news, you only ever see fleeing people and burned-out cars. But never recovery, the fresh green growth and carpets of wildflowers. That negative framing suggests that all fires are bad and must be stopped. For the bigger picture, it is important that we sometimes accept fire. That calls for a more diverse perspective on fire than we generally see at present.' >

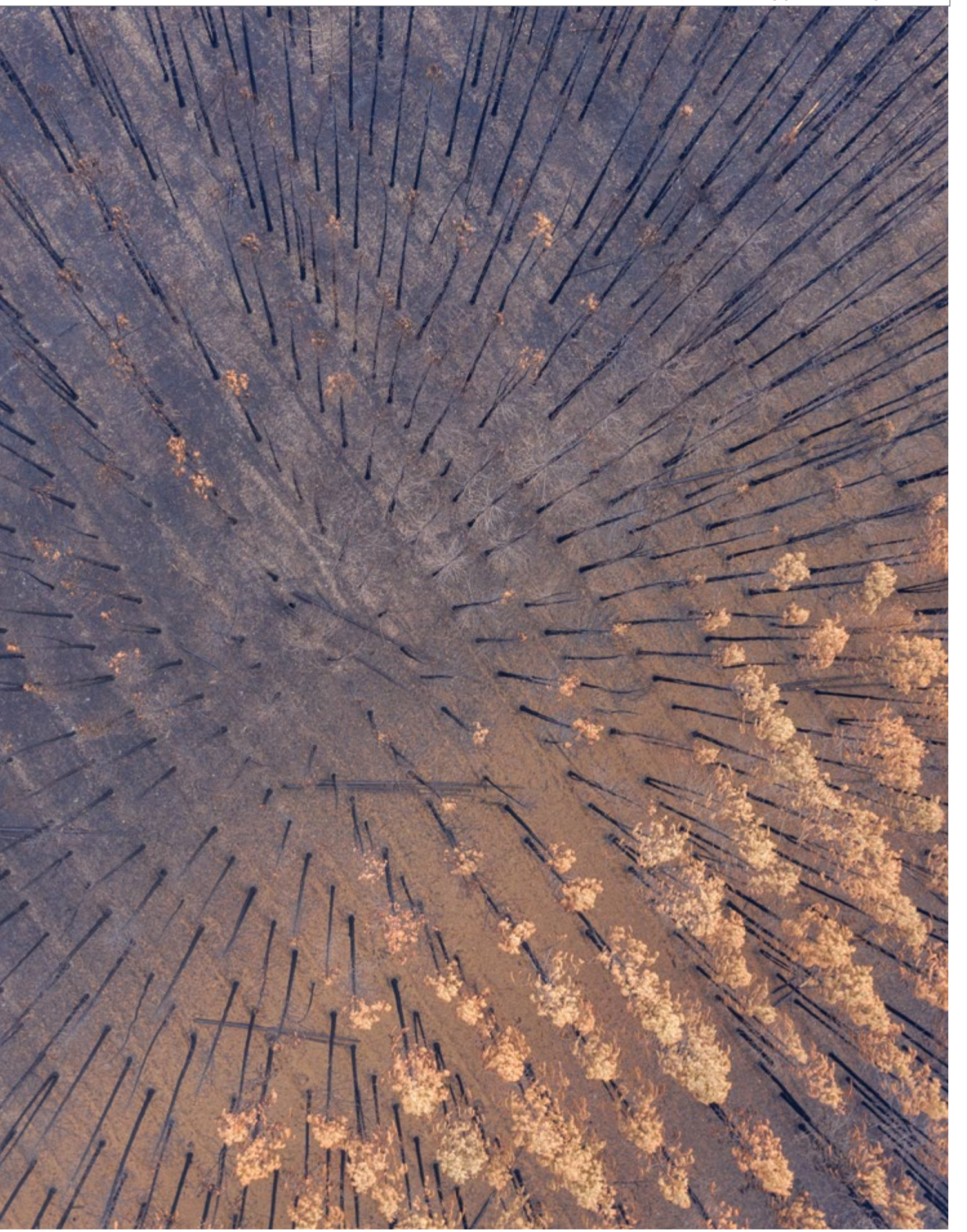


PHOTO NOUT STEENKAMP

CATHELIJNE STOOF
Wildfire specialist and project leader at PyroLife

‘You often see pictures of fleeing people, never of recovery’

How may fires are there worldwide, actually?
Van der Werf: ‘Annually, worldwide, it is estimated that an area the size of Australia goes up in flames. But you can quantify fires in different ways. We usually look at the surface area burned, 90 per cent of which is grassland fires in the tropics. Worldwide, the surface area that catches fire is going down, mainly because savannahs are being turned into farmland. But in many regions, wildfires are on the increase. In Canada and Siberia, the number of forest fires doubled over the last 10 years. And if you look at emissions, forest fires are more significant that savannah fires.’

What does that mean for the greenhouse effect?
Van der Werf: ‘I look at the role of fires in the carbon cycle on a global scale. Where are the fires, and what gets into the air? You can calculate that if you know how much biomass is involved. Fires are carbon-neutral in theory: the emissions are compensated for by the new growth. But when the number of fires increases, as is happening in the far north, they do help to reinforce the greenhouse effect. As a result you get more droughts every year and therefore even more fires. And we’re talking about a lot of CO_2: the fires in Canada this year emitted more CO_2 than all the traffic and industry in the Netherlands.
‘But the system is much less straightforward than you think. Fire releases a lot of fine particles too, for instance. And that can have a cooling effect, by reflecting solar radiation. And when a coniferous forest disappears in the far north, the snowy landscape gets whiter, causing it to reflect more solar radiation in the spring. We are trying to get as good a grasp as possible of this global system.’

Are there more wildfires in the Netherlands than there used to be?
Stoof: ‘The Netherlands has kept excellent statistical records since 1924. Fire was the enemy of the timber harvest, so damage to timber plantations was closely monitored. But fires on heathland, for example, was very much under-reported. And after several mild years, people stopped collecting statistics altogether in 1994. So in 2017, a fire brigade colleague and I started collecting new statistics. Good data on fires is essential for prevention and safety, for understanding the effects of climate change, and for fulfilling our Kyoto obligations. ‘Nowadays, we have between 100 and 1100 fires per year, averaging about 600 covering a total of about 400 hectares. That is roughly the same scale as it used to be, but there are peaks and troughs. And I’m guessing that the impact is getting bigger and bigger, because the Netherlands has become more and more densely populated. And we have more and more vital infrastructure.’

You state the case for less emphasis on firefighting. Why?
Stoof: ‘We are reaching the limits of our firefighting capacity. The biggest fires in Australia, Southern Europe and Canada are just impossible to put out. What is more, focussing on firefighting only makes the problem worse. If a landscape doesn’t get burned enough, you get an accumulation of dry organic matter. And then if it does catch fire, the fire is immediately massive and unmanageable.
‘What we are arguing for is a certain resilience in the landscape. That can be achieved through landscape design and the way people live and work there. This approach entails the conservation of small-scale cultivated landscapes and knowledge of how you can live with nature. The ideal is a “living landscape”: a bio-economy in which people can live off the land, and thanks to which rural areas remain attractive places to live and work.’

That sounds like a complex socio-economic puzzle to solve.
Stoof: ‘Right. But it *is* possible, that kind of shift in awareness and policy. We saw that in the world of water management. In the space of 20 years, “living with water” and “room for the river” have become widely shared concepts. We no longer seek to simply control and hold back water, but wherever we can we give it space.’
Van der Werf: ‘Fire, like water, does generate its own dilemmas. The space you would ideally want to reserve for fires might clash with existing infrastructure, for

PHOTO GUY ACKERMANS

GUIDO VAN DER WERF
Personal professor of Wildfires and the Carbon Cycle

‘Fire is a useful part of natural cycles’

example. As well as with our wish for forests to sequester more and more carbon. We’ll have to make some decisions.’

Do we have any examples of that kind of ‘fire-resilient’ landscape in the Netherlands?

Stoof: ‘An interesting pilot area is the Ministry of Defence terrain near ’t Harde, along the A28. There you see a combination of acceptance of fire, landscape management based on that, and good cooperation between the various organizations. In the early spring, the Ministry’s fire brigade does controlled burning in this area. Actually, that is not only useful for landscape management but also for learning from fire and for bringing different parties together that don’t otherwise see much of each other.’

Van der Werf: ‘That controlled burning is one way of managing the landscape. It requires a lot of labour. You would rather find more natural ways of keeping the landscape open and free of dead matter. By grazing, for instance. And of course you should also consider what you do one stage earlier: where do you plant trees, how many, and which species? Deciduous trees burn much more slowly than conifers, for example.’

Stoof: ‘That’s why we talk about “integral fire management”. It’s about combatting fire, but also about preparedness and prevention of unmanageable situations, about recovery, about learning and communication: the entire circle. To involve all the relevant parties in the design and management of the landscape: owners and managers, and also firefighters and fire specialists.’

And scientists?

Stoof: ‘Yes, we are looking for lots of forms of collaboration. For example, we are now working intensively with Marc Castellnou, who has been a chief fire officer in Catalonia for 20 years. He is doing research as an external PhD student at WUR. In his job, he “reads” fires, the landscape and the atmosphere, and we use the very detailed data collected by him and fire officers around the world to study the fundamental processes that cause wildfires to become extreme.’

