WAGENINGEN WORLD

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

no.3 2020

‘The arrival of the wolf forces us to have a rethink’

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Seeking a happy medium between wet and dry

Learning from the crisis
Five Wageningen scientists on where to go from here

Standards give consistency
For the bio-economy to grow you need workable standards

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WAGENINGEN UNIVERSITY & RESEARCH

The mission of Wageningen University and Research is ‘To explore the potential of nature to improve the quality of life’. Under the banner Wageningen University & Research, Wageningen University and the specialised research institutes of the Wageningen Research Foundation have joined forces in contributing to finding solutions to important questions in the domain of healthy food and living environment. With its roughly 30 branches, 6,500 employees (5,500 fte) and 12,500 students, Wageningen University & Research is one of the leading organisations in its domain. The unique Wageningen approach lies in its integrated approach to issues and the collaboration between different disciplines.

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FEATURES

Standing together for nutrition

'The coronavirus crisis has put millions of people at risk of malnutrition, in particular children in South Asia and sub-Saharan Africa. Great progress recently been made in reducing malnutrition among infants and mothers. If we do nothing now, all that will be wiped out. So the Standing Together for Nutrition consortium urgently appeals to the international community to take action now. The consortium is made up of experts in nutrition, food systems, health and the economy, and is studying the implications of the coronavirus pandemic for malnutrition.

'The production, transport and marketing of healthy food have all been affected by the coronavirus crisis. Feeding and social programmes such as school meals and support for pregnant women have come to a standstill. Healthcare systems are under tremendous pressure too, which often makes it impossible to prevent and treat malnutrition. From recent figures it appears that even a fairly short lockdown leads to an average drop in income of 7 to 9 per cent. When this was included in our model, and with the rise in food prices and the expected deterioration of healthcare services, the projection was that nearly 130,000 more children under five will die in 2020. And another 6.7 million children will become severely malnourished. That is an increase of 14 per cent, on top of the 47 million children who already suffer from acute malnutrition. An appallingly large number.

'These models predict the short-term effects. If the crisis goes on for a long time, all forms of malnutrition will increase. The consequences will go on having an impact on several generations. We know from research that maternal malnutrition can lead to a lower educational attainment level in the child, and as a result to possible economic disadvantage in later generations.

'According to the United Nations, 2.4 billion dollars is needed for emergency measures to restore the food supply. We are asking other scientists to help, and donors and local governments to prioritize nutrition in their budgets.'

Saskia Osendarp, researcher in Human Nutrition and Health, director of the Micronutrient Forum, and co-founder of Standing Together for Nutrition

PLANT BREEDING

EU money for better photosynthesis

The European Commission has provided 8.6 million euros for the research project CAPITALISE, which aims to increase crop yields. The researchers want to use plant breeding to improve photosynthesis in crops, thereby obtaining plants that grow faster and produce larger yields. The Wageningen biophysicist Jeremy Harbinson is coordinating the project.
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ENTOMOLOGY

Bee winter deaths stabilizing

Almost 87 per cent of honey bee colonies in the Netherlands have survived the winter, according to the annual survey by Wageningen researchers and beekeeper organizations.
Last year, nearly 91 per cent of the colonies survived whereas almost a third were dying 10 years ago. The main cause of death in the winter is the varroa mite, which first arrived in the Netherlands in 1983.
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ARABLE FARMING

Mixed cultivation gives higher yields

In intensive farming, mixed cultivation (in which various crops are grown alongside one another) results in yields up to 29 per cent higher than the yields from monocultures. Mixed cultivation also requires 19 to 36 per cent less fertilizer. These findings come from PhD candidate Chunjie Li. She worked with Wageningen and Chinese researchers analysing the results of 226 previous experiments.
A mixed cultivation method using crops with differing growing seasons, which is common in China, gives the biggest yields. The study appeared in June in the scientific journal *Nature Plants*.
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HORTICULTURE

Algorithm beats tomato growers

Teams that used artificial intelligence to manage a greenhouse full of tomatoes remotely performed better than the human growers in the Autonomous Greenhouse Challenge.

Five international teams spent six months growing cherry tomatoes remotely using self-developed algorithms. They used sensors and technology in their own greenhouse compartment at the Wageningen Plant Research site in Bleiswijk. A group of growers cultivated the same tomatoes in a reference greenhouse.
The winner, Team AuTomatoes, had the highest production and used the least water and energy. The jury was enthusiastic about the team's strategy for using artificial intelligence (AI). The team consisted of researchers, engineers, consultants and students from Delft University of Technology, Van der Hoeven Horticultural Projects, KeyGene and Hoogendoorn Growth Management.
All AI teams had high yields and high-quality tomatoes with a good flavour, but the winner stood out for its sustainable use of the raw materials.
'All the AI teams performed better than the reference growers,' says Silke Hemming of Wageningen Plant Research, co-organizer of the competition that WUR ran in partnership with the IT company Tencent.
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PHOTO SILKE HEMMING

PLANT SCIENCES

Hybrid of knotweed and Russian vine

Japanese knotweed may also be able to spread via seeds, conclude researchers at WUR and Probos. That is surprising because there are hardly any male plants to enable pollination. Reproduction normally takes place via the rhizomes and stems of female plants. Two summers ago, the unexpected discovery was made of a knotweed plant with seed. Research shows that the seed came from fertilization by pollen of the Russian vine. The seeds grew into seedlings in the greenhouse but are not really able to germinate in the wild. The researchers advise people to look out for male knotweed plants. If they start pollinating female flowers, that could well lead to more vigorous descendants.
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PHOTO SHUTTERSTOCK

AGRICULTURE

Farm of the Future tests sustainable cultivation methods

PHOTO BRAM PETRAEUS / ANP

On 25 June, Wageningen University & Research opened the Farm of the Future in Lelystad. At the farm, researchers collaborate with farmers in the development of sustainable, circular agriculture.

Researchers will use the 105-hectare arable farm to test and demonstrate new cultivation methods and techniques. 'We work on the principle of the minimum environmental burden and preventing pollution and wastage of nutrients such as nitrogen and phosphate. The idea is also that agriculture should improve the living environment and help restore nature, plant and animal species, and soil life,' says the project manager and researcher Wijnand Sukkel. That can be achieved by growing several crops together, for example in strip cultivation and mixed cultivation.

The experimental farm uses manure from a local livestock farmer and struvite extracted from human urine, and it will also investigate the potential application of human manure.

The Farm of the Future uses technological innovations in IT, GPS, sensors, satellite images, drones and robotics. These innovations enable precision agriculture, in which farmers determine precisely how much water, fertilizer or pesticide is needed per square metre or even per plant. Pesticides can then be targeted at the affected plants. 'Using this smart approach, you can often use up to 20 per cent less pesticide,' says Sukkel.

The researchers are also looking for solutions for soil compacting. Heavy machinery and tillage cause the soil to compact, which reduces its ability to absorb rainwater. This leads to a loss of soil life. Farmers can prevent this by using fixed tractor paths, smaller machines, and robots. The researchers are also experimenting with sustainable energy, for example storing wind and solar power in the form of hydrogen.

In addition to agricultural businesses and branch associations, the research involves start-ups, technology companies, public authorities, universities and other educational institutions, and organizations such as the World Wildlife Fund.

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WAGENINGEN ACADEMY

Opportunities in refrigerated transport of fresh products

Global demand for sustainable transport options is growing throughout the cold supply chain. Temperature-controlled transport by reefer containers and trucks is a key part of the food logistics chain. An extensive knowledge of the complex subject of refrigerated transport technology supports efforts to safely improve climate control and energy efficiency. For retailers and customers at the end of the chain, food waste is then minimized and the shelf life of fresh products such as vegetables, fruits, fish and flowers is extended. The online course Refrigerated Transport Technology, which combines self-study, lectures and live virtual classroom discussions, presents the latest R & D developments and an update on the basics of refrigeration technology.

www.wur.eu/wageningenacademy

WATER QUALITY

Microplastics in Dutch rivers

Researchers from Wageningen, Utrecht University and the University of Amsterdam have measured microplastic and microrubber in the Dommel and Maas rivers and in Dutch sewage purification plants. In the past, the focus was on particles larger than 300 micrometres. 'Now we can detect particles as small as 20 micrometres — the size of a human skin cell,' says Wageningen PhD candidate Merel Kooi. The team identified 26 different kinds of plastic and rubber. On average the researchers found one particle per litre. There were usually more particles closer to towns and cities. No adverse ecological effects are expected from these low concentrations but the microplastics do not disappear and they can therefore accumulate in the environment. The study was published in the scientific journal Water Research in June.
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TOXICOLOGY

Carcinogenic substance in basil and star anise

Estragole, a compound that is found in basil, star anise and fennel, damages DNA and possibly leads to cancer in liver cells. Shuo Yang, a PhD candidate in the Wageningen Toxicology chair group, discovered this. Yang found that the cells overlook the DNA damage and therefore fail to repair it. The dosage in the study was much higher than what people normally consume in their diet. But DNA changes can accumulate gradually, especially if no repairs are made.
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PHOTO SHUTTERSTOCK

AGROFORESTRY

Shade for threatened coffee plants

Climate change is threatening coffee cultivation in Brazil, the Wageningen PhD candidate Lucas de Carvalho Gomes has calculated. Shade trees could be the solution.

PHOTO MAURO PIMENTEL / AFP / ANP

About 60 per cent of the coffee-growing areas in the Atlantic coastal zone in Brazil will no longer be suitable for coffee cultivation by 2050. This is the result of model calculations that De Carvalho Gomes performed in partnership with Wageningen University & Research and the Brazilian Universidade Federal de Viçosa. If temperatures rise by two degrees, this will make life difficult for the Arabica coffee plants. But if farmers surround the coffee plants with trees that cast shadow on about half of the area, it will be possible to keep three quarters of the current coffee fields and plantations. Plantations that are at altitudes of 600 to 800 metres in particular will benefit from such an agroforestry system, for example in combination with avocado trees. Mixed 'coffee forests' are a traditional cultivation method in Latin America.

It is already too hot for coffee cultivation in the coastal zone below 600 metres, says De Carvalho Gomes. He expects that by 2050, coffee production without shade trees will only be possible at altitudes of over 800 metres. But because there are a lot of nature reserves at such altitudes, the coffee farmers will run into conflicts with nature managers.

Incidentally, many fruit trees on mixed plantations in Latin America are also suffering from global warming. That is why last year, an international research team – which included Milena Holmgren Urba from Wageningen – recommended planting climate-resilient fruit trees and cocoa trees that can cope with drought and heat in mixed coffee plantations in Central America. Back in 2012, Wageningen and Brazilian soil scientists found that the soil temperature is six degrees lower on average in mixed coffee forests compared with coffee-only plantations. De Carvalho Gomes obtained his doctorate on 26 May. His findings were published in June in the journal *Science Direct*.
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CHEMISTRY

Restoring paintings safely

A Wageningen PhD candidate built a device to measure the movements of pigment molecules in paint in pictures. This will help restorers avoid damage by solvents.