Van der Werf: ‘When fires get so intense that they communicate with the upper layers of the atmosphere, they can create their own weather systems, which is massively unpredictable and therefore dangerous.’

Stoof: ‘Without those many years of hands-on experience and the very detailed data, this research would not be possible. At the same time, Marc uses the results continuously in his fire management, which means we’re not only applying the knowledge immediately, but can also test ideas and improve them.’

Van der Werf: ‘That collaboration between scientists and practitioners is crucial.’

Stoof: ‘That’s why we are always asking: where can we collaborate? And not in a colonial, top-down fashion – scientists who decide everything without consulting stakeholders. It’s all about formulating the questions *together*.’ ■

www.wur.eu/wildfires

COURSES ON FIRE MANAGEMENT

Wageningen has been offering a Master’s course in pyrogeography, or ‘fire landscape studies’ for two years now. The course was set up by Cathelijne Stoof. It covers all aspects of fire management, from the technical side to the involvement of stakeholders. It attracts a lot of students and gets very positive evaluations from them. ‘There seems to be a lot of interest in the subject of wildfires,’ says Van der Werf. ‘We are now trying to give the subject of fire a permanent place in the core courses such as geography and air quality.’

As well as the Master’s course, there is the PyroLife programme, in which 15 PhD researchers from various countries *and* from various disciplines do research in close collaboration with practitioners in this field.

A DAY COUNTING FISH ON THE MARKER MUDFLATS

‘Perch, five. Ruffle,

four. Carp, six’

Seven years ago, a group of islands called the Marker Mudflats was created by dredging in the Markermeer lake. The idea was to restore the ecology of what had by all accounts become a dead tank of water full of swirling silt. The fish stocks are one indicator of whether this restoration effort is having any success. A report of 24 hours counting fish.

TEXT AND PHOTOGRAPHY MARIEKE ENTER

Young pike and rudd are a sign that the reedbeds are becoming established

Clad in a green rubber wading suit, fish researcher Joey Volwater of Wageningen Marine Research strides into the water in the small marina on the Marker Mudflats. After about five metres, he comes to a stop, grins and declares the water temperature to be 'warm as piss'. A few months ago, he and University of Amsterdam Master's student Elizabeth Manoloulis stood on this same spot shivering from the cold. That was in early April, the time of year when the spawning season starts for many freshwater fish species.
Since then, they have visited the Marker Mudflats every three to four weeks to document the numbers and sizes of the fish species they find. Today is their last visit for the year. It is the end of September, but the weather feels summery with a temperature of around 21 degrees, abundant sun and a light breeze. However, the fish will soon be looking for deeper waters to prepare for their winter resting period. One last 24-hour session and that will be the end of the 2023 fish monitoring season.

NOT RECLAIMED

The Marker Mudflats project consists of seven small islands in the Markermeer lake, created by depositing more than 35 million cubic metres of sand, mud and clay from the lake bed. The Netherlands originally planned to drain the lake, as it did previously for the reclaimed land of Noordoostpolder, Oostelijk Flevoland and Zuidelijk Flevoland. A dyke was built for this purpose – the Markerwaarddijk, also known as the Houtribdijk. It was completed in 1976, but the land was never reclaimed and the Dutch government officially scrapped the plan in 2002. Meanwhile, Markermeer gradually changed into what was frankly a dead tank of water full of swirling silt. That was largely due to the lack of natural shoreline zones, gullies and shallows.
The Marker Mudflats, an initiative of the nature preservation society Natuurmonumenten, were constructed in 2016 to bring about ecological restoration. The islands were designed with a lot of shallow zones, and the gullies between the islands were raised to give water depths of one to two metres. A great deal of variation was incorporated in the island shorelines, ranging from sand devoid of vegetation to fields of marsh ragwort and reedbeds. The idea was that lee zones behind the islands would give the swirling silt the chance to sink to the lake bed, while the islands themselves could function as valuable nurseries and foraging areas for birds and fish.
Given the encouraging ecological results for the first five islands – Wageningen research showed that biodiversity had increased at various levels in the food chain – Natuurmonumenten and the Directorate-General for Public Works and Water Management decided in early 2021 to build two more islands. Their construction was completed this year, giving the Marker Mudflats a total surface area (above and below water) of 1300 hectares.

MULTI-DAY RESEARCH

The Marker Mudflats are uninhabited but you can visit them. Or at least the main island, and mainly during the day. You can only stay overnight in one of the four off-grid island chalets, and there are a limited number of berths in the marina. But researchers and students get special treatment: to allow research over several days, Natuurmonumenten erected an off-grid group hut with ten bunk beds.
This particular 24-hour session involves three WUR researchers and their two student assistants – one from the University of Amsterdam and one from Utrecht University.
The group accommodation looks out over the first shoreline fish count site for today, the




marina. It has depths of four to five metres, relatively deep for the Marker Mudflats and with more shelter than other areas too. Volwater is standing up to his waist in the water to grab the net that researcher Olvin van Keeken is feeding out of his rubber dinghy. It is what is known as a hatchery seine net, an elongated net that stands upright in the water with the aid of floats at the top and weights at the bottom. Van Keeken carefully arranges the net in a semi-circle in the water, after which he and Volwater gently pull the ends towards one another. Once the circle is closed, the fish swimming inside it have only one place to go: the bulge in the centre. When the researchers haul in the net, it catches all the fish like a kind of sack.

LEARNING LESSONS FROM RESEARCH

Other research projects besides the fish monitoring focus on the Marker Wadden. For example, Jeroen Veraart of Wageningen Environmental Research (WEnR) is studying the governance of the Marker Wadden for the ministry of Agriculture, Nature and Food Quality. The aim of his research is to learn lessons for the governance of other landscape projects around Building with Nature, including the Programmatic Approach to the Main Water Systems, aimed at improving water quality. Another example is the WEnR study on the elements of the Marker Wadden design that might be useful in the Purifying Landscape project. This is a collaboration with drinking water company PWN, which draws most of its water from the IJsselmeer. And Wageningen Marine Research and WEnR collaborated on a recently published analysis of the 'benefits for nature' mindset in relation to the main water systems, looking at options such as the development of new habitats.

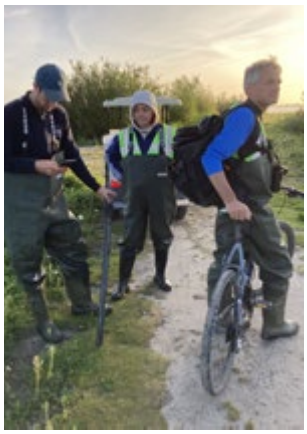
SILVERY MASS

The catch is measured with great precision. The researchers carefully lay the net in a large plastic container with plenty of water in it. The contents look like a writhing silvery mass at first but the fish soon calm down. In a practised routine, Volwater moistens his hands – this prevents harm to the fish – and picks out the largest fish, which measures about 30 centimetres. He explains that the larger fish are more sensitive to stress and so he measures them first. This one is a bream. That's a surprise, says project manager Joep de Leeuw. 'We don't often see ones this size here at this time of year.'

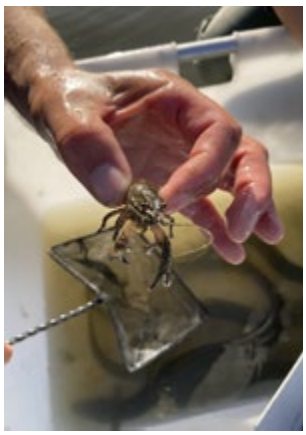
The shoreline counts are always conducted in the same spots, selected to represent a range of shoreline types varying in sedimentation, vegetation and water depths, and consequently also in currents and water temperature. Thanks to that variation, they form habitats for different species of flora and fauna. That includes the fish: marshy banks with dense growth attract different species of fish compared with the beach-like sandy, open shoreline. To measure the ecological effect of the Marker Mudflats, the researchers need to figure out what species are found there and in what stages of growth.

TRIGGERING BITE REFLEX

The researchers manage to identify all the fish at an impressive rate – including the lit- >








tle ones a centimetre or two long. 'See how that mouth is pointing upwards. That tells you it's a bleak, a surface predator, and not a roach,' explains De Leeuw. He identifies another tiny fish by triggering a bite reflex with his fingertip. Snap! So it's clearly a predatory fish, a pike-perch to be precise, a species that is fished commercially in the lake.
The researchers use an instrument they made themselves to measure the fish. It's a tray with a ruler screwed onto it. The tray simplifies the careful measuring procedure: place the fish with its nose against the crossbar, hold it firmly so it doesn't wriggle away, and read out the size by its tail so Manoloulis can note down the result. A deft hand movement by the researcher sends the fish sliding back into the water through the gap in the tray's rim.
By the time the container is empty, the A4 sheet on Manoloulis' clipboard is full of tally marks recording the fish species and their lengths in centimetres: 'Pike-perch, nine. Blackmouth gudgeon, four. Perch, five. Ruffle, four. Carp, six. Roach, four. Roach, four. Another roach, four.' They are all offspring from this breeding season that are now big enough for a connoisseur to identify them by sight. The tiny larvae caught earlier in the season had to be identified in the lab, under the microscope.