PHOTO SHUTTERSTOCK

Jesse Buijs, a PhD candidate in the Physical Chemistry and Soft Matter group, developed the device together with researchers at the Rijksmuseum in Amsterdam. The device uses a laser to measure the tiny movements made by pigment molecules in paint when they come in contact with the solvents restorers use to remove dirt and old varnish from a painting. This makes it possible to see precisely how far a solvent penetrates into the varnish and paint and how long it stays there. This is very important because exposure to solvents can damage the paint.

'This is a promising addition to other methods for determining how varnish and paint respond to exposure to solvents, in part because you can measure this in real time during the restoration process,' says Lambert Baij, researcher at the Rijksmuseum and the University of Amsterdam.

At present, the device only works on small pieces of canvas that are fixed in the lab, as large canvases move too much. Baij: 'The next step is to make the method suitable for small paintings and panels. Potentially, this technology probably has a broader range of uses, such as in the restoration of paper.'

The research results were published in June in *Nature Scientific Reports*.

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NATURE CONSERVATION

Reducing nitrogen levels in five steps

Wageningen researchers have developed an action plan to reduce the high levels of nitrogen compounds in emissions in the Netherlands.

PHOTO SHUTTERSTOCK

In the plan, Wageningen agricultural and nature experts and economists show the extent to which national and local measures can reduce emissions of compounds containing nitrogen from farming and so improve nature. 'Running through the steps in the plan will show policy-makers, farmers and nature managers what choices they have,' explains Tia Hermans, who chairs the Wageningen nitrogen team.

The first step is an analysis of the nitrogen deposition per nature area. Next is an assessment of the effects of various national measures for agriculture. The third step involves the quality of the nature and possible nature restoration measures. In the fourth step, provinces, farmers' associations, nature organizations and water boards look at additional local solutions, for example a reduction in nitrogen-containing emissions from livestock farms next to a nature area. If all these measures are not enough, in the fifth step the nationwide measures and nature targets are reviewed.

'An approach that is part national and part specific to the nature area is required because both agriculture and nature differ between areas,' explains Hermans.

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AGRICULTURE

Scenarios for the future of agriculture

Wageningen researchers have worked out four scenarios for agriculture and land use in the Netherlands in 2050. These are extreme scenarios that assume either high productivity or nature-inclusive farming, with or without additional environmental targets.

If the Netherlands wants to be climate-neutral in its own right, reductions in livestock farming are needed. In the scenario that is geared most to production, the livestock population would need to be cut by a fifth even with technological measures such as low-emission barns. There is less room for arable farming in all scenarios because that land is needed for woods for carbon storage or to provide dairy farms with locally grown fodder.

The study was commissioned by the Agriculture and Land Use sector group of the Dutch Climate Agreement.

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METEOROLOGY

Solar energy peaks with clouds

Cloudy days can in fact lead to peaks in the electricity grid, with 22 per cent more power than on clear days.

This finding is from a study of the impact of solar energy on the electricity grid by WUR, the grid operator Liander, the Royal Dutch Meteorological Institute and Utrecht University.

While more electricity is generated on clear days, cloudy days result in the biggest peaks in the energy supply.

Clouds, for example cumulus clouds, reflect more light. Also, solar panels cool down in the shadow of a passing cloud.

'The more light falls on a solar panel and the cooler it is, the more energy it generates,' explains researcher Frank Kreuwel.

The study was published in August in the scientific journal *Solar Energy*.

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FOOD SCIENCE

Chocolate provenance can be determined

PHOTO SHUTTERSTOCK

The provenance of chocolate can be determined using markers in the cocoa beans used to make the chocolate, PhD candidate Valentina Acierno discovered. These markers remain present in the chocolate and show whether the chocolate was made from Criollo, Forastero or Trinitario beans and whether the beans were grown in Africa, Southeast Asia or Latin America.

Furthermore, the acetic acid levels give information about how the beans were processed, such as fermentation and drying conditions. Knowledge about local processing methods can help pinpoint the chocolate origins, says the PhD candidate.

As of 2025, information on the provenance of the beans used in chocolate made in the Netherlands will be mandatory. The beans will also have to be grown and processed sustainably.

Acierno obtained her PhD in May. Her research was published in July in *Food Research International*.

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ECOLOGY

PHOTO SHUTTERSTOCK

Investigation into biodiversity in solar parks

The Netherlands Enterprise Agency has made 3.6 million euros available for investigating the effect of solar panels in solar farms on the soil and on flora and fauna.

The SolarEcoPlus project will examine six test solar farms on sandy soil, clay soil and peatland.

Wageningen researchers will study the effects of the solar panels on the soil and vegetation. Mixes of native wild plants will be sown in the test farms and camera traps placed to see which animals visit. The soil fertility and carbon sequestration will also be assessed. 'We expect to be able to use the results to draw up guidelines for the design and management of solar farms that will improve their ecological impact,' says WUR project manager Friso van der Zee. In addition to Wageningen, TNO and the solar park developer LC Energy are also involved in the project.

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FORESTRY MANAGEMENT

PHOTO ALAMY

Hot tropical forest stores less CO_2

Tropical forests store less carbon when temperatures exceed 32°C, concludes an international research team on the basis of extensive measurements.

The researchers measured carbon sequestration in over half a million trees in 813 tropical forests in 24 countries so that they could compare sequestration in different climate conditions. Growing trees store carbon, but forests with a lot of trees that are dying due to heat and drought actually release carbon. If the Earth heats up by two degrees, that will probably lead to substantial emissions of carbon from tropical forests, especially in the Amazon. Even so, tropical forests will still be able to store a lot of carbon in the future, think the scientists. However, this will require global warming to remain limited, and for forests to be given time to adapt to climate change and to be protected against felling and fires. 'Our study gives a warning that tropical forests could lose their carbon storage function. This situation could become worse if forests experience drought more often and more severely,' says forest ecologist Pieter Zuidema, co-author of the study, which appeared in May in the journal *Science*.

Heat and drought are bad for forests, but at the same time more CO_2 in the air can help trees grow faster. Zuidema investigated this using measurements from more than 5000 tree rings in Asia and Australia. More CO_2 does indeed lead to faster growth in cooler forests. But in forests with temperatures of over 25°C, an increase in CO_2 leads to more severe heat and drought stress, which curbs growth. These results are in the May issue of *Global Change Biology*.

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ARABLE FARMING

Bigger cassava harvests in Africa

Cassava harvests in Africa could triple if farmers improve nutrient management and cultivation conditions. This finding comes from PhD research by Joy Geraldine Adiele in the Plant Production Systems chair group. Cassava is rich in carbohydrates and is grown in many African countries but yields are usually low.

Better growing conditions and a well-balanced application of fertilizer can increase harvests to 35 tons of cassava roots per hectare, as field trials by Adiele and her colleagues have shown in six locations in West Africa.

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POST-HARVEST TECHNOLOGY

Spectrometer can tell whether mango is rotten

Researchers at Wageningen Food & Biobased Research have developed a way of identifying rotten mangoes without cutting the fruit open. They measured the moisture content and chemical composition of the intact fruits with a near-infrared spectrometer (NIR). Then they cut the mangoes open and took colour photos to assess whether the fruits were rotting. Based on comparison with the colour analyses, the NIR measurements could correctly determine whether a mango was rotten in 80 per cent of cases.

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PHOTO SHUTTERSTOCK

DEALING WITH DROUGHT

Capture that water!

The ability to dispose of surplus water is in Dutch people's DNA. But nowadays the Netherlands faces increasingly frequent dry periods, making it at least as important to hold onto water. There is plenty of experimentation going on with methods that benefit both farmers and nature. 'We are looking for a new happy medium between wet and dry.'

TEXT RENÉ DIDDE **PHOTO** VINCENT JANNINK / ANP **INFOGRAPHIC** STEFFIE PADMOS

> ‘Water level management in the Netherlands has got to change’

Drought has become a serious problem in the Netherlands. In 2018, even in the soggy western part of the country, the grass went yellow from lack of rain. Farmers’ incomes dropped due to small harvests and they had to buy extra fodder for their cows, while nature suffered a severe blow. Drinking water companies had to pump up more groundwater than they were licenced for to maintain an adequate supply. Extremely low water levels meant that inland shipping plied the Waal and the IJssel rivers with half the usual cargo.

2019 was dry too, especially on higher ground with sandy soils – and that means one third of the Netherlands. These areas can only get a limited amount of water from the Rhine and the Maas and are dependent on the water stored in the soil in winter, and on rainwater in spring and summer. If it doesn’t rain, both nature and the agriculture sector are in trouble. And even though 2020 is not yet over, there is already talk of ‘the third dry year in a row’. Farmers were already having to irrigate in April, and wildfire destroyed 800 hectares of the Deurnsche Peel nature reserve, with residents of three villages having to be evacuated. Ditches and streams in sandy soil areas had dried out before summer had even begun, in spite of the fact that we had had a wet winter, with February actually the wettest month since meteorological records began.

DRY FEET

Dutch water management has traditionally been focused on ‘keeping our feet dry’ and draining off water. Now we have got to get to work on ways of creating buffers of water to see us through dry periods better, say the experts. ‘Water level management in the Netherlands has got to change. We must capture more water on high sandy soils, for example, so we can cope with drought,’ says Petra Hellegers, professor of Water Resources Management in Wageningen. ‘That is already being done in more and more places by installing barrages. The groundwater level goes up, and both agriculture and nature are better served as a result.’

Hellegers has noticed that this sometimes means a clash between the best interests of agriculture and of nature, particularly if they are located close together. ‘It is a political issue: how can we manage the water effectively in times of drought? Where should the water be allocated to nature and where can it go to agriculture? If they are close together, you have to be quite precise about it. It is a fine balance. I am all in favour of the typically Dutch “polder model” of broad consultation used by the water boards, in which farmers, nature organizations and companies are all represented.’

LATIN FOR EARTHWORM

In several different projects, Wageningen is working with stakeholders to study how to improve water management so that nature, leisure activities and agriculture can all cope better with periods of drought. In the past four years, the Lumbricus research programme has gained experience of improving the soil and water management on the high sandy soils in the east and south of the Netherlands. A number of researchers from several disciplines in Wageningen are participating in the project, along with experts from Twente University, Radboud University Nijmegen, the Louis Bolk Institute and KnowH2O consultancy. The water research institutes Deltares and KWR are involved too. The total budget comes to eight million euros, largely raised by the research institutes and water boards, with two million euros in co-financing by the ministry of Infrastructure and Water Management.

‘The basis for improvement is the soil,’ says Bas Worm, strategic advisor to Vechtstromen water board, responsible for an area of hilly sandy soils, clay soils and remnants of raised moorland in Overijssel and Drenthe provinces. Worm is the architect of Lumbricus. ‘In 2015, I saw six different research proposals come in, involving a smart barrage, growing deeper rooted tall fescue grass, promoting soil life to improve water retention, and innovative forms of drainage. I thought: why don’t we do all that research in a coordinated fashion in one part of our watershed? Then we can see whether these measures are complementary or perhaps undermine each other.’

With a nod to Worm’s surname, the water board called the new project Lumbricus, Latin for earthworm, the animal whose underground wriggling enriches soil life and enables crops to send down deeper roots, and rainwater to seep deeper into the soil.