SLURPING SOUNDS

As early evening approaches, it is time to set the traps for the counts in the little waterways that connect the open water to the creeks in the 'interior' of the mudflats. That too covers a variety of habitat types, with one trap for the fish swimming out to the lake and one for the fish headed inwards. The traps are next to one another, with 'wings' that prevent the fish from swimming around them.
As she sets the traps, Utrecht Biology student Emma Eggert discovers first-hand that the Marker Mudflats really do largely consist of a thick layer of mud. As she lowers herself into the water from a platform, she becomes completely stuck. Loud slurping noises from the ooze are evidence of the struggle she has to break loose. 'Wiggle your feet, don't stand still and try to keep your weight on your toes,' advises the old hand Volwater.
The next morning, the dawn skies and water of the Marker Mudflats are a bright orange. The researchers doing the shoreline counts take the dinghy while the trap team set off by bike or in the electric golf cart they have on loan from Natuurmonumenten – indispensable for transporting the large quantities of fish materials. The place is now full of birds. The researchers constantly point them out: spoonbills, snipe, teal, dabchicks, blue-headed wagtails. De Leeuw in particular turns out to be a walking bird encyclopaedia, with a sharp eye *and* ear. 'A spotted redshank, can you hear it?' And when a sound like a screeching piglet is heard from the reeds, 'No doubt about that one, it's a water rail!'

STURDY EELS

The first site where the traps are installed is called 'Flamingo': the researchers call each site after a particular bird they spotted there. In addition to the same species that were found in the seine net the previous day, these traps also contain two spotted American crayfish and some sturdy-looking eels. The crayfish are parked temporarily in a transparent tray so that student Eggert can examine them in more detail; she is researching invasive exotic species.
For the eels, the researchers produce a new homemade measuring instrument, the 'eel flume', which makes measuring such a slippery customer a whole lot easier. Pour

Three-spined sticklebacks make ideal food for spoonbills

in some water, manoeuvre the flume under the eel, push the eel in, wait until it unwinds itself and stretches out — then quickly read off the length.

At the 'Bearded Tit' trap site, the eponymous birds make abundantly clear why the researchers chose this name. They flutter up, over and in between the reeds in their dozens or even hundreds. Their calls are unmistakable. 'Like knocking two pebbles together' is how Volwater describes it. In the traps, the researchers find not only a Chinese mitten crab – an exotic species – but also some interesting new species: thin-lip mullet, ide, common rudd and a young pike. The presence of the last two species in particular, as typical reedbed inhabitants, says something about the establishment of the reedbeds, explains Volwater. Reed growth on the Marker Mudflats is not yet optimal, partly because of damage by geese and the 'unnatural' water level management, with higher levels in summer and lower levels in winter. The young pike and rudd are therefore a sign that the reedbeds are becoming established after all. That is good news because reedbeds are important as spawning grounds for adult fish and nurseries for larvae and young fish.

FOUR NEWCOMERS

Once all the traps have been emptied and the fish that were caught have been recorded, the 2023 Marker Mudflats monitoring season has come to an end. The actual data analysis still has to start, but the researchers make a quick provisional assessment. They have found 21 different species of fish, including four newcomers: the pike, Prussian carp, common rudd and tench, all four typical reedbed residents. That is a hopeful sign the new island group is starting to move on from the ecological 'pioneer' stage and live up to its promise of becoming a significant nursery for Dutch freshwater fish – and consequently a source of food for migratory and other birds.

The researchers have identified two clear peaks during the season on the Marker Mudflats regarding the supply of food for birds. The first is in early April, when three-spined sticklebacks swim up the creeks and gullies of the Marker Mudflats in huge numbers to spawn. With a length of about six centimetres, they are ideal food for birds such as spoonbills.

The second peak starts during June, when the fish born that year are just big enough to be caught by the monitoring nets, and can no longer swim through the holes in the net. Young perch, roach bream and pike-perch in particular form the supply of food in this second peak, which lasts until the end of September. One of the key insights from the long-term monitoring of the fish around the Marker Mudflats is that the restoration of shallow freshwater shore zones with a gradual transition from land to water can soon result in new, productive habitats. It also turns out that the various shoreline types differ in how they develop. Unlike the exposed sandy shoreline, vegetation quickly takes hold on the more sheltered banks of nutrient-rich clay and mud sediment, which soon leads to habitats for young fish.

Thanks to such insights, the research on the Marker Mudflats is providing important pointers for design and construction in possible similar restoration projects in the future. This knowledge is not only relevant to the Netherlands. As project manager De Leeuw notes, 'Given that humans are changing and damaging ecosystems around the world, there is a lot of demand for examples of how to stop and reverse the negative effects.' ■

www.wur.eu/fish-ijsselmeer

LONG-TERM ECOLOGICAL FISH RESEARCH

Wageningen Marine Research conducts fish research on the Marker Mudflat islands for various projects. For the Knowledge and Innovation programme Marker Wadden II, commissioned by the Directorate-General for Public Works and Water Management, Deltares and Natuurmonumenten, WUR is monitoring the extent to which the Marker Mudflats are achieving the ecological recovery that they were created for.

Fish stocks around the islands' shoreline are also investigated for the annual shoreline counts in the IJsselmeer and Markeermeer waters. That is for the Ministry of Agriculture, Nature and Food Quality, which uses the data in part as the basis for catch recommendations for commercial freshwater fisheries. This research has been ongoing since 2011; in 2023, nearly 100 kilometres of new shoreline around the Marker Mudflats and Trintelzand were added to the monitoring sites on the recommendation of Wageningen Marine Research. These new sites are more varied than the other shorelines – mainly dykes made of basalt rocks – and therefore have potential as a habitat for different kinds of fish species.

The third research project concerns fish as a source of food for spoonbills; this is for the Nieuw Land National Park, consisting of Oostvaardersplassen, Lepelaarplassen, Trintelzand, Markermeer and Marker Mudflats.

Making paper from grass

Wageningen researchers are turning worthless grass from verges and nature areas into the raw material for paper and cardboard. That could give a boost to the local economy. 'This saves trees in Scandinavia as well as removing the need to transport pulp or paper to the Netherlands.'

TEXT RENÉ DIDDE

There is a pleasant grassy smell in the test room of ACCRES in Lelystad, WUR's trial and development location for sustainable energy and green raw materials. With a sweeping gesture, Kimberly Wevers, researcher at Wageningen Plant Research, chucks armfuls of verge grass onto a conveyor belt. A camera that has been trained using 15,000 photos carries out a rapid scan for foreign objects such as cans or agricultural plastic. 'We even found a pair of underpants once,' says the biotechnologist. The objects are discarded through a hole in the conveyor belt system.

The raw grass is deposited in a cage and taken to a specially developed digester where a culture of microorganisms is sprayed on from a shower head. 'The bacteria convert the sugars into biogas, which we can use for refining the grass further,' explains Wevers. The grass then undergoes a series of additional treatments, such as washing, an alkaline bath, and drying and cutting in a screw press and a second-hand mincer. The researcher shows the final result: snippets of fibrous material that is clean and devoid of sand grains. 'These smaller fibres link together nicely during the paper-making process,' says Wevers.

Now that four years of Wageningen research have shown grass to be a viable raw material, the Schut paper factory in Heelsum, the oldest in the Netherlands, is set to start producing paper from verge grass next year. Wevers shows business cards, greetings cards and artists' paper made by Schut using materials other than wood fibre. 'Schut has a great deal of experience making paper with fibres from cocoa shells or even worn-out jeans.' Such special paper for niche markets will soon be among the possibilities, says Wevers, as will packaging material such as cardboard, egg boxes or tomato trays.

But grass paper won't be coming out of the laser printer any time soon. 'The technical specifications for that are too demanding at present.' Anyway, the market for cardboard products has better prospects: we are printing less and less, but we are ordering ever more packages online.

GRASS WITH ADDED VALUE

The research in Lelystad is part of the GO-GRASS EU project. The EU programme Horizon 2020 funded four demo projects as part of GO-GRASS, aiming to develop 'grass-based circular business models for rural areas' in four countries. More than a fifth of the surface area in Europe is grassland and the idea is to see if that grass can have value as something other than just cattle feed.

In Denmark, researchers are exploring methods for extracting proteins from young grass. 'Denmark has a lot of pigs, which mainly eat soya as they have difficulty digesting grass,' says Wevers. If the Danish pigs were able to consume the grass protein, it would reduce soya imports. In Germany,


PHOTO GO-GRASS


PHOTO SHUTTERSTOCK


PHOTO SCHUT

Verge grass undergoes a series of treatments: cleaning, fermentation, washing, leaching, drying and cutting up. The fibrous material that remains can be used to make paper.

researchers are turning grass into a kind of charcoal – biochar – that can be used to enrich marginal soils with carbon. And in Sweden, researchers are using the grass as litter for stables. All four projects have been a success, says Wevers.

TOUGH AND WOODY

The Dutch grass paper and cardboard are made from grass from verges and nature areas. 'This grass is mown once or maybe twice a year at most, so it's tough and woody and doesn't contain much protein,' explains Kimberly Wevers. 'Verge grass in particular has a negative economic value as it costs money to get rid of it. The Directorate-General for Public Works and the provincial authorities are required to remove it and turn it into compost. Or they leave it lying there. But that is exactly the kind of grass we want. The woodier the better – the tougher the paper. There isn't enough grass in the Netherlands to satisfy the entire demand for paper, but it's suitable for niche markets.'