SAND REPLENISHMENT

One of the project’s research locations lies in Stegeren, near Ommen, along the Overijssel Vecht – a reasonably sized river that drops in height significantly. The common intervention of retaining water by slowing the current would be tricky here, says Worm. ‘That has to be done without building new barrages, because the river has to stay navigable for the pleasure boats.’

One of the research projects therefore involved creating a side arm of the river and doing some sand replenishment. ‘Like a small-scale version of the well-known offshore “sand engine”, the stream deposits sand itself, so the streambed gets raised, >

DEALING WITH DROUGHT

The Netherlands faces increasingly frequent droughts due to lack of rain. Plenty of experimentation is going on with methods of capturing water.

Dutch soils

Drought is mainly a problem on the higher-lying sandy soils that can only get a limited amount of water from rivers. These soils cover one third of the Netherlands.

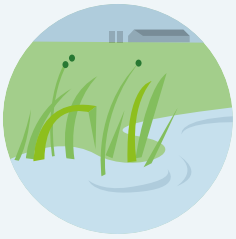
Sandy soil
Rivers

Slowing the flow

One way of retaining water for longer is to slow the flow in ditches and streams. This gives water more time to seep into the ground and replenish the groundwater supply.

The flow of water can be slowed by:

Building barrages



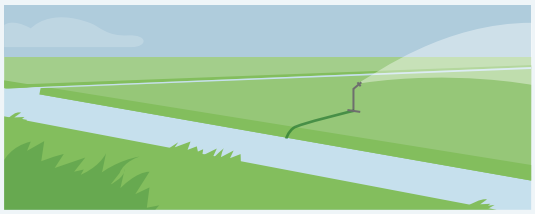
Mowing the banks less often

Digging side arms

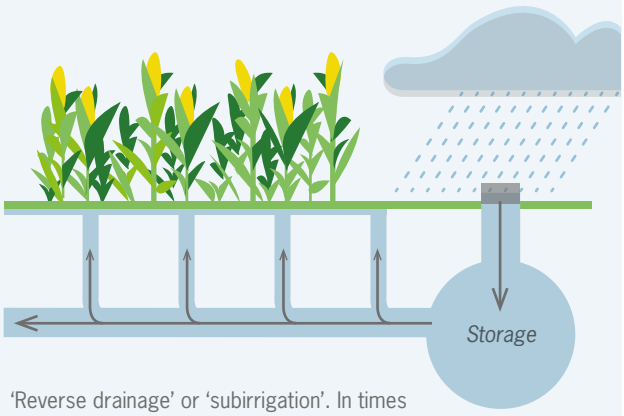
Replenishing sand

Capturing water on farmland

Farmers can also hold onto water for longer and use it more efficiently on their land by methods including:



Storing drainage water in ditches and wells, to use it on the land in times of drought.



'Reverse drainage' or 'subirrigation'. In times of drought, the underground drainage system below the crops is not used to drain off water but to bring water directly to their roots.

> ‘If I want to go on farming, and my two children too, we will have to adapt’

the flow of water slows down and the water level goes up.’ Another way to slow down the flow of the river is to mow the riverbanks less often, so vegetation flourishes.
Although the report containing the Deltares researchers’ results is not out yet, they have used drone footage and laser techniques to observe a change in the river’s profile, with more variations and transitions between shallow and deep sections. Worm: ‘That creates opportunities for nature, as well as for farming in times of drought. On the other hand, this measure could also cause flooding on farms downstream in winter and spring. We are looking for a new happy medium between wet and dry.’

INFLATABLE SKIPPY BALL

According to Lumbricus project leader Mirjam Hack-ten Broeke, improving the large-scale water management by the method used in the trial on the Vecht would be a long-term project. More immediate results are achieved when land users in the area harvest more rainwater. ‘They have to do so in the waterways of the system, the ditches and streams, raising them as high as possible,’ says Hack-ten Broeke, who is Soil, Water and Land Use team leader at Wageningen Environmental Research. This doesn’t have to be done with expensive, high-maintenance barrages. It can also be done by simple means such as culvert covers, closing drains or raising small barrages located on farms with planks. Waterways can also be blocked with a bulk bag or an inflatable skippy ball. This is a large rubber ball that farmers can pump up and use, in consultation with the water board, to close off ditches. If they need to till the fields, or if heavy showers cause flooding, they can deflate the ball and let the water flow away. That way, the measures taken to capture water don’t prevent the drainage of excess water from thunderstorms or heavy winter rain. ‘If you let the captured rainwater filter through the sandy soils, it reaches the groundwater and you refill those supplies,’ says Hack-ten Broeke.

REVERSE DRAINAGE

Another way in which land users can capture more rainwater is through drainage pipes. Seven farmers experimented with this in the Lumbricus project. Together with KnowH2O, Ruud Bartholomeus of KWR water research institute has been following this ‘climate-adaptive drainage’ experiment closely. ‘You use the drainage pipes not just to get rid of water under wet conditions, but also to then capture it in ditches and newly dug wells,’ explains Bartholomeus. Another promising approach is reverse drainage or ‘subirrigation’, a method by which the farmer pumps water back up into his drainage system and to his crops in times of drought.
In one of the trials in Stegeren, surface water is pumped to the fields using two solar panels and a battery. Bartholomeus: ‘Because the water goes straight to the roots of the crop underground, none of it gets lost, as it does when sprinklers are used from above.’ And it can be done at night. ‘The farmer can stay in bed and doesn’t have to go through his crops or field with huge reels of hosepipe,’ says Bartholomeus, who is a Wageningen alumnus and works one day a week at the Soil Physics and Land Management chair group. He stresses that a lot of questions remain to be answered. ‘When there are differences in levels, do you get the drainage water close enough to the roots of the crop? And does it work for all crops?’
Bartholomeus is doing research on different sources for subirrigation too. The system can make use of drainage water from lower-lying wet fields, surface water from the region, or shallow groundwater – five to eight metres deep.

CAPTURING WINTER RAINFALL

There is even a trial going on in which a farmer is watering his land with purified water from a sewerage water purification installation. ‘We are keeping a careful eye on the effects of all these measures and estimating the implications for the nearby nature,’ says Bartholomeus. ‘The consumption of groundwater in periods of drought goes down if excess water is stored for longer, for example by ensuring that as much winter rainfall as possible infiltrates the soil in sandy areas. Both agriculture and nature benefit from that.’
One of the farmers participating is dairy farmer Robert Geertman. ‘I don’t pump the water from a wet plot into the ditch, but to a dry plot on higher ground,’ says Geertman, who has 100 cows and 60 heads of young cattle on over 56 hectares. He is conducting this trial on nearly 3 hectares of his land. ‘Draining water from the wet plot is going fine, but I’m not getting the water far enough onto the dry plot,’ he says. But he is not giving up. ‘I’ve got to do something,’ he says. ‘The climate is changing. If I want to go on farming, and my two children too, we’ve got to adapt. I hope we can stay here. The nature here along the Vecht is stunningly beautiful. That is important. Agriculture doesn’t have to get 10 out of 10, and nor does nature. But I think that with the Lumbricus measures, we can co-exist while both scoring a clear 7 out of 10.’

NO SPONGE FUNCTION

The results of the trials in Stegeren and the southern trial location near Horst will be made available this autumn. There are

PHOTO PROGRAMMA LUMBRICUS

Sand replenishment on a side arm of the Vecht River in Overijssel province. The aim is that the river itself deposits sand so that the riverbed is raised, the flow is slowed down and the water level goes up.

experiments going on with barrages and infiltration, as well as with enriching the soil life with wriggling earthworms, adding compost and planting a deeper-rooted grass called tall fescue instead of ryegrass.
Hack says, though, that raising levels of organic matter in the soil may be good for the soil life and soil fertility, but doesn't do much for the soil's 'sponge function' – its water retention capacity – in the Netherlands. 'And yet people have been claiming for years that compost is a good solution to drought.'
The researchers used the data on water management conditions to test and expand a water management tool called WaterVision Agriculture (Waterwijzer Landbouw in Dutch). 'That way you can quantify the effect of measures on the crop yield, using information about hydrology and the soil. Farmers and the water board can see, for instance, how much less crop spoilage they can expect if they apply subirrigation,' says Hack. For nature, there is the WaterVision Nature tool. 'With this, water boards and nature organizations can find out whether the water management approach matches the nature-related objectives they have set for a particular area. Which types of vegetation are promising, and what does a change of water management mean for things like drought stress, oxygen stress or acidity?'

DISSEMINATION OF KNOWLEDGE

Although Lumbricus is still going on, a follow-up project, Climate Adaptation in Practice (KIMAP), already started this spring. 'We need to disseminate the knowledge gained from the local pilot projects to all users in the region,' says KLIMAP project leader Myriam de Graaf of Wageningen Environmental Research. Besides the research consortium Lumbricus, seven water boards and the provinces of Gelderland, North Brabant and Limburg are participating in KLIMAP. 'Water boards and provinces can find out whether their current policy and measures against drought are adequate, or whether any adjustments are needed.' The programme runs until 2024. Half of the budget of 6.5 million euros comes from the top sectors Agri & Food and Water & Maritime. The other half comes from water boards, provinces and a few companies.
De Graaf, who has worked for Limburg water board for 13 years, wants KLIMAP to contribute to ensuring that rural areas can withstand climate change better, in periods of both drought and heavy rainfall or flooding. She too thinks the measures will benefit both agriculture and nature. But, she warns, in the long term it may turn out that spatial planning must change and farming systems must be adapted. 'It is possible that certain kinds of farming cannot continue in the same way. This could lead to different crops and different business models for the farmers. If we want to capture excess precipitation in the winter in a stream valley in order to get through dry periods better, then it would be better to move sensitive crops such as asparagus, lilies or trees in nurseries out of that valley,' says De Graaf. 'Because in the winter the land there is too wet, and in dry periods those crops require a lot of water. Of course those decisions are not for us researchers to make, but we would like to provide the basis for the decisions.' ■

www.wur.eu/drought

Female great tits avoid the best singers

Songbirds sing to attract a partner and fend off competitors, say textbooks on the function of birdsong. But it is not as simple as that in reality, shows a large-scale field study. It is actually the males who are attracted to the territories of the best singers.

TEXT NIENKE BEINTEMA

In a large-scale field study in which dozens of great tits were fitted with digital radio tags, Wageningen behavioural ecologists made some remarkable discoveries. Females stayed away from the territories of the males that sang the most elaborately. Rather, it was other males who were attracted to these territories. The authors published their results in *Behavioral Ecology* in May 2020.

'There has already been a lot of research into the function of birdsong, some of it done by us,' says Marc Naguib, professor of Behavioural Ecology at Wageningen University. 'Most of these studies involved birds in captivity, or were field experiments documenting birds' immediate responses to birdsong. However, if you want to understand the relation between birdsong and bird movements and social interactions, you need to look at whole populations in the wild. And you'll need to track the birds at times when there is no singing as well.'