When asked whether the contamination of verge grass with substances from exhaust gases and the rubber particles in car tyres is a problem, Wevers replies: 'It turns out they mainly end up in the first metre of the verge next to the asphalt. The Public Works directorate can designate the cleanest sections of verge for our raw materials. But the scope of our study didn't include traffic pollution.'

> 'The woodier the grass, the tougher the paper'

By turning the verge grass and – much cleaner – grass from nature areas into paper fibres, the grass acquires a positive commercial value and contributes to the regional economy.

According to Wevers, this could become a new business model for composting companies. They already process a lot of grass clippings from the region and they could therefore also turn the grass into fibres for paper applications. 'This saves trees in Scandinavia as well as removing the need to transport pulp or paper to the Netherlands,' she says, summing up the benefits. A broad lifecycle analysis shows that 'grass-based pulp' scores better from an environmental perspective than conventional wood pulp. Wevers: 'It is better in terms of both water consumption and energy consumption. The latter benefit is mainly because we first extract biogas from the grass, which we then use in the production process.' ■

www.go-grass.eu

Agriculture is very thirsty

Agriculture is the biggest consumer of fresh water in the world. And demand is set to rise, while availability falls. 'Changes to the food system can go a long way towards solving the water scarcity problem.'

TEXT MARIANNE WILSCHUT **PHOTO** IAISI/GETTY IMAGES

There's an Arabic saying: In the desert, any water will do. This is in danger of coming true in Jordan, where there's a growing shortage of fresh water. Farmers in this Middle-Eastern country are going to have to use purified wastewater for irrigation, and some of the country's drinking water will have to come from desalinated seawater. These were the main solutions put forward in a series of dialogues organized in Jordan by WUR and stakeholders in 2022, on the water scarcity challenges the country will be facing by 2050.

'Jordan's demand for water is rising, partly because of the growing population and climate change,' says Petra Hellegers, professor of Water Resources Management and co-organizer of the dialogues. Reusing wastewater and desalinating seawater are going to be a bitter necessity, says Hellegers. 'The demand for water in Jordan in 2050 is expected to be four times the replenishable supply from rain and groundwater.'

Irrigation in the Jordan Valley, Israel

According to Unicef, Jordan is in the top three countries for water scarcity in the world. In order to supply households, industry and farms in the highlands and the fertile Jordan valley with water, deeper and deeper wells are being dug, but the groundwater supplies are not infinite. Hellegers: 'By using up the groundwater you burden future generations with a huge problem. Besides, the approach to water scarcity in Jordan is significant for the entire region: Jordan is a stable country in an unstable region, and hosts a lot of Palestinian and Syrian refugees. It is in the interests of the international community to maintain stability there.' That is why the Dutch ambassador and the government of Jordan visited WUR to bring policymakers, water managers, agriculturalists and food traders together. Hellegers: 'The main aim of the meetings was to raise awareness of the problem and highlight the importance of looking for solutions together. One of the ways we did that was through the Water Allocation Game that was developed for the meetings as an interactive way to get a grip on the problems and possible solutions.' The input for the game came from research on Jordan's water problem by Hellegers and her colleagues.

Certain steps have to be taken before purified wastewater can be used in agriculture. Hellegers: 'The transition from using fresh water to using purified wastewater in agriculture is expensive and requires not just technical changes but also legislative ones. If it is properly purified, wastewater is safe to use for irrigating crops, but the regulations do not permit it as yet. What's more, the food safety norms will have to be relaxed in the countries that import tomatoes, dates, grain and other crops from Jordan too. That's not something a country can tackle on its own. Other countries, donors, international organizations and food importers will have to get involved as well.'

JOINT RESPONSIBILITY

Hellegers has long been arguing for integral policy, in Jordan as elsewhere. All too often, in her view, water and food are considered separately in policy and research, and in practice. 'Dealing with water scarcity is a joint responsibility of the government, producers, purchasers >

> ‘One third of global rice production uses meltwater from the Himalayas’

PHOTO GUY ACKERMAN

PETRA HELLEGERS
Professor of Water Resources Management

and consumers, so you also have to seek solutions jointly.’
At the UN Water Conference in New York in March, WUR announced its intention to invest an extra 7.7 million euros over the next few years in research on water-resilient food systems. WUR also organized a session entitled ‘Make water pivotal’. Hellegers: ‘That was the only session at the Water Conference that put water *and* food in the spotlight. And yet agriculture is responsible for 70 per cent of global water use. Changes in the food system can go a long way towards solving the water scarcity problem.’ During the session, it was decided to set up a global working group on water and food.
Recent studies by Hellegers’ Water Resources Management group make clear that if we carry on as we are now, water use in agriculture will double by 2050. Hellegers: ‘The impact of agriculture is increasing due to population growth and increasing meat consumption, as well as the demand for biofuels. Rising energy prices are driving up demand for crops used to produce bio-ethanol, such as maize and sugar cane.’

INDUS AND GANGES

Sugar cane is a particularly thirsty crop. The watershed of the Indus in Pakistan is one of the places where more sugar cane is being grown now the demand for bio-ethanol is increasing. Along with the Ganges and the Brahmaputra, the Indus is one of the major rivers with their source in the Himalaya mountain range.
A lot of rice, another thirsty crop, is grown in the region too. About one third of the total rice production in the world, and one quarter of the wheat production, use meltwater from the Himalayas. Climate change is making that a vulnerable lifeline. From a report by the International Centre for Integrated Mountain Development in Nepal that was published this year, we learn that if climate change continues at its current rate, the glaciers of the Himalayas will have lost 80 per cent of their current volume by the end of the century. That could impact two billion people who depend on that water for the drinking water, food production and energy generation.
Hester Biemans, a researcher in Water and Food Security at Wageningen Environmental Research, is collaborating on this large-scale study. She did research on the consequences of the melting of snow and glaciers in the Himalayas. ‘It is estimated that in Pakistan and India alone, about 130 million farmers are dependent on the meltwater from the Himalayas,’ says Biemans. ‘The entire food system downstream is largely geared to it. Due to climate change, the peak of the meltwater is changing: with higher temperatures, snow and ice are

PHOTO SHUTTERSTOCK

The green Indus Valley, India

melting earlier in the year.' Consequently, the water supply no longer coincides with the crops' growing season, and more groundwater gets pumped up for irrigation later in the year.
Biemans: 'In theory, farmers should be able to respond to gradual global warming by adapting the sowing time for the crops to tie in with the new timing of the meltwater peak. But success is not always guaranteed because rainfall patterns have become more unreliable and more extreme. That can lead to periods of drought and flooding.'
Biemans: 'What is more, the population is growing fast, so there is a lot of pressure on the food production system. In future it could become difficult to feed the populations of the 16 countries that depend on water from the Himalayas. Pakistan is particularly at risk. It has the biggest irrigation system in the world and is extra dependent on river water.'

ECONOMICAL IRRIGATION

Biemans is working with PhD students and local research institutes to identify viable solutions. 'Creating water reservoirs to store meltwater and the monsoon rain is an obvious option. Research is going on into more economical methods of irrigation and the farming of crops that have been bred to need less water. Another option is to replace crops like sugar cane and cotton that are not needed for food production with crops that use up less water and do contribute to the food supply. But of course, these are tricky decisions because sugar cane and cotton are usually more lucrative.'
The above-mentioned global working group will ponder these kinds of difficult considerations. Last September, this global working group got together in Wageningen to look at ways of reducing the water footprint of the food system. 'Possibilities include stemming food waste, new eating habits, drought-resistant seeds and land use measures that would slow down water runoff,' explains Hellegers. 'Or stopping importing water-guzzling crops from countries suffering from water scarcity.' The working group includes not only policymakers and researchers, but also representatives of the agro-industry, among them an avocado importer. 'We hope this will inspire big players in the agro-industry, such as Cargill and Unilever, to give more thought to the water footprint of the products they purchase.'
These subjects will also be discussed at COP 28, the UN climate conference that was held in Dubai in early December.
Hellegers: 'I'm pleased about that because it's high time the "water world" sat up and took notice of the importance of the food system and the role that water can play in tackling the effects of climate change. The way Jordan is drying up is a good example of that.' ■

www.wur.eu/foodsecurity-valuingwater

PHOTO GUY ACKERMANS

HESTER BIEMANS
Researcher into Water and Food Security, Wageningen Environmental Research

Parasites provoke bizarre behaviour in insects

Caterpillars that climb to the tops of trees, ants that bite onto grass for hours on end: these are the fascinating phenomena Simone Nordstrand Gasque studies. The weird behaviour is caused by parasites. But why? And how does this work?

TEXT RIANNE LINDHOUT **PHOTO** HANS SMID

As a Master's student of Parasitology in Copenhagen, Simone Nordstrand Gasque used to get up at three in the morning to look for so-called 'zombie ants' exhibiting abnormal behaviour in the woods. An infection with the parasitic flatworm *Dicrocoelium dendriticum* (the lancet liver fluke) makes the ants crawl into the vegetation and bite onto the greenery. That increases the flatworm's chances of getting inside the stomach of its next host: a grazing animal such as a deer.