The project is a collaboration between Naguib's group, specialized in birdsong and bird movements, and Professor Kees van Oers of the Netherlands Institute of Ecology (NIOO-KNAW), who studies the ecology and genetics of great tits. PhD student Nina Bircher and her colleagues placed sound recorders next to 38 nesting boxes in the woods near Wageningen, and captured 70 great tits that visited those nesting boxes. These birds were fitted with tiny lightweight backpacks containing radio transmitters that give off a signal every 5 seconds. A network of receivers sent these signals to a computer, so that the researchers could follow all the birds for weeks and compare the spatial information with recordings of birdsong.

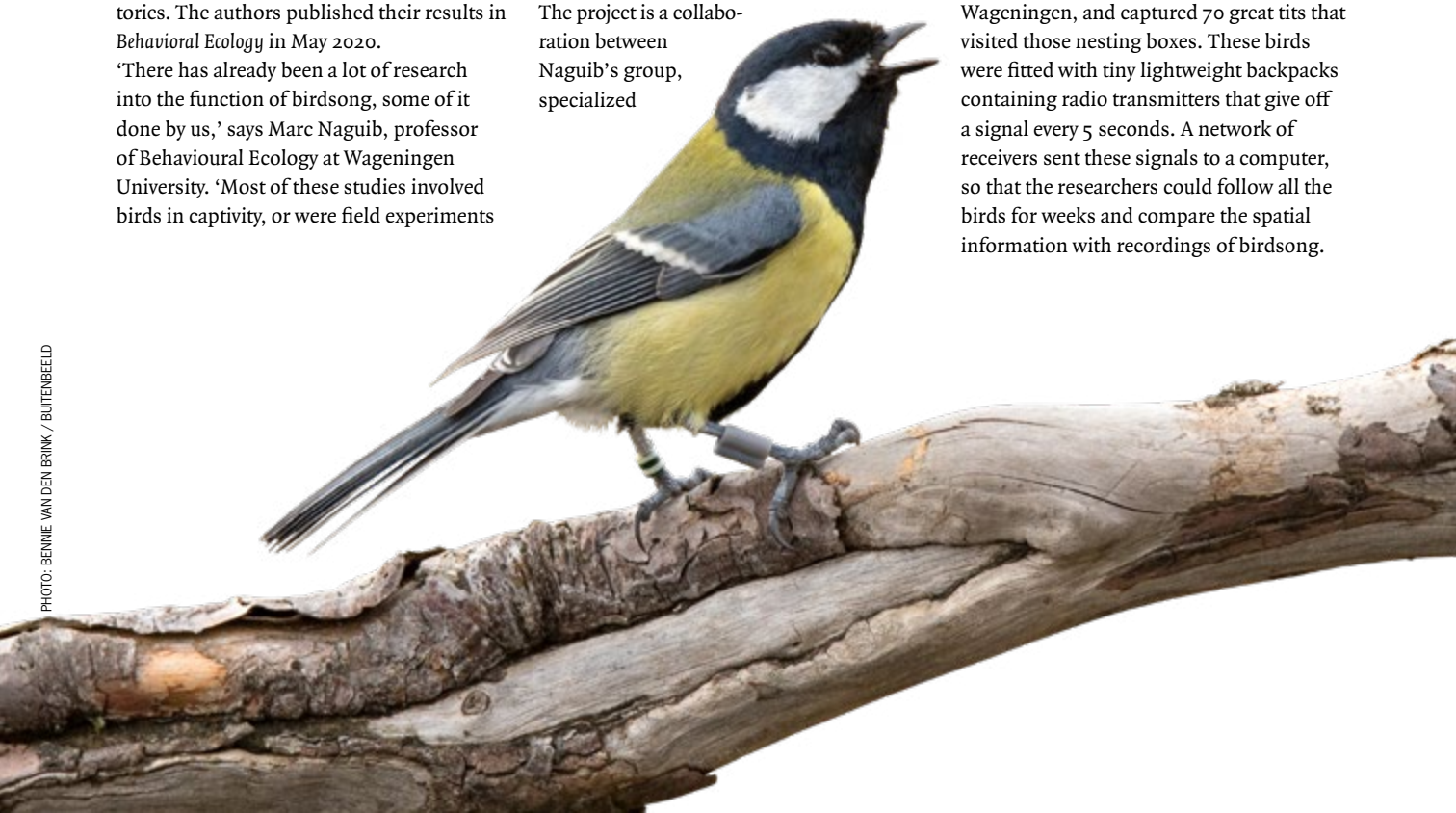


PHOTO: BENNIE VAN DEN BRINK / BUITENBEELD

MORE THAN 20 YEARS OF RESEARCH ON BIRDSONG

Research on birdsong goes back decades and it has attracted researchers from many disciplines, ranging from linguists and neurobiologists to behavioural and evolutionary ecologists. Professor Marc Naguib and his colleagues have been doing research on birdsong and bird movements for more than 20 years. Professor Kees van Oers from NIOO-KNAW has been studying great tit ecology and genetics for a similar length of time. The two institutes joined forces a few years ago. 'This cooperation and the use of novel technologies are now providing very different insights,' says Naguib. 'Into the role of song and social relations in bird communities, for instance.'

PHOTO WUR

This great tit has been fitted with a radio tag (visible near its tail).

'All in all, we collected about 35 million data points from the radio tags, which revealed around 30,000 excursions by great tits into their neighbours' territories,' says Naguib. 'An amazing number, when you think about it. This has never been done on this scale before.'

Although the males mainly sing between 5 and 7 am, Bircher found that the effects of the singing in that peak period continued throughout the day. 'All day long, males appeared to have a preference for the territories of the best singers,' notes Naguib. That is, for the territories of the males with the largest repertoires, who started earliest and sang for longest. 'Females, on the other hand, actually appeared to avoid those territories. Why? We don't know yet. But it does show that the function of birdsong is not as simple as we have always assumed.'

EXTRA-PAIR MATING

Naguib can imagine a few possible explanations for this. 'Perhaps the visiting males want to see how strong and healthy their neighbour is,' he says. 'Or check out the quality of the territory, the breeding stage of the female, or how alert the male is.' Earlier studies have suggested that excursions by male songbirds into neighbouring territories are sexually motivated – even when the males have already found a mate. This phenomenon is known as extra-pair mating. Over half of the offspring in a songbird's nest may be fathered by a neighbour. In the current Wageningen study, extra-pair chicks made up 18 percent of the chicks sampled, and 40 per cent of broods contained at least one extra-pair chick.

'Interestingly, we didn't find any correlation between extra-pair paternity and male or female excursions into others' territories,' says Naguib. 'Females made most trips into neighbouring territories after they'd already laid their eggs.' Combined with the birdsong data, this suggests that males do not sing in order to attract females to their territories, and that females do not seek out male neighbours with the aim of mating.

> 'The radio tags gave us 35 million data points'

COMPLEX SOCIAL NETWORKS

All in all, these findings challenge common beliefs about the function of birdsong, concludes the Wageningen professor. 'It's very exciting. When suggesting that birdsong attracts females, we always presumed that females actively choose their mates, but we had no information on what they do during the day, as they live so quietly, hidden away in the woods.'

Further studies are on Naguib's wish list, but to conduct them some new technological aids will have to be developed, such as backpack microphones combined with radio tags, to discover when and how much birds sing on and off their own territories. 'We also want to log how close birds get to each other,' says Naguib. 'The social networks within bird populations are fascinating and complex. There's so much we still don't know – let alone understand.' ■

www.wur.eu/greattits

Learning lessons from the crisis

Critics say the coronavirus pandemic has exposed the truth about the modern food system. The 'miracle of efficiency' that supplies us with food turns out to be a more precarious construction than we thought. Five Wageningen scientists on the lessons of the coronavirus, and how to proceed from here.

TEXT JANNO LANJOUW **PHOTO** ANP **PORTRAIT PHOTOGRAPHY** ERIC SCHOLTEN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MARCEL VIJN

‘Short supply chains are an insurance against hard times’

IMKE DE BOER

‘We must now really insist on a food system that is fair to humans, animals and the planet’

Faltering imports and exports, markets that disappear because the hospitality industry closes, and a panicky, pasta-hoarding general public: all in all, the Dutch food industry got quite a shock early this year. Quite apart from the human suffering caused by the coronavirus crisis, it became clear that the food sector would not escape its economic impact either.

The most obvious impact on the Netherlands took the form of surpluses. The sudden end of demand from restaurants produced a potato mountain that could have filled the Amsterdam Arena football stadium three times. Italian demand for Dutch veal stopped too, with consequences across the sector – from dairy farmers who couldn’t sell their male calves to truck drivers without work. Internationally, problems arose in the grain and rice markets, mainly due to import and export restrictions and protectionist measures.

This raises the question of how well equipped the current system is to cope with a serious global crisis. Is it time to rethink the conventional, efficiency-driven system based on complex global supply chains? What lessons can we learn from the coronavirus crisis?

‘A number of issues emerged,’ says Imke de Boer, professor of Animal Production Systems. ‘Firstly, our food system is very global. About three quarters of the land needed to produce the food consumed in the Netherlands is in other countries. At the same time, we export vast amounts of what we produce ourselves. The crisis showed that those long supply chains are vulnerable, but we already knew that, really. And it’s only logical: the more links there are in a chain, the more places there are where things can go wrong. ‘What is more: when you think in circular economy terms, you want to keep supply chains short wherever possible too. It is much easier to create a closed loop in a short supply chain. If you want to work towards

circular agriculture – as I do – you must purchase locally whatever products we can produce locally. So it's fine to look abroad to source avocados and citrus fruit, which we're not going to grow in greenhouses here. But you shouldn't import potatoes from Israel when they are in plentiful supply here.

'Where I think the coronavirus really is a game changer is the conditions in abattoirs. Especially the labour conditions. Currently, it is mostly East Europeans who process our meat for a pittance. They work at close quarters to each other, and are then taken in crowded buses to holiday camps where they are packed into chalets. This has got to stop. We must now insist on a food system that is fair to humans, animals and the planet. I already knew that, but it really has become crystal clear to me now.'

De Boer, Evelien de Olde and their team are among the 10 finalists in the Rockefeller Foundation's prestigious Food System Vision Prize. The team submitted a holistic vision of a healthy and circular food system for the Netherlands in 2050.

BUFFER

Marcel Vijn, who researches urban-rural relations at Wageningen Plant Research, is studying the potential of short food supply chains. 'I agree with De Boer. There is not necessarily anything wrong with long supply chains. They are often very useful. But there is not enough recognition of the importance of the short supply chain.

'Short supply chains and direct distribution from the farmer to consumers can provide a buffer for a few days. The food system is based on the just-in-time economy: supermarkets want to keep their stock moving. When the Icelandic volcano with the difficult name (Eyjafjallajökull, ed.) erupted in 2010 and much of the air traffic over Europe was grounded, the British calculated that London had a food supply to last just three days. "Nine meals from anarchy", they called it with typically British dry humour. The UK is particularly dependent on imports, but in the Netherlands we might only have a few more days than that. The system is totally dependent on a continuous logistical flow.

'And that is where the weak points are. The supply, which comes from a vast number of producers, has to reach a vast number of consumers via just a few very big purchasers — the supermarkets. If you were to draw it, it would look like an egg-timer: everything is funnelled through that handful of buyers. The egg-timer model has its advantages, because it keeps costs down. But it is very sensitive to hiccups.