As Gasque explains, that is good for the parasite because it needs different hosts for the various stages of its lifecycle. It starts out as an egg in a snail, which is transferred to the ant when it eats the slime secreted by the snail, and then the larva ends up in a mammal, where the parasite matures into an adult. With her research, Gasque was able to confirm for the first time in the field what had been suspected for 50 years, namely that infected ants only bite onto the plants when temperatures are low. Gasque: 'This clamping on happens largely at the start and end of the day, which is precisely when the deer are grazing.' If the ant is not eaten, it lets go of the grass when the temperatures rise again. 'But on cold days, I saw ants biting hold and not letting go for almost the whole day.'

TREETOP DISEASE

The Danish ants are not the only animal to show a change in behaviour following infection by a parasite, and the liver fluke is not the only culprit. After her Master's in Denmark, Gasque came to Wageningen to study a similar form of zombie behaviour in caterpillars. In the Laboratory of Virology, where she is supervised by Professor Monique van Oers and Associate Professor Vera Ros, she is studying the caterpillars of the small mottled moth (*Spodoptera exigua*, also known as the beat armyworm). The caterpillars turn into zombies after infection by a baculovirus. Gasque: 'The caterpillars become hyperactive, which helps spread the disease. Sometimes they get what is called treetop disease: they climb to the top of a tree, where they die and turn liquid. The liquid drips down onto leaves that are then eaten by other caterpillars. And so the virus spreads.'

> ‘Ants bite on tightly during grazing time for the deer’

In the Laboratory of Virology, researchers are figuring out the molecular mechanisms that cause this behaviour. Which genes are involved in the host’s change of behaviour? The laboratory has years of experience in investigating baculoviruses, which often cause deadly diseases in host insects. That is why these viruses are used in the biological control of pests in agriculture and horticulture. Baculoviruses also make a good subject for research because they are easy to modify genetically and the effects of such modifications can clearly be seen in the changes in behaviour.

BLOOD-BRAIN BARRIER

Gasque hopes to receive her doctorate in the spring of 2024 for her research on how the virus manages to reach the caterpillar’s central nervous system. To do this, it has to cross the insect equivalent of the blood-brain barrier. Many different scientists are interested in knowing how that is possible. For example, this knowledge could help develop medicines that can reach a brain tumour.

Gasque investigated whether certain proteins play a role here. ‘We know from earlier studies by our group that protein tyrosine phosphatase is needed to induce behavioural change.’ Gasque infected caterpillars with viruses where the protein had been genetically modified in a variety of ways. ‘Whatever changes we made to the protein, the virus always got inside the brain. That even happened when we removed the protein from the virus altogether.’ So this protein does not hold the key to the blood-brain barrier.

AUTOIMMUNE DISEASES

Incidentally, there are examples of behavioural change beyond the insect kingdom, says Gasque. Dogs become more aggressive when infected with the rabies virus, which helps spread that parasite. ‘If a dog gets involved in more fights, that increases the chance of infecting other dogs.’

‘Parasitism is a very successful approach,’ she continues. ‘It has existed for many millions of years.’ The definition of a parasite is an organism that profits from the relationship with the host whereas that host does not benefit from the relationship. But that is a grey area, according to Gasque. ‘There are indications that fewer autoimmune diseases are found in areas where a lot of people have intestinal parasites. That might be because the immune system is then too occupied to attack the person’s own body.’ One of Gasque’s teachers in Copenhagen put this theory to the test by infecting himself with a pig worm to cure his psoriasis. ‘That worked. There are now companies that grow pig worms for the treatment of people with an autoimmune disease.’ ■

www.wur.eu/vir

SUSTAINABLE DIETS EXPERT CORNÉ VAN DOOREN:

‘Current eating habits are not sustainable’

Corné van Dooren has been a specialist in sustainable diets for more than 15 years. He has now been working for the nature conservation organization WWF for two years. ‘Our food consumption is the biggest threat to nature on Earth.’

TEXT RENÉ DIDDE **PHOTOGRAPHY** JUDITH JOCKEL

‘The food system is broken. Current consumption patterns are not sustainable.’ Corné van Dooren, since 2021 an expert on sustainable diets with the World Wide Fund for Nature (WWF), is adamant about this. ‘We’ve all got to make a protein transition towards plant-based foods. The limits set by the planet require us to change our eating habits so we get two thirds of our protein from plant sources and one third from meat and fish. You can achieve that by raising the price of meat and ensuring that social norms change so that eating meat every day is not normal.’

Van Dooren worked for years as an expert on sustainable food at the Nutrition Centre in The Hague, getting his PhD at VU University Amsterdam along the way, for a model study on sustainable diets. He made the move to WWF in 2021. >

WWF's donors probably identify mainly with tigers and pandas. As an expert on sustainable food, aren't you a bit out of place?

'WWF does indeed exist to protect nature, landscapes and threatened species. But the current food system constitutes the biggest threat to nature, so it's important that we also work on a nature-inclusive form of production and consumption. To stop deforestation and overfishing, for example.'

'At the Nutrition Centre we did a lot of work on health, food quality and food safety. Everyone in the Netherlands is familiar with the 'Wheel of Five' (a pie chart showing a balanced diet). Slowly but surely, we integrated issues such as animal welfare, food waste and the environmental impact of food into our information campaigns. But there is a lot more to be done, because most dietary guidelines around the world are not sustainable enough. WWF is a major NGO with international influence. I've got 10 working years to go and I was keen to take this step.'

In a recent study by WWF, calculations by a computer model showed that the five big global environmental problems – greenhouse gas emissions, excessive land use, water problems, surplus manure (nitrogen and phosphate) and the decline in biodiversity – would be greatly reduced by a more plant-based diet. The study calculates the Earth's boundaries in terms of a menu for the week. 'It isn't a totally vegetarian or vegan menu,' explains Van Dooren at WWF Netherlands' impressive head office in Zeist. It's okay for us to go on eating some meat, fish, dairy produce and eggs. To be precise: the Earth's carrying capacity allows for between a half portion and one-and-a-half portions of meat, one-and-a-half portions of fish and up to three eggs per week. We should also halve our cheese consumption, but one or two daily portions of milk or yoghurt are allowed. Key foods on the sustainable menu are pulses, nuts and other meat substitutes.

How do you calculate the sustainability of a diet in terms of loss of biodiversity?

'The criteria for biodiversity in a sustainable menu are quite new and are therefore still quite tentative. We measured biodiversity loss indirectly through a life cycle analysis of products. So we measure the causes of biodiversity loss such as greenhouse gases, acidification, overfertilization and land use changes such as deforestation, and calculate their impact. Then we apply that to the Netherlands and calculate it per person.'

Healthy and sustainable diets go reasonably hand-in-hand, Van Dooren has noticed. 'In the second half of the 20th century we Europeans began to eat far less pulses and more meat. Before World War II, beans and lentils had an image of being the food of the poor. And yet pulses are healthy, and reduce the risk of coronary heart disease.' They are also an excellent European agricultural crop. The plants put down deep roots and capture nitrogen from the air. 'That is good for the soil structure and for water management. They don't need much fertilizer. And they flower for a long time, which is good for insects and for biodiversity.'

More variety on our plates can easily go hand-in-hand with diversity in nature, according to Van Dooren. He is pleased to see that pulses have made a cautious comeback in recent years. 'The influence of Mediterranean and Asian cultures is noticeable in that respect, with hummus, falafel and all the curries.'

If people all around the world switch from meat to soya, won't you get extra deforestation for soya production?

'That's a misunderstanding. Ninety per cent of the soya in South America is grown for livestock feed. Farm animals use that protein extremely inefficiently. Most of it ends up in manure. Putting soya straight into human stomachs is much more efficient in that sense. What's more, you can easily grow the soya for your meat substitute or soya drink on farmland in France or Canada. And there is European legislation in the pipeline ruling that soya production must be deforestation-free.'

Were you a food pioneer from a young age?

'I grew up near Hattem, right next to the Veluwe and near a dairy farm where I often played and occasionally helped out. One of my friends had ponies and a vegetable garden, and another one kept bees. We were a real group of nature-lovers. At that time, Wageningen was the only university where you could study nutrition with a multidisciplinary approach. It was a degree course

‘The meat lobby and the dairy lobby have lost ground, now for the livestock feed lobby’

that included biology, biochemistry and the social aspects.’
A new world opened up to me in Wageningen. Global North-South relations, for instance, and malnutrition. I often ate at Jokari, Zeezicht and the SSR canteen. I lived in the Bornsesteeg block of flats. We had individual apartments but I often ate together with other students using recipes from De Kleine Aarde (Diet for a Small Planet, ed.) I shopped for food at Buys & Ko (an organic health-food store, ed.) – when I could afford it – and worked on setting up the vegetable boxes that were distributed by a cooperative in De Wilde Wereld. No, I’m not a vegetarian; I’ve always been a flexitarian, even before the word was coined. When I eat out, I’m fine with eating the occasional bit of meat or wild fish. On WWF-NL’s new quiz on how planet-friendly your diet is (‘Hoe aardig eet jij?’), which came out at the same time as the report, I scored 91 out of 100.’

Does Wageningen still play a role in your life?

(Thoughtfully) ‘Wageningen offered me a broad perspective on the world, with discussion groups, talks, philosophy lectures from Hans Achterhuis, and Christian Philosophy with Egbert Schuurman. And of course, the engaged sociology taught by Iteke Weeda. Later came Organic Agriculture, with Jan Diek van Mansvelt.’
‘I think the critical and philosophical side of a Wageningen education is strong. The way you think about who conducted a study and at the behest of which companies and financiers. And I also think it was at Wageningen that I learned that the global food problem is a result of the injustice that we live a far too luxurious life and waste a lot of food, or feed it to animals, when it would be better to eat it ourselves.’
‘I still come to Wageningen. I give the occasional guest lecture on nutrition and I am in touch with a lot of researchers. The degree course has become a lot more international and the eternal student is a thing of the past. There is even a Master’s track now called a Systems Approach for Sustainable and Healthy Diets! Because I work in Zeist and the children have left home, I am planning to move from Delft back to Ede, to a smaller house in the sustainable neighbourhood around the World Food Centre, right next to the station. Incidentally, I’ve noticed that you can’t find a good vegetarian restaurant in Wageningen.’

Is there any hope for our food production and consumption?

‘Something must be done, urgently. The decline of biodiversity is worrying. Drought is causing harvest failures in more and more parts of the world, The climate is changing, and we’ve got to anticipate that. It’s not happening fast enough for me. The political direction the world is going in doesn’t help, but theories about transition teach you that you’ve got to go through a period of unrest first before you can establish a new reality and new social norms, and gradually break down the old system.’
‘So I want to be optimistic. Meat consumption is going down in the Netherlands. The meat lobby and the dairy lobby have lost ground. Now for the livestock feed lobby. Ten per cent of the Dutch population is “green”: a fan of vegetarian food, and consciously trying to eat sustainably. Then there is a whole generation of people aged between 18 and 35 who are open to new eating habits – often women, graduates and city-dwellers in the west of the country. Put together, that is 44 per cent of the population. It means that we might have enough of a support base to take measures to reduce meat consumption.’ ■

CORNÉ VAN DOOREN (58)

2021: Senior Advisor on Sustainable Diets, WWF Nederland
2018: PhD at VU University Amsterdam, Simultaneous optimization of the nutritional quality and environmental sustainability of diets
2007: Expert on Sustainable Food, Netherlands Nutrition Centre
1995-2007 Editor of several food sector magazines
1989-1995: Policy officer for Nutrition at the Alternative Consumers Union, ethical consumption organization Goede Waar & Co and the Organic Agriculture & Nutrition Platform
1983-1989: Master’s Degree in Human Nutrition, Wageningen University & Research

Students turn waste into protein

A group of Wageningen students won the Rethink Waste international student challenge with their idea for making high-quality protein powder out of waste streams. Four of them are now starting a company in order to put their concept into practice. 'Fermentation is an excellent way of turning waste into human food.'

TEXT RIANNE LINDHOUT **PHOTOGRAPHY** GUY ACKERMANS

'The It smelled like a fart,' says Master's student of Sustainable Business & Innovation Tim Bongers. He's referring to the fermented cabbage that Marisol Calderon shoved under his nose when they had just started collaborating on a student challenge. Her room was full of jars full of fermenting foodstuffs. 'The challenge team looked a bit worried when they saw that,' laughs Calderon, a Master's student of Food Technology. 'But it's delicious. Fermentation is magic, and micro-organisms are magicians.'

At the end of 2022, Bongers and Cameron formed a team with four other students to enter the Rethink Waste Challenge. The aim of this international student challenge is to find the best business plan or prototype for converting a waste stream into a useful product.

More than 190 students from 72 universities in 33 countries took on the challenge. What started for team Afterlife with a whiff of fermented cabbage and a pile of post-its with vague ideas ended in June with the prize for the best business plan for a financially viable product made from waste.

As they worked on the challenge, the students got help from various quarters. Team member Tijmen Visser: 'There were meetings aimed at learning how to brainstorm effectively, for example. And you could approach companies with any questions you had. So for instance, we held useful discussions with the waste and recycling company Renewi, and we learned about intellectual property from the marketing company CJ.'

> 'The production process uses less land and water than growing soya'

Bongers: 'At this point, our idea only exists on paper, but all the principles we use are already applied in practice.' The idea the students worked out is based on fermentation: a fungus converts agricultural and food industry waste into a protein-rich raw material for food products. 'Potato peel and beet pulp, for instance, are full of cellulose, starch and other sugars. Fungi can easily grow on those fibrous waste products. It really is a great way of transforming waste from a social problem to a source of human food.' In the Netherlands alone, the sugar industry is left with a million tons of sugar beet pulp every year. A small proportion of this becomes livestock feed, but most of it is processed into biogas. Bongers: 'Those are both low-end products compared to what we want to make.'

The student team AfterLife won the Rethink Waste Challenge with the best business plan for a financially viable product made of waste.

Visser: 'The fungi can use the waste streams to make proteins with the same nutritional value as proteins from meat and dairy produce. Plant proteins from soya, for example, are of slightly lower quality. So this could be really good news for vegans. You can add a spoonful of the protein powder to a protein shake at home, and the food industry can mix it into meat substitutes.'
Bongers: 'There's no funny taste to it and producing it uses less land and water than growing a crop like soya.'

SCALING UP

Team member Peter van Nes, a Master's student of Biotechnology, will be joining Calderon, Bongers and Visser when he gets back from his internship in Australia. Visser is the only graduate in the group, having studied Agrotechnology and Biosystems Engineering; he now has an IT job as an application engineer for livestock feed company Royal De Heus. 'I operate in two different worlds: I'm getting to know the world of a big company, and I'm trying to do research and launch a business together with our team. We are designing experiments we want to conduct, and we're thinking about how we can best upscale for maximum impact. So do we focus first on the market for protein shakes, or on meat substitutes?'
Besides the prize money of 6000 euros for further development of the idea, the team was also the general public's favourite and won a money prize from challenge partner Fuji Oil, which develops plant-based ingredients for the food industry.
In October, Afterlife also won the 4 TU Impact Challenge run by the four big Dutch technological universities. With their prize money, the team will soon be off to the lab for their first experiments. Bongers: 'We are still looking for funding to take it further after that, and we are keen to set up an expert panel.' ■

www.wur.eu/studentchallenges

STUDENT CHALLENGES

WUR has been organizing several interdisciplinary student challenges annually since 2017. Coordinator Rio Pals: 'It is a nice way of learning how to put theory into practice and how you can make a difference.' Funding for the challenges comes from the university and government and private sector partners. University Fund Wageningen has been a partner for several years now too, and raises donations from alumni to help finance the challenges. 'We have the same objectives,' says Pals: 'Providing education for talented young people and stimulating entrepreneurship.'
If you want to support talent development, become a Friend of University Fund Wageningen. *www.universityfundwageningen.eu/friendsofufw*

WUR'S ANNIVERSARY

Wageningen Experience Day: the world in 105 years' time

The theme of the Wageningen Experience Day on 7 October was WUR's 105th anniversary. Over 2000 alumni, employees and family members got a glimpse of the world in 105 years' time, and the role WUR plays in that.

'It was a candy store full of solutions for the future,' says alumnus Sonja Vlaar (Human Nutrition 1983). 'I thought the talk shows about food on Mars and about a plant-based food system of the future were very interesting.'
In the past two years, WUR organized the Wageningen Experience Day just for alumni, but this year family members and employees were also invited. Indeed, there were also a lot of children, almost 500. Most of the programme could also be followed online.
Visitors could sit in on inspiring talk shows about the question: what will the world look like in 105 years' time and what role does WUR play in that? The film *Onder het Maaiveld* was also screened, both the cinema version and the children's version. The film gives a glimpse of the wonderful world of soil life.
In a varied programme, visitors were able to explore an installation about food on Mars or participate in a quiz compered by WUR alumnus, comedian and presenter Rob Urgert. Young adventurers went exploring during the Kids Speed Expedition with author Geert Jan Roebers and there were performances by reptile expert and alumna Sterrin Smalbrugge. Book fans were in their element at the book fair, which was full of interesting literature about WUR-related themes and books written by alumni and employees.

Photos, videos, the after movie and the online virtual campus can be viewed via *www.wur.eu/wed*

PHOTO'S GUY ACKERMANS

LABOUR MARKET

Excellent job opportunities for alumni

In 2022, 97 per cent of the WUR alumni had a paid job within a year of graduation, according to the National Alumni Survey, a biannual national survey among recently graduated Masters' students.