'In my local supermarket I couldn't get any eggs for a while at the start of the crisis. People had been hoarding them. But the farmer near my home had plenty of eggs, and he has a vending machine at the side of the road. Normally he had to fill it once a day, but now he had to do so continuously. Sales were crazy. In other words: there were still eggs, but something had gone wrong in the middle of the egg-timer. 'During the crisis, short supply chain initiatives suddenly sprang up everywhere, such as the "Support your locals" campaign. Farm shops did a roaring trade, doubling or even tripling their turnover. I think that just goes to show what the potential is. The big question now is: are we prepared to invest seriously in the development of short supply chains. It has real advantages: you can see it as an insurance against hard times. And short supply chains are also good in terms of sustainability issues. Consumers build a relationship with "their" farmers, and can support the way they work by buying their products. That is worth a lot.'

JEROEN CANDEL

'The right to food – especially healthy food – is not that well organized'

PUBLIC HEALTH

Jeroen Candel, assistant professor of Public Administration and Policy, has been working on food policy for years now. If you monitor every aspect of the food system – from production to consumption – he believes it is possible to create an integrated policy that tackles several societal problems at the same time. By focusing on food, you can tackle public health, and you can also improve the environment by stimulating more sustainable agriculture.

'The coronavirus crisis was a short-term shock that exposed a number of systemic >

JOOST GUIJT

‘Landless labourers run the risk of sliding into deep poverty and hunger’

problems. The most striking one to me was that the impact of the coronavirus hit the weakest in the food system hardest. Like less well-off consumers, for instance. Social inequality is a crucial issue, if you ask me. ‘We are seeing that a growing number of people are dependent on food banks. And yet at the start of the coronavirus crisis, the food banks had to close. That made clear where the pinch is felt: the lower echelons of society are more vulnerable than people realize. Especially if you take a Europe-wide perspective and bear in mind the expected economic downturn. The right to food – especially healthy food – is not that well organized.’

Candel helped write a report called ‘A sustainable food system for the European Union’, which was commissioned by SAPEA, a scientific advisory body to the EU. ‘The EU pursues an agricultural policy, a food safety policy, and an environmental policy, but that is all very fragmented. Now there is a push to work towards a more integrated food policy, such as European Commissioner Frans Timmermans’ Farm to Fork strategy. This is the food-related component of the Green Deal, the policy that aims to make Europe climate-neutral by 2050. Our report was input for that. One of our main messages was: don’t look at food as only a commodity, but also as a public good. And think about how we can distribute food in a fair manner. There is a certain momentum around the Green Deal objectives. It might seem as though the coronavirus has lent them extra urgency, but I am afraid of the backlash. We know from past experience that when economic stress goes up, the environment is put on the back burner. I’m not very hopeful.’

VULNERABLE ECONOMIES

Joost Guijt is worried about the near future too, not so much for the Netherlands or Europe, but especially for vulnerable economies in Asia and Africa. Guijt is Senior Advisor Inclusive Agrimarkets at Wageningen Centre for Development Innovation (WCDI), which focuses on creating a robust food system in developing countries by fostering local knowledge and skills.

‘First of all, it could have been a lot worse. Everywhere, as soon as the crisis began, the agricultural sector was declared crucial. As a result, the supply, trade and local markets were reasonably well maintained. But I still fear the worst. Because while we in the Netherlands are fretting about getting seats at pavement cafes, the virus is only expected to peak in regions like East Africa in September. It could get really out of control there. As for crisis areas such as Yemen, cases are not being registered there but you hear from colleagues that there is a steady flow of funerals day in day out.

‘It is crucial that the coming harvests go well, so the supply of food is kept up. Because the countries where WCDI works generally lack a good safety net. You can see how the measures to control the coronavirus are starting to have an impact. In the sesame sector in Ethiopia, for example, there are half a million landless farmers and farm labourers, whose movements are now limited. And rightly so, because those labourers are a risk factor for spreading the disease. They live in crowded conditions and lack the resources to take measures themselves. But these measures have a far-reaching impact.

‘Sesame farming is labour-intensive. Now that labour is not available, landowners are opting for less risky and labour-intensive crops such as sorghum and millet. And as a result, the landless labourers run the risk of sliding into deep poverty and hunger. We are seeing horrifying developments throughout Africa, in that respect.

‘Sesame is also Ethiopia’s second biggest source of foreign currency. If 90 per cent of the sesame farmers reduce the amount they sow, it won’t just be rural communities that suffer a massive, almost insuperable loss of income: the nation as a whole will lose revenue. And that reduces the country’s

ability to respond to emergencies by buying equipment such as ventilators, for instance. 'The strong side of the food systems in the countries we work in is the informal sector: all the small traders who go up and down between the city and the country with relatively small quantities of food products. We see that those informal markets are often more robust in certain respects than the formal markets like the ones we have in Europe. One weak link in the chain here can mean a whole batch of refrigerated food arriving too late, defrosting and having to be thrown out. In informal supply chains you find the supply being spread over many short supply channels in smaller quantities. Regrettably, we still don't know much about how those informal markets are responding to the crisis. Unfortunately, the signs are not positive.'

IMPORTS AND EXPORTS

'Of course, in a crisis of these proportions, the economy as a whole is at great risk,' says Roel Jongeneel, a researcher at Wageningen Economic Research and an assistant professor of Agricultural Economics and Rural Policy. 'It is a fact that the food system is not usually as badly affected as other sectors, simply because people still have to eat. During major crises, the agricultural sector does not usually shrink as badly as other sectors. But I still thought it was a bit scary, especially for a country like the Netherlands that is so dependent on imports and exports.

'But the European internal market has done well in forestalling trade problems between the member states. "Green lanes" were established at borders so that transport of important products could continue as usual, in spite of the restrictions on travel and transport brought in because of the coronavirus. That has proven effective. The final safety net that was kept in reserve, an emergency fund with minimum prices for food products, has hardly had to be used at all. Overall, the food system turned out to be very resilient. Having said that: it is also obvious that it is not perfect, what with the tensions around the climate, the environment, health, and the nitrogen problem. It needs quite a bit of correcting on these issues.

'I too believe that short supply chains deserve more attention; that is a good development. But the food system is diverse. Short supply chains are good for parts of it, but I think they will always be a niche. They don't offer an alternative to the food system as a whole. That is just pie in the sky.

'One positive consequence of the coronavirus, I think, is the new awareness among the general public. People are taking a fresh interest in where their food comes from, and I think that connection is very important. It's not just that it contributes to a more robust food system because people get in touch with producers themselves. Personally, I also think it's a good way to live. Taking an interest and relating to your food and where it comes from: for me that has almost spiritual meaning.' ■

www.wur.eu/foodsecurity

ROEL JONGENEEL

'Short supply chains don't offer an alternative to the food system as a whole'

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Asphalting with wood

Road constructors are keen to use more sustainable asphalt. Wageningen is working with them to study the scope for partially replacing oil-based bitumen with lignin, a by-product of the paper industry. This reduces CO_2 emissions.

TEXT KARST OOSTERHUIS

It is not often that road construction is described as 'sustainable'. Because of the high temperature at which asphalt is processed, a lot of CO_2 is released during road construction. And bitumen of fossil origin is still needed as a binding agent. For more than eight years now, Wageningen has been involved in research on replacing bitumen with lignin from wood. With a view to testing this bio-asphalt under real outdoor conditions, a number of demonstration roads have been constructed around the Netherlands, the oldest of which dates from 2015 and runs across an industrial estate in Zeeland. 'The road surface is in good condition, there is no wear and tear, in spite of the heavy traffic there,' says lignin expert Richard Gosselink of Wageningen Food & Biobased Research. Other trial roads are performing well too, such as the cycle path near the WUR campus, where Wageningen researchers are testing different kinds of lignin in various mixtures on three sections of the path. The substance provides an alternative to the fossil binder bitumen, but not all lignin is the same. 'Lignin gives the woody stalks of trees or grass-like biomass their firmness. It is a natural product and its characteristics are heavily dependent on the isolation process, and are different for each kind of wood,' explains Gosselink. Different lignin variants are compared across the sections of road in the trial.

CO_2 IS STORED

In the classic production of bitumen, large amounts of CO_2 are released, whereas lignin from wood actually captures a lot of CO_2. 'Asphalt can last for up to 15 years and the captured CO_2 stays in the road all that time. And even longer if it's recycled,' says Gosselink. And thanks to the use of the natural additive, the asphalt can be processed at a lower temperature. Lignin-based asphalt


PHOTO WUR

Fractionation of biomass


PHOTO WUR

Separation of lignin and cellulose


PHOTO VERSE BEELDWAREN

Lignin

can be produced at a temperature 40 degrees lower that the 180 degrees at which hot bitumen-based asphalt is normally produced. 'This combination of lignin and the lower processing temperature lead to a CO_2 saving of 20 per cent.'

Yet lignin is not yet being used in asphalt on a large scale. One limiting factor for upscaling its use is that it is in short supply. Lignin is a by-product of pulp and paper production, but because of its high energy value, it is used as a fuel by the factories themselves. 'Whereas lignin's economic value as a binding agent is five times higher than that. But if there is not much demand, lignin will not be extracted on a large scale for use as a raw material. Demand will only go up if lignin starts being used in more applications.'

One of the new applications of lignin is in the processing of panel material. Together with panel material producer Trespa, Wageningen Food & Biobased Research has developed panels in which half of the adhesive phenol is replaced with lignin. These have recently been launched on the market.

REUSING LIGNIN-BASED ASPHALT

To further stimulate the use of lignin in asphalt, at the beginning of 2020 Wageningen started working with 22 parties from the entire production chain in the CHAPLIN programme (Collaboration in aspHalt APplications with LIgniN). The consortium, which includes research institutes, the national public works agency, small and medium enterprises and large building contractors such as Dura Vermeer, wants to conduct additional research with the aim of being able to upscale the use of lignin in asphalt. Partly thanks to a grant of 1.5 million euros from the Netherlands Enterprise Agency (RVO), trial sections will be laid down along a provincial highway this year. 'This will enable us to collect more data about the usage phase, and get a good impression of the life cycle,' says Gosselink.

PHOTO SHUTTERSTOCK

'We also want to study how the lignin bio-asphalt can be included in the recycling process. For example, we are going to look at whether a surface layer with lignin in it can be reused as a bottom or middle layer. All these steps are necessary for making lignin mainstream in the asphalt industry.'

NO ADDITIONAL FELLING

The recently revived debate on the use of biomass as a source of heat and electricity creates an opportunity for the industry to extract resources such as lignin from wood, says Gosselink. 'When biomass is burned, the CO_2 in it is immediately released into the atmosphere, along with particulates. Used as a raw material, wood captures this greenhouse gas for a much longer time, and no additional trees need be felled for the lignin production.'

Are there any disadvantages to using the natural adhesive? 'At the moment we can't use more than 50 per cent lignin in the asphalt mix,' says Gosselink. 'Its adhesive power goes down after than because that requires some specific components from bitumen.' He sees it as phase 2.0 of the study to replace bitumen completely. 'It would be fantastic if in future we could get all the asphalt characteristics we need from biobased by-products.' ■

www.wur.eu/bioasphalt

PHOTO WUR

A mixture of lignin and bitumen

'The road surface is in good condition, there is no wear and tear'

PHOTO SHUTTERSTOCK

Bio-asphalt

Wolves in search of habitats

The wolf is a symbol of unspoiled wilderness. And yet there are now around 10 wolves in the densely populated Netherlands. They are welcomed by some and feared by others. 'The return of the wolf forces us to have a rethink.'

TEXT MARION DE BOO **PHOTO** KARL VAN GINDERDEUREN / BUITENBEELD

In 10 days this spring, a lone young wolf near the Dutch village of Heusden killed 61 sheep and wounded as many again. The TV news showed images of lambs bleeding, at their last gasp. 'He even chases cows and horses,' declared local livestock farmer and farmers' representative Mari van Drunen in the Dutch daily paper *De Telegraaf*. 'Farmers are taking their children to school by car now, and carry a pitchfork when they go outside after dark.'

'We would rather not have these wolves here,' agrees Saskia Duives-Cahuzak, chair of the sheep farmers' branch of the Netherlands Agricultural and Horticultural Association (LTO) and a member of Gelderland province's wolf committee. 'But you can't keep them away, so we are trying to come up with solutions in consultation with all parties.' In France and in some parts of Germany, every sheep farmer is given a livestock guardian dog by the government. But Duives-Cahuzak doesn't think this is the answer. 'Those dogs can also chase holiday-makers. There are 17 million people in the Netherlands and now that everyone is going on holiday in their own country because of the coronavirus, the whole country is out on bicycles. And those dogs are expensive: about 5000 euros to buy and 1000 euros a year to keep. And one dog is not even enough: you need at least three per flock.'

'The wolf population won't get out of hand here'

Experience with wolf-proof fencing has been more promising. On the advice of the wolf committee, in August Gelderland province established a subsidy for erecting electric fences. 'But they only fund the extra component that you need to make the fence wolf-proof,' says Duives-Cahuzak. 'It takes a lot of labour too and we don't get any compensation for that. And what about large areas such as heaths and dykes? It's not easy to fence those off. It's so easy to say, "just put up some netting and protect your sheep," but if the interests of livestock farmers are not taken into account, support for the wolf will soon dwindle.'

Clearly, the wolf is back in the Netherlands after a 150-year absence. Its arrival was expected and it is welcomed by some and feared by others. At present, support for the wolf is increasing steadily in the Netherlands, according to results of an opinion poll done by the provincial governments that was published in June. Fifty seven per cent of the Dutch feel positive about the return of the wolf and 65 per cent consider it a harmless animal. Three quarters of the Dutch population would see an encounter with a wild wolf as an exciting experience, and nearly half would love to come across a wolf in the wild. But 18 percent feel the wolf is unwelcome because of lack of space, its predation on livestock, and the possibility that it will be a nuisance and cause dangerous situations.

FOUR NEW CUBS

Lone German wolves have been taking a look across the border since 2011. In 2019, a pair took up residence in the North Veluwe area of countryside. Last year, they had five young and this year the wildlife cameras showed four new cubs. 'Half the cubs do not survive the first year,' says the Wageningen animal ecologist Hugh Jansman. He follows the movements of established and roaming wolves using genetic analysis of traces of DNA from droppings: are they really a wolf's and if so, from which pack? This year to date, eight different wolves have >

> ‘Wolves will move on from farmland where there are only sheep’

been identified, most of them in the north and east of the country. Their distribution can be followed through quarterly bulletins on the website of BIJ12, the 12 Dutch provinces’ implementing organization for keeping the countryside thriving. Even dead wolves are examined to find out the cause of death as well as their age, sex, condition, stomach contents, reproduction status and any infections present such as rabies. ‘Up to now, all the wolves that have been run over have been perfectly healthy,’ concludes Jansman.

European legislation forbids the capture or shooting of wolves. Jansman: ‘In the long term, that wouldn’t have any effect anyway. The wolves in the Netherlands are part of larger, West European populations. They will just keep coming. In Germany the first pack established itself near the Polish border around the year 2000. Now there are already about 1000 wolves in Germany and their numbers keep on increasing. In view of that unstoppable advance, there is also no point putting a fence all along the Dutch border to keep out roaming wolves.’

DOGS OFF THE LEAD

So the interprovincial wolf plan of 2018 focuses on things like information-spreading and damage prevention. All livestock farmers in the Netherlands are compensated for damage caused directly by wolves – for dead animals and veterinary costs. When a wolf is suspected, Wageningen analyses the DNA from fluids from the wounds of bitten sheep. Jansman: ‘About 5000 sheep are bitten to death every year, but 95 to 99 per cent turn out to be the victims of dogs let off the lead.’ In 2019, 165 sheep were bitten to death by wolves. About 10,700 euros was paid out in compensation for damage by wolves, which is 0.04 per cent of all the compensation for fauna damage (25 million euros).

Jansman expects conflicts will go on occurring: ‘A roaming wolf in search of a territory of its own doesn’t know that large areas of the Netherlands are unsuitable for it. Wolves will move on from farmland with only sheep, because it’s too risky for them. And in nature areas, established packs won’t tolerate new packs. So the wolf population won’t get out of hand here. Wolves are very territorial and defend their territory fiercely against intruders of their own species. Out of all wolves, 68 per cent get killed sooner or later by another wolf, and that is how the population keeps itself under control.’

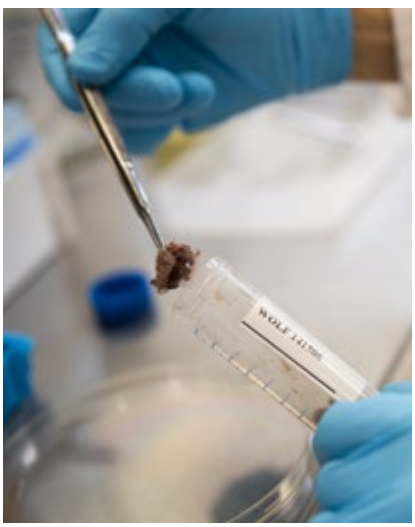


PHOTO ANP/JEROEN JUMELET

In Wageningen, a DNA sample is taken from sheep’s wool to find out if a wolf did the damage.

DEER POPULATION

Does the Netherlands have room for the wolf? ‘Definitely,’ says Jansman. ‘The wolf is protected by law and can find enough to eat here. Nowadays we hardly ever get the severe winters that keep populations of deer and wild boar down. On the Veluwe, where wolves have been established for two years now, the number of incidents involving sheep can be counted on the fingers of one hand.’

Tensions arise, says Jansman, when roaming wolves turn up in farming areas. Young wolves become sexually active in their third year. Some of them then leave the pack in search of new habitats. ‘It is those young, inexperienced loners that can’t catch big game on their own and go for easy prey like an unsuspecting and unprotected sheep in the meadow,’ says Jansman. ‘Usually they then make a quick escape, covering about 40 to 50 kilometres a day. But if an animal like that hangs around, it causes a big reaction. And that will go on happening, because wolves don’t encounter many barriers. They cross motorways, swim across rivers and make use of tunnels and bridges. They could turn up anywhere, even in the Westland area or Zeeland.’

SELECTIVE HUNTING

According to Jansman, wolves are highly intelligent. Working as a pack, they hunt wild animals that are far bigger and heavier than they are. ‘Wolves have an unerring instinct for the weak spots in the health of their prey. Their favourite food is the red deer. Some wolves killed a deer near my house here on the Veluwe. The deer had 20 deer botflies in its throat. All those fat

PHOTO RUUD PLOEG

A sheep farmer installs an electric fence to keep wolves at a distance.

larvae cause breathing difficulties, so a wolf can easily catch the deer. Wolves hunt very selectively, helping to keep the wildlife healthy.

Once it is established, a pack of wolves mainly eats wildlife. Researchers in former East Germany analysed 6500 wolf droppings. The menu had included roe deer (53 per cent), wild boar (18 per cent), red deer (15 per cent), fallow deer and smaller prey such as hares. Livestock accounted for only 1.1 per cent of the diet. Duives-Cahuzak of LTO Netherlands is not reassured by this. She is afraid that in the Netherlands, the wolf will eat far more livestock. 'Our farming is much more small-scale, and farms border nature areas everywhere.'

German livestock farmers no longer get compensation for wolf damage if they haven't taken steps to prevent it themselves. They usually work with an effective combination of electric fences and livestock guardian dogs. Wolves hate electric shocks so they steer clear of electric fencing. Jansman: 'You don't really need a dog – an electric fence on its own works just as well. And aggressive dogs cause problems in areas with a lot of holidaymakers.'

FARMERS UNDER THREAT

'All over Europe you can see that most of the people opposing the wolf are livestock farmers who feel their survival is under threat,' says the Wageningen environmental anthropologist Robert Fletcher. 'They feel livestock farming is no longer highly valued, and that the EU would prefer to see it disappear to make way for nature. They feel threatened and the wolf is symbolic of that conflict.'

Fletcher coordinates the international research project Conviva, which studies ways of encouraging people to live peacefully side by side with large predators such as the wolf in Finland, the jaguar in Brazil, the grizzly bear in Canada and the lion in Tanzania. 'These are all top predators that play a key role in the ecosystem and appeal to our imagination, but which are also often involved in conflicts with people. We research the common patterns you can identify in these conflicts, and which measures are effective for co-existing peacefully with these large predators.' For example, the researchers try to find out why the Finns, who have co-existed with bears for centuries, have such a difficult relationship with the wolf.

Hugh Jansman: 'The wolf holds up a mirror to us, showing us how distanced we humans have become from nature. Mediterranean farmers have always had to deal with large predators, but our farmers haven't been used to that for 150 years now. The return of the wolf forces us to have a rethink.' ■

www.wur.eu/wolves

SCIENTIFIC ANALYSIS PROVIDES PERSONAL DIETARY ADVICE

How healthy is my diet really?

Not everyone gets enough vitamins from their food. You can find out whether you are getting enough of these essential nutrients from NutriProfiel, an analysis of your blood values and eating habits developed by doctors and scientists. Reporter Tessa Louwerens tested it for herself.

TEXT TESSA LOUWERENS **PHOTOGRAPHY** ALDO ALLESSI **INFOGRAPHIC** PETRA SIEBELINK (WUR)

It is quiet in the Gelderse Vallei hospital (ZGV) in Ede, where I am waiting my turn to have a blood sample taken. I'm in perfectly good health; I'm here for a bit of research of my own. I see myself as a fairly fit person: I exercise regularly, don't smoke, and I think I have a healthy diet. But how healthy is my diet really, and what could be better?

NutriProfiel has the answer, says the website. It can give me personalized dietary advice based on my blood values and eating habits. It is a project of the Dutch Nutrition in Healthcare Alliance (Alliantie Voeding in de Zorg), whose mission is to apply scientific findings on diet and exercise in healthcare. The key partners are Wageningen University & Research, the Gelderse Vallei hospital and Rijnstate hospital in Arnhem.

Four tubes of blood are taken so as to measure levels of haemoglobin, ferritin (iron level), folic acid, and vitamins B6, B12 and D. 'Those values provide a picture of the long-term balance of the micronutrients,' explains Michiel Balvers, a researcher in the Human Nutrition and Health chair group in Wageningen and the NutriProfiel project leader. The body lays down a store of certain vitamins. You have a buffer of B12, for example, to last you over a year. Balvers: 'So if your blood values are too low, you've had a deficiency for some time.' It is these vitamins for which the values are measured because deficiencies are common. 'About 20 per cent of the elderly have too little B6,' says Balvers. 'We also see in our analyses that 5 to 10 per cent of the patients have a folic acid or B12 deficiency. And in winter you can assume that half of the Netherlands has a vitamin D deficiency.'

Deficiencies can cause serious health problems. A lack of B12, for instance, can cause neurological symptoms such as exhaustion, tingling feelings, memory loss and muscle cramps. Insufficient vitamin D increases the risk of fractures. Balvers: 'With NutriProfiel we can bring dangerous deficiencies to light in time, before serious and sometimes irreversible symptoms occur. Like permanent neurological damage caused by a long-term vitamin B12 deficiency.'

But the test results don't tell you everything. 'You can't really interpret the blood values properly if you don't know what a person eats,' says Balvers. So the blood test is complemented with the *Eetscore* (eating score) questionnaire developed by the >

Human Nutrition and Health department.
At home at my PC, I spend 15 minutes answering questions about how much I eat of various product categories, and how many times a week I eat them. The categories are dairy produce, whole grain products and vegetables. That information is set against the Dutch Nutrition Centre's Healthy Diet Guidelines.
Some questions are hard to answer, like how many 50-gram spoonfuls of vegetables I eat per day. How reliable is my memory? I don't weigh my food. 'The questionnaire has to be easy to fill in, so you don't have to weigh your food,' says Balvers. 'The eating score measures the quality of your diet. If you fill in the questionnaire honestly, it gives a good picture of the degree to which your diet matches the guidelines, and where there is room for improvement.'
The programme draws up personalized dietary advice based on the *Eetscore* questionnaire and the blood tests. While I'm waiting for that, I call Ben Witteman, a gastrointestinal consultant at ZGV who has been involved in NutriProfiel from the start. He uses the method in his practice, and even as a diagnostic tool. 'Let's say you see that a person has low blood values but a healthy diet. Then you first look for other causes such as intestinal problems that impede the absorption of vitamins.' As well as this, NutriProfiel can be used preventively. 'If the blood values are good, but the person's eating habits could cause deficiencies in the long term, we can intervene in time.'

NutriProfiel also helps make people more aware of how important diet is, says Witteman. 'Patients will tell me that their diet is healthy. But when I see their answers on the *Eetscore*, there can be room for improvement. I can go into that with the patient. Everyone has some idea of what is healthy, but few people follow the Healthy Diet Guidelines.'

FEELING BETTER

Witteman notices that patients often feel better after changing their eating habits. 'Diet is important: not just for keeping people healthy, but also for helping people with chronic conditions feel better. I have identified and then treated several coeliac patients through NutriProfiel, for instance.'
My NutriProfiel result is ready in just under a week after the blood test. I'm curious and a tiny bit nervous. Maybe I too, like those patients of Witteman's, have a distorted idea of what is healthy.
My blood test results are good, except that my iron level is low. Iron deficiency can lead to anaemia because your body manufactures less haemoglobin, resulting in tiredness, paleness and getting out of breath easily. It turns out my diet doesn't contain enough iron. NutriProfiel advises me to eat iron-rich products (with more than 0.8 milligrams of iron per 100 grams) such as meat, fish and whole grain bread. Or, for vegetarians like me: eggs (four per week is enough), tofu, tempeh, nuts and iron-rich readymade meat substitutes. It is also sensible to eat more citrus fruits with a bread-based meal: vitamin C supports the absorption of iron. Polyphenols in coffee and tea do just the opposite.
From the eating score questionnaire, it seems that my diet is generally fairly healthy (illustration 1), although I don't get the recommended daily allowance of 150-200 grams of vegetables (4 serving spoons). I could improve that by making homemade soups with vegetables, perhaps frozen, or by eating a vegetable omelette. My diet is low in certain vitamins too (illustration 2). My vitamin D score is particularly low. That could be boosted by spreading more margarine on my bread, as vitamin D is added to that.

> 'I have identified several coeliac patients using NutriProfiel'

NO HARM?

What about vitamin pills? Balvers says that generally speaking, they are unnecessary. 'In fact, you sometimes run the risk that you get too much. In the case of vitamins, it is certainly not always true that "it can't do any harm". Supplements often contain vitamins in large doses, sometimes a lot more than it says on the label.'
You excrete an excess of vitamin C in your urine, but that is not the case with all vitamins. Balvers: 'In 10 per cent of our blood samples, we see levels of vitamin B6 that are too high. That is due to supplements, because you won't get amounts like that from your food. Every year in ZGV, we see a few patients with vitamin B6 toxicity.' One of the most famous of these was the skater Sven Kramer, who incurred nerve damage in his right leg as a result and could not skate for a winter.
In my case, most of the vitamins in my blood are on the low side. But according to NutriProfiel, I don't need to go on supplements. Balvers: 'Theoretically, you can get all the nutrients you need from a vegetarian diet. Eat pulses regularly, for instance, and eat meat substitutes with added iron and B12. Especially if you do a lot of sport, for instance. And if you are going to take a supplement, make sure it doesn't contain

NUTRIPROFIEL

Reporter Tessa Louwerens did NutriProfiel's vitamin check. Personalized dietary advice is based on the vitamin levels in people's blood and an analysis of their eating habits.

more than 100 per cent of the recommended daily dose.'

NutriProfiel was started five years ago and has already achieved a lot, says Balvers. 'We started out with three GPs, and now we're working with all the GPs in the region and several specialists at ZGV, and we are creating dozens of profiles every week.'

NutriProfiel is free for people referred by their GP, while consumers who want to take the test on their own initiative pay 89 euros. There has not been any research on whether people follow the advice they get. Balvers: 'NutriProfiel brings together the science on a healthy diet and uses it for practical advice on how to eat according to the Healthy Diet Guidelines – which have been proven to contribute to your health. We have not investigated whether our recommendations are actually leading to behaviour change.'

There is, however, work going on to support people in putting the advice into practice. Wageningen municipality, for instance, joined the Nutrition in Healthcare Alliance six months ago and started a project that links NutriProfiel to cookery courses in a community centre, aiming to help people cook healthy affordable meals.

It is true that it is surprisingly difficult to change your habits and I don't know if I'll manage, but I'm going to try. Time to dust down the blender and make soups, and I can easily manage four eggs a week, given the rate at which my chickens lay them. ■

https://nutriprofiel.nl/english

CLARITY FOR THE BIOBASED ECONOMY

How standards ma

Clear agreements are needed for the Dutch economy to achieve the goal of growing from its current 7 per cent circular and biobased production to 100 per cent by 2050. Agreements about standards that new materials have to meet, for instance. Not an easy task in a fast-changing world. Developing such standards takes a lot of scientific research.

TEXT ARNO VAN 'T HOOG **ILLUSTRATION** JEROEN MURRÉ

ke for consistency

More and more food packaging bears the seedling logo for 'compostable', meaning that the packaging meets the European standard EN 13432 and is therefore fit for processing into compost at an industrial composting plant, along with organic waste. Standards are voluntary agreements between market players such as packaging manufacturers and composters about product or material characteristics, standard sizes or measuring methods. EN 13432 states, for instance, that products should disintegrate in less than 12 weeks into pieces of less than two millimetres, and should be completely broken down in six months. But the standard also describes procedures, conditions and the timescale within which the compostability should be tested. 'These are the recurrent features of many standards,' says Maarten van der Zee of Wageningen Food & Biobased Research, who has been doing research on the scientific basis for new standards for over 20 years.

Van der Zee got his doctorate in 1997 for research on the breakdown of biodegradable biopolymers such as polylactic acid. 'At that time I developed all kinds of measuring methods, which is how I ended up in the world of standardization.' He went on to work on research questions related to the characteristics of biobased products, such as plastics that are partly made out of plant-based raw materials. 'How do you determine the biobased content? Often scientific research is needed first before you can neatly encapsulate the appropriate measuring method in a standard.'

TRANSPARENT PLASTICS

Standards often emerge as an answer to developments in society and the need for new policy. Europe, for example, wants to move towards a circular, biobased economy. 'Of course you then have to be clear about what that really means, and how you measure it,' says Van der Zee. 'Whether things are biobased cannot be seen from their appearance. PET, polyethylene or polylactic acid, for instance, are all transparent plastics that can be made out of both plant-based and fossil fuel-based ingredients. You can't see with the naked eye what the proportion of plant-based material is, so you have to measure it.'

> ‘Standardization doesn’t yet mean the market is developing spontaneously’

Within the EU project Open-Bio, Van der Zee and international colleagues developed a method that made use of the same principle as the carbon dating with which the age of archaeological finds is determined: the presence or absence of the rare radioactive carbon-14 isotope in the material. Van der Zee: ‘Through solar radiation, there is a tiny amount of carbon-14 in the atmosphere and therefore also in plants, which have absorbed that carbon dioxide from the air. But it is not present in crude oil. Plastic in which no carbon-14 can be detected is therefore of fossil fuel origin. And the level of carbon-14 can be indicated using a scale from 0 to 100 per cent. A product that is a mix of fossil and plant materials will be somewhere in the middle. This measuring method has now been established by the European Committee for Standardisation (CEN) in the European standard EN 16640. This can be used by policymakers for stimulating the use of plant materials. Subsidy schemes, for example, can include requirements for the composition of materials, which can be measured using standard EN 16640.’

MARKET INFLUENCE

Standards have to be technically feasible and assessable. But you also need market players such as manufacturers to be on board, and to benefit. Measuring isotopes may sound like a fool-proof method of determining the proportion of plant materials, but some manufacturers feel cheated by it. It only looks at the biobased proportion of the carbon that is present, while plant materials often contain a lot of other elements – far more than fossil fuel-based materials. If a manufacturer replaces half the petroleum-based plastic with starch-based plastic, the isotope method won’t come up with a figure of 50 per cent, but only roughly 20 per cent as that is the proportion of biobased carbon. That difference is difficult to explain to customers, and therefore difficult to sell, says Van der Zee. ‘When this came up a few years ago, that biobased percentage was very important in the marketing: the higher the better. That is why an additional standard was developed (EN 16785-1), which uses a calculation based on the ingredients used. This shows that the market has an influence on the development of standards too.’ Meanwhile, the biobased percentages are no longer the only thing that is looked at, says Van der Zee. ‘The sustainability and recyclability of materials are taken into account now too. Take for example the use of water and raw materials during production, as well as what happens to the leftover waste: it is recycled, composted or incinerated.’

BIOBASED BARRIERS

Although various standards are now enforced, this hasn’t yet resulted in the market for biobased products developing automatically, says Ortwin Costenoble, who works at NEN (the Royal Netherlands Standardization Institute) and as a project coordinator at Open-Bio and a second EU project WUR is collaborating on: STAR4BBI. The main focus of STAR4BBI is research on the question of why there are still barriers to the introduction of biobased products. Costenoble: ‘Some composting companies are opposed to letting people put bioplastics in the green bin for food and garden waste. They are afraid that more non-compostable plastics will get into the green waste because households are careless about sorting their rubbish. Then the companies have to remove that before or during the composting process, increasing the chances that compostable plastics will get removed too.’

Another sticking point is that common composting practice has deviated from the situation on which the test standard for compostable waste is based.

‘Packaging companies have designed a product that meets the requirements for disintegration, based on the time it takes for regular organic kitchen and garden waste to break down: 12 weeks. But in the interests of efficiency and cost effectiveness, composting companies have been using shorter and shorter cycles, sieving out material that hasn’t decomposed sufficiently and adding it to the next load of green waste to be composted further,’ explains Costenoble. ‘In short, common practice has changed.’ That leads to doubts among producers as to whether their products still meet the criteria. Van der Zee: ‘So it would seem like a good idea to find out whether the testing method should be adapted to the situation in which composters put undigested organic material back into the process along with fresh supplies of green waste.’ >

> ‘A set of standards like this is an important condition for achieving a cycle of reuse’

WHAT ARE STANDARDS?

Standards are agreements on things like standard sizes, performance criteria and material characteristics that increase the consistency of products and production methods. They ensure, for example, that plugs always fit sockets. Every organization is free, within the limits of the law, to make such agreements within the organization or with other organizations. Standards that are developed under the supervision of the Netherlands Standardization Institute (NEN) are known as NEN standards.

Organizations are free to apply standards or not. Some buyers ask for them. NEN standards can also help producers meet legal requirements. Anyone wanting to prove that a product or process meets the requirements of a standard can opt for certification. Sometimes that can be combined with a label.

Standards have been agreed in the biobased sector as well. Several standardization committees are active in this field, including the Biobased Products committee, which has been working since 2010 on general standards for biobased products, such as the content of biogenic material, and how that is assessed, the life cycle or the sustainability.

One example of a biobased standard is the one used to determine the biobased content of a product: NEN-EN 16640:2017, ‘Bio-based products – Bio-based carbon content – Determination of the bio-based carbon content using the radiocarbon method’. Details are given of the measuring methods you can use for this and how to calculate the proportion of biogenic material using the results.

One of the policy recommendations from the STAR4BBI project is to use biodegradable plastics mainly for products that the compost company can also expect to get added value from. That way, packaging manufacturers can enhance their image with a green and compostable product, while the composters get a new waste stream that is profitable for them. Costenoble: ‘Take coffee pads or teabags, for instance. Their contents are largely organic matter – coffee grounds and tea leaves – which could swell the volume of compostable waste. So make sure you incentivize producers to use biodegradable plastics for those products.’

The idea of being able to put all coffee pads and capsules and teabags in the green waste bin in a couple of years appeals to Erwin Vink, sustainability manager at NatureWorks, the world’s biggest producer of polylactic acid (PLA). PLA is biodegradable in an industrial composting plant, where it breaks down so that bacteria can consume the lactic acid. It can also be used for making coffee capsules and replacing the polypropylene in teabags and coffee pads. Vink: ‘We would like to see more of these kinds of useful compostable products coming on the market. You could say, there is only a little bit of tea or coffee in a capsule or teabag. But globally it adds up to quite a mountain. Composting is the only right way to process tea and coffee waste. So make the packaging compostable too. The Coffee and Tea Producers branch organization has since taken up this idea and started a project aiming at a sector-wide transition to compostable coffee pads and teabags by January 2021.’

COMPOST HEAP IN THE GARDEN

Vink says composting companies tend to be a bit conservative. So last year, Maarten van der Zee started a study on how 10 compostable products perform in industrial composting plants. ‘That study showed that the biobased teabags and coffee pads compost well in the plants. Of course some products break down faster than others, but that is no different with “normal” organic waste: grass and lettuce also breaks down faster than orange peel or twigs from the garden.’

Here, Vink touches on another sticking point: the misunderstanding that compostability is a universal

characteristic. ‘People assume that compostable packaging will break down in their own compost heaps in the back garden too, whereas that is often not the case. In an industrial installation, the temperature can go up to between 55 and 65 degrees due to bacteria and heating, so the breakdown process goes a lot faster than in the compost heap.’ To make that difference clear, a separate standard is under development for products that are compostable at home. So by the end of next year there may be two European standards, with two logos, for two forms of compostability. But Vink is not in favour of people composting packaging at home. ‘A compost heap in the back garden is not a reliable environment for composting biodegradable plastic. Everyone goes about composting in their own way, and how the composting goes is strongly affected by the weather conditions. What is more, with home-composting, the emissions are not under control, which means that as a waste disposal method it is much less circular than it appears.’
Van der Zee agrees with him on this. ‘Home-composting is attractive for cutting the municipal costs of waste collection and disposal, but that doesn’t make it sustainable or circular. I would prefer to see more effort going into standards for making it easier to recycle and reuse materials.’

MAARTEN VAN DER ZEE
Senior Biobased Products researcher

STANDARDS FOR RECYCLING

Standards play an important role in the reuse of regular plastic from household waste, too. Currently in the Netherlands, about 30 per cent of discarded plastic is recycled into material for new products such as garbage bags, buckets, bottles and foils. Recycling companies produce what is known as recyclate: granules that manufacturers can melt in order to make new products with them. But demand does not meet supply in the recycling market, notes Ingeborg Smeding, the recycling project leader at Wageningen Food & Biobased Research. ‘We have carried out research which showed that recycling companies have difficulty selling their recyclate. And producers say they can’t find enough suitable material that meets their needs.’
The odour of recyclate is one factor: recycled plastic often has a smell that manufacturers don’t want for their products. Smeding: ‘Colour variation is another important point. It doesn’t matter if recycled plastic granules are grey, as long as they are always the same shade of grey. There are still no standards for those kinds of material characteristics. What you see is that every recycling company interprets it in their own way. They make datasheets with the technical details about every batch of granules, but that makes it very difficult for manufacturers to compare batches of plastic and suppliers.’
So there is clearly a demand from the market to increase uniformity through standardization: a description of a fixed set of test characteristics for a batch of recycled plastic for a specific application. According to Smeding, such standards could be about composition, purity, colour, smell and mechanical characteristics such as fluidity at a particular temperature. ‘The standards could vary per product, because there are different requirements for soft drinks crates than for plant pots or shampoo bottles. Ultimately, you want a standardized classification that provides clarity on that. A set of standards is an important condition for closing the circle of reuse and significantly increasingly the circularity of the Dutch economy.’ ■

www.wur.eu/renewablematerials

BIOLOGIST JOSÉ KOK:

‘We are responsible for the wellbeing of the animals’

José Kok, head of Animal Care at Ouwehands Zoo, is often recognized by children these days as ‘the lady on TV’. ‘I quite often see a budding biologist in a child like that. Maybe I can stimulate their interest by talking about the zoo’s mission. That’s why I do it.’

TEXT RENÉ DIDDE **PHOTOGRAPHY** MARIJE KUIPER

A hot summer’s day in Rhenen, and the Netherlands is enjoying a ‘corona holiday’. At the entrance to Ouwehands Zoo there is a long and winding queue to show the tickets bought online. The two giant pandas from China are a star attraction, especially since they had a baby at the beginning of May. ‘But José is a star too,’ says the receptionist when I ask for the head of Animal Care. José Kok, who graduated in Biology from the Agricultural College in Wageningen in 1986, knows all there is to know about big bears, including the giant panda.

Two young pandas, the female Wu Wen and the male Xing Ya, came to Rhenen from China in 2017 after long negotiations. Accommodation fit for royalty was built for the pair, styled like a pagoda and with several storeys and rooms, and a farrowing hole in the cellar. A square and a section of ‘Great Wall of China’ complete the panda palace. Today, Xing Ya is hanging almost motionless in a tree in front of an audience of hundreds. Young mother Wu Wen is still in the farrowing hole, and no one is allowed near her. But on an enormous screen, the visitors can see a baby giant panda lying on its mother’s belly, and looking at least as relaxed as his dad a few storeys higher up.

TELEVISION PRIZE

The receptionist is right. As we walk around the zoo, it seems all eyes are on José Kok. ‘That’s the lady on the TV,’ we hear repeatedly. In her ‘natural habitat’, José Kok just goes on talking, but there is no escaping the attention. She is asked to pose for a photo twice during the guided tour. Kok has her appearances on the children’s news programme *Jeugdjournaal* and the Dutch TV series *Real Life in the Zoo* to thank for this star status. The second season of the series finished just before the summer, and was nominated twice for the Dutch TV prize, the Gouden Televizier-Ring. ‘In the series, we show the behaviour of animals in the zoo and the things we do to take good care of them,’ explains Kok. ‘Children recognize me from the TV series and the *Jeugdjournaal*. The attention doesn’t interest me. What interests me is that I quite often see budding biologists in those children. Maybe I can stimulate that interest by talking about the zoo’s mission. That’s why I do it.’

For Kok, part of that mission is to let the animals be ‘ambassadors’ for their species in the wild, whose survival is under threat. ‘That is only possible if they display behaviour typical of their species, which they >

José Kok, head of Animal Care in Ouwehands Zoo, at the panda enclosure.

José Kok and a colleague deliver food to the giant pandas' outdoor shelter in Ouwehands Zoo.

will only do if they are well looked after in good housing,' says Kok. She came to work at Ouwehands in 1994 after responding to a newspaper advertisement for a 'biologist-educator', and she was allowed to get straight to work on the educational role of the 'Bear Forest', two hectares of wooded land set aside for brown bears that have been abused in the past. There is such a long queue at the entrance to the 'Bear Forest' that Kok phones Security to ask them to come and enforce physical distancing. 'We work with time slots so as to spread visitors over the day. At any given time of day we are allowed to have 2500 visitors here.'

Do the visitor numbers confirm the popularity of the zoo – thanks to the giant pandas?

'People have a thing about giant pandas. They make them start thinking about the fate of this species. My motto is: "Be amazed and admire": knowledge breeds respect for nature. Not just the pandas' habitat, but that of almost all the animals here that is threatened. We want to do something about that. Ouwehands Zoo Foundation donates more than a million euros a year to protecting the habitats of species found here in the zoo, including the giant panda. We replicate their habitat as closely as we can here, and we breed the animals.'

What are the breeding programmes for?

'In breeding programmes we exchange animals with other zoos to keep up the genetic diversity and prevent inbreeding. We often consult the international nature conservation organization IUCN – the organization behind the red lists of threatened animal species. We bring their work to our visitors' attention. The aim is to keep the species going. Yes, see the zoo as a reserve population for the animals in the wild.'

But if you want to save, say, the giant panda, surely you've got to stop the damage to the biotope too?

'Of course the decline of the giant panda is due to the growth of the Chinese economy and population, with the creation of motorways, railway lines and dams, and the massive expansion