'There are major shortages in the labour market and the job opportunities are excellent,' says Silvia Blok, Education and Labour Market policy office at WUR. Wageningen themes such as climate change, biodiversity loss and restoration, food security and energy transition are popular and urgent, Blok notes. 'The long-term prospects are good too. The biggest opportunities for Wageningen graduates are in technical and medical professions, IT and education – especially in the sciences.'
Alumni also appear to be more likely to stay on in the Netherlands to work. Blok: 'In the past, by which I mean before 2000, more alumni went abroad, for example to work in development cooperation. But now WUR attracts more international students , many of whom go on to do a PhD after graduating or return to their home country.'
More and more women are graduating. The number of female alumni who completed the career monitor questionnaire – the five-yearly investigation of the labour market position of WUR alumni – increased from 16 per cent in 1973 to 61 per cent of graduates between 2016 and 2019.
Blok does still see a discrepancy in income between men and women, with men earning more on average. 'We have to analyse this data more to be able to interpret the difference better.'
Info: silvia.blok@wur.nl

REUNION

Together again on campus after 40 years

A group of 25 international Soil and Water Management students started their education at WUR 42 years ago. The alumni went their own way after graduation and lived scattered around the world. They found each other years later at monthly online sessions during the coronavirus pandemic.
On 4 September, 12 of them gathered to celebrate the fact that they had now graduated over 40 years ago. They met up on campus, where they enjoyed a lecture from former professor Jos Dijkerman (now 87 years old).

ACTIVITIES

Alumni tour in the United States

Last September, alumni from the 4TUs – four technical universities including WUR – who live and work in the US met up during the US alumni tour in Washington DC, New York and Houston.
WUR President of the Executive Board Sjoukje Heimovaara told the 80 attendees in New York about her contribution to the United Nations (UN) Science Summit. A number of WUR alumni working at organizations such as the Inter-American Development Bank (IDB), the UN or the World Bank talked about their work and shared tips. The key question was: how do we make sure that talented young scientists from the Netherlands find their way to these large international organizations? This prompted Student Career Services Wageningen to develop an online workshop together with the IDB, which has now been done by 20 Wageningen students.
Info alumni@wur.nl

FUNDS

Organize an alumni activity?

Alumni with an idea for a conference, debate, podcast or lecture can apply for a grant from the KLV Fund in order to implement their plan. The KLV Fund gives financial support for one-off activities and new initiatives to be set up by and for alumni that 'help strengthen knowledge and skills in the WUR domains'.
Info: wur.eu/klv-fund

CONNECT!

As a Wageningen alumnus you are part of a global network with almost 65,000 graduates and people with a PhD. There are various ways to keep in touch with each other and the university.

LinkedIn
The LinkedIn alumni group Alumni@ Wageningen University & Research is growing steadily and currently has almost 16,000 members.

Alumni website
An alumni tour through the US, a reunion or a theme day about soil recovery – many activities for alumni around the world can be found on the WUR alumni website.
ww.wur.eu/alumni

Networks
Various independent Study Circles and Networks are part of the alumni community. They organize lectures, excursions and network meetings and represent the interests of their field.
The Land and Water Network, for example, awards an annual prize to the best graduation theses. Winner of the Folkert Hellinga MSc Award 2022 was **Thomas Westhoff.**

His thesis was also commended at the Dutch Soil Science Association as the best soil science thesis of the Netherlands in 2022.
www.wur.eu/studycircles

Alumni newsletter
If you want to stay informed about the latest developments, activities and alumni stories, subscribe to the alumni newsletter:
www.wur.eu/alumninewsletter

Moved or new job?
Submit changes to: *www.wur.eu/changecontactinfo*

Prof. Paul J. van den Brink, Environmental Protection (Water Purification) 1992 and WUR PhD 1999, has received the SETAC Capacity Building award. The award is in recognition of his work in developing countries in setting up organizations that offer support with chemical risk analyses. 26 October 2023.

Susan Dijkshoorn MSc, Animal Sciences 2020, dairy farmer and part-time lecturer, became the representative of the younger members of LTO Noord in September. The farming lobby organization has set up a programme to assist young farmers and has accordingly assigned one of the seats on its board to a representative of this group. 23 July 2023.

Prof. Thijs Ettema, Biology 2000, professor of Microbiology, has been appointed a member of the Royal Netherlands Academy of Arts and Sciences (KNAW). He is one of 18 new members in 2023. 30 October 2023.

Prof. Louise Fresco, Rural Sociology of the Non-Western Regions 1976, former president of the WUR Executive Board, has been awarded an honorary doctorate by the University of Pretoria, South Africa, for her significant contribution to the public debate on sustainable food.7 May 2023.

Prof. Annemiek ter Heijne, Environmental Sciences 2009, has been appointed chairholder in Environmental Technology. 4 July 2023.

Gerrit Hiemstra hands over to Roosmarijn Knol

Gerrit Hiemstra MSc, Meteorology 1986, has stopped as the TV weatherman for the public broadcaster NOS after nearly 25 years. He will now focus through his own company on climate-neutral construction using natural raw materials. 'Up to now, I've mainly explained and talked about climate change. Now I want to do something about it,' he said in an interview with NOS. Another Wageningen alumnus will take over from Hiemstra. The new NOS weather presenter is **Roosmarijn Knol MSc,** Earth and Environment 2021. While at university, she started as an assistant meteorologist for Weeronline. After graduation, she worked for Weerplaza. September 2023.

PHOTO ANP

PHOTO ALAMY

Prof. Kasper Hettinga, Food Technology 2003, has been appointed professor holding a personal chair in Dairy Processing and Functionality and interim chairholder in Food Quality and Design. 15 May 2023.

Margrethe Jonkman PhD, Food Technology 1993, has been appointed president of the executive board of VU University Amsterdam. 11 July 2023.

Prof. Ben Scheres, Phytopathology 1985, has been appointed professor by special appointment of Applied Plant Developmental Biology. The chair is funded by Rijk Zwaan Breeding BV. 26 May 2023.

Prof. Coen Smits, Zootechnics 1988, has been appointed professor by special appointment of Functional Ingredients for Sustainable Animal Nutrition. The chair is funded by Nutreco. 10 October 2023.

Nine Veni grants for talented young scholars

Nine Wageningen researchers received Veni grants. These are personal grants of up to 280,000 euros for talented researchers who recently obtained their doctorate. **Annet Pauwelussen PhD,** assistant professor of Marine Governance, will study how oyster reefs along the North Atlantic coast can be restored inclusively and fairly. **Ina Möller PhD,** assistant professor of Climate Politics, will study large-scale CO_2 emissions, a core element of European climate policy. She wants to get a clear picture of the impact on food and land use systems. **Esther Gehrke PhD**, assistant professor in the Agricultural Economics and Rural Policy group, will do research on inequality in education within families in low- and middle-income countries. **Kryss Waldschläger PhD,** assistant professor in the Hydrology and Environmental Hydraulics group, will study how microplastics influence how aquatic soil particles clump together and sink. **Thijs Fijen PhD,** assistant professor in the Plant Ecology and Nature Conservation chair group, will study mass migration in bumble bees. Philip **Minderhoud PhD,** assistant professor in the Soil Geography and Landscape chair group, will examine the drowning of deltas. **Michael Schon PhD**, a researcher in the Laboratory of Molecular Biology, will study the genes that coordinate development via RNA molecules. **Quint Rusman MSc,** Biology 2014, will explore the role of leaf-eating herbivores in the evolution of flowers. Finally, **Imre Kouw PhD,** a researcher in the Human Nutrition and Health chair group, will do research on food and feeding tubes in intensive care. 9 August 2023.

Vidi grants for three WUR researchers

Daan Swarts PhD, Molecular Life Sciences 2011, assistant professor in the Laboratory of Biochemistry, **Karen Kloth PhD,** Biology 2004, assistant professor in Plant Sciences, and **Fedor Miloserdov PhD,** assistant professor in Agrotechnology and Food Sciences, have all received Vidi grants of up to 800,000 euros. The grants will enable them to spend the next five years developing innovative lines of research and building their own research group.
30 June 2023.

Lobbying for young farmers in the EU

Peter Meedendorp, MSc student of Agricultural Economics, has been appointed chair of CEJA (*Conseil Européen des Jeunes Agriculteurs*), a farmers' union in Brussels that represents two million young farmers in the European Union. As chair, he plans to focus mainly on new EU legislation. He also works on an arable farm in partnership with his father. He has completed his Master's apart from the final thesis.
23 juni 2023

PHOTO HUISMAN MEDIA

IN MEMORIAM

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

Mr E. Baars MSc, Tropical Land Use 1992. 15 May 2023.
Prof. P. van Beek, emeritus professor of Operations Research. 14 May 2023.
Ms C.E.M. Berkholst MSc, Tropical Plant Breeding 1960. 15 August 2023.
Mr S.A. de Boer MSc, Land Development 1962. 16 May 2023.
Mr H.Y. Boersma MSc, Dairy Production 1958. 3 October 2023.
Mr P.H. Bon MSc, Forestry 1959. 8 May 2023.
Mr N.F.H. Bremer MSc, Land Development B 1980. 8 March 2023.
Mr D. Brouwer PhD, Phytopathology 1964. 30 April 2023.
Mr H.J. Cats MSc, Soil and Fertilization Science 1985. 24 April 2023.
Mr R.P. Daanen MSc, Soil, Water and Atmosphere 1997. 20 July 2023.
Mr P.G.R.P. de Dooij MSc, Forest and Nature Conservation 2010. 2 October 2023.
Mr J.P. van Eijk MSc, Horticulture 1959. 7 September 2023.
Mr J.B.H.A.M. van Emstede, Rural Sociology of the Western Regions 1975. 30 April 2023.
Ms M. Floor BSc, International Development Studies 2023. 17 July 2023.
Mr S.P.W. Franses MSc, Tropical Forestry 1964. 29 August 2023.
Mr W.J. Geldof MSc, Economics of Agriculture and the Environment 1993. 9 June 2023.
Mr P.H. Groenevelt PhD, Tropical Land Development 1963. 10 February 2023.
Mr H.A.P.M. Hesselmans MSc, Agrarian Economics 1977. 3 March 2023.
Mr J.R. Hetzler MSc, Forestry 1979. 29 June 2023.
Mr J. Huisman PhD, doctorate 1990. 15 July 2023.
Mr H.H.M. Hutschemaekers MSc, Rural Economics 1973. 8 June 2023.
Mr M.W. van Iersel MSc, Horticulture 1989. 20 April 2023.
Prof. C.M. Karssen, Rector Magnificus 1993-2000. 14 October 2023.
Prof. E.H. Ketelaars, Zootechnics 1954. 13 June 2023.
Mr W. Lange PhD, Plant Breeding 1962. 1 July 2023.
Mr P.C.J. van Leeuwen MSc, Human Nutrition 1990. 4 February 2023.
Mr J.P. Lindenbergh MSc, Agricultural Plant Breeding 1974. 17 March 2023.
Mr A.P. van Loon MSc, Tropical Land Development 1974. 5 October 2023.
Mr C.A.A.A. Maenhout MSc, Phytopathology 1970. 13 October 2023.
Mr P. Minderhoud MSc, Tropical Land Development 1970. 30 July 2023.
Mr A. Moonen MSc, Agricultural Plant Breeding 1962. 11 May 2023.
Mr H.A. Okma MSc, Forestry 1971. 20 April 2023.
Mr R.J. Oosterbaan MSc, Tropical Land Development 1965. 5 July 2023.
Mr D. Prins MSc, Phytopathology 1969. 23 August 2023.
Prof. J. Renes, doctorate 1999. 28 September 2023.
Mr J.A.W.A. Reus MSc, Phytopathology 1988. 31 August 2023.
Mr N. Roos MSc, Economics of Agriculture and the Environment 1992. 20 February 2023.
Mr J.A.F.M. Sluijters MSc, Tropical Plant Breeding 1955. 11 July 2023.
Ms R.C. Smallegange PhD, Biology 1993. 29 August 2023.
Mr G.J.R. Soer MSc, Tropical Land Development 1971. 29 April 2023.
Mr C. Sonneveld PhD, doctorate 2000. 18 May 2023.
Ms B.H.M. Spierings MSc, Horticulture 1981. 15 February 2023.
Prof. M.S. Swaminathan, honorary doctorate 1988. 28 September 2023.
Mr W.J.T. van de Ven MSc, Rural Economics 1957. 6 August 2023.
Mr J.L.H. Verschure MSc, Rural Economics 1966. 30 May 2023.
Mr J. Visser MSc, Horticulture 1968. 20 May 2023.
Mr R.M.W. van de Vlasakker MSc, Geo-information Science 2023. 27 May 2023.
Mr J. van der Vleuten MSc, Zootechnics 1978. 5 August 2023.
Mr H.J.P. Vreeman MSc, Tropical Forestry 1969. 21 April 2023.
Mr A. Weeda MSc, Soil and Fertilization Sciences 1971. 10 March 2023.
Mr G.L. van Winkel MSc, Soil and Fertilization Sciences 1986. 14 September 2023.
Mr P. Zwaginga MSc, Dairy Production 1957. 6 September 2023.

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

Profitable landscapes

Gert Jan Jansen, Tropical Plant Breeding 1981, and his wife have written a workbook about how to set up landscapes with harvestable crops. It is based on 20 years of experience with projects including Hof van Twello and Lekker Landschap Kromme Rijn. It is a hands-on book for farmers and people running food forests – anyone looking to change the design and use of their land. Landscape managers, nature societies, policy-makers and politicians can also learn from the book. *Florae, 22.50 euros*

Closed due to nitrogen

The nitrogen problem has grown into a huge crisis. This is due in large part to failed agricultural policies and Wageningen theories. Emeritus professor of Rural Sociology **Jan Douwe van der Ploeg** spent years deeply involved in the science and practice. He shares his unique perspective on the origins and polarization of the nitrogen issue and the institutional inability to find a solution. He also offers some original suggestions for a way out. *Noordboek, 19.90 euros*

Outdoors with young children

Nature is good for children's development. But how do you let your baby or toddler experience nature? This book by **Denise Enthoven,** Animal Sciences 2018, is full of inspiring nature activities for young children, fun facts about nature and up-to-date scientific information. *KNNV, 21.95 euros*

Food for success

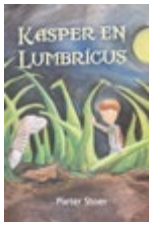
Lianne Hoogeveen, BSc Nutrition and Health 2021, has written a cookery book with vegetarian and vegan recipes specifically designed for a healthy lifestyle and optimum performance in people who practise a strength, team or endurance sport. *Boekscout, 26.99 euros*

Condiments, cockles and chickens

Scientific discoveries are rarely the result of a single stroke of genius. They usually involve hard work, failed experiments, side-tracks and luck. Science is the story of determination and setbacks, patience and impatience, competition, recognition and underestimation — but always of people who have a deep urge to understand the world around them. In this book, **Louise O. Fresco,** Rural Sociology of the Non-Western Regions 1976, former president of the Executive Board of WUR, gives two fascinating examples of that. *Prometheus, 4.99 euros*

Role models for a new society

We all want to live in a better world, with meaningful work, healthy diets, sufficient income and well-being instead of welfare. But how? In her book, **Jelleke de Nooy van Tol,** Landscape Architecture and Spatial Planning 1977, shows that many people, companies and other organizations are already managing this, and she describes their achievements. *Santasado, 17.50 euros*



Kasper and Lumbricus

Pieter Stoer, Tropical Land Development 1989, takes the reader on a journey underground in his children's book, a world where strange things happen. Deep under the Ekelum mound hides a history that comes to life in an exciting and mysterious way. His book is also a light-hearted ode to the earthworm. *Elikser, 22.50 euros*

The red knot

The red knot likes to travel. It spends winter in the Netherlands or takes a break there en route between Siberia and West Africa. Its wanderlust makes the knot a good storyteller. This book by science journalist **Rob Buiter,** Animal Sciences 1990, is an account of a changing world through the eyes of a migratory bird, as told by people who have been studying it for years. *Noordboek, 24.90 euros*

'Have you ever seen such a hunk?'

In 2017, the famous Wageningen student house H6 (Heerenstraat 6) celebrated its centenary. This book considers the history of the building, which goes back to 1738, and offers a fascinating glimpse of Wageningen student life in bygone days. Some 200 current and former house occupants have bought a copy, and the book is now going on sale to the general public. *50 euros*

Hanneke Rouw, cellist

Biology 2011

'I've been playing the cello since I was eight. When I left secondary school, I auditioned for the Conservatoire in Zwolle and I got in. But I didn't have the confidence to start on that path. You've got to be outstanding if you want to work as a professional musician, and at that point I didn't think I was good enough.

I liked biology at secondary school, so I did that at university. But I had a niggling feeling that something wasn't right. I wasn't following my heart. I really need the cello, its beauty and purity.

After graduating, I took extra cello classes for a year and was then accepted by the Conservatoire in Louvain. This time I felt a bit more confident, partly because with a degree in Biology, I had a good Plan B up my sleeve.

As a debutante musician, I started by performing in small cafes. I thoroughly enjoyed that, and it was lovely to grow from there. Now I tour throughout Europe. The best place I've ever played was Chichester Cathedral in England. There's such a special atmosphere there.

What I love best about the cello is its sound. There's something human about it. The instrument feels like an extension of yourself, and my feelings are expressed in the music. I love playing Bach and sonatas. I hope to perform a lot more in future. It's the best thing ever.'

'There is something human about the cello'

PHOTO ALBERT VAN DE MAAT

FOTO ALAMY

Disease threatens organic bananas in Peru

About 8000 small farmers in the Chira Valley in Peru grow 25 per cent of the global supply of organic bananas. Their future is now uncertain because the dreaded fusarium wilt, also known as Panama disease, has reached the area. Once this soil fungus establishes itself on a plantation, the soil remains infected and therefore unsuitable for growing bananas for many years. 'The fungus variant in question, Tropical Race 4, started in southeast Asia, but has spread to 16 new countries in the past 10 years,' says Gert Kema, professor of Phytopathology and an expert on banana diseases.

This fusarium species is still impossible to fight off. Growers cut down infected plants but that is not enough. 'Once you can see it, you're too late,' says Kema. 'We are working on setting up a system for identifying high-risk areas, with the Chira Valley as a case study.' An analysis of 133,700 aerial photos shows that the whole valley depends on a single irrigation system, and is subject to flooding. Since fusarium can spread via water, that puts the area at risk. 'We took samples in the flood-prone areas, which have already revealed more than 200 cases.'

Wageningen scientists previously developed a fast field test which gives results within an hour. WUR and partners are also working on new varieties and new farming methods, such as growing bananas in containers with an organic substrate. 'Soilless cultivation is a solution for affected areas, and can even boost production,' predicts Kema.

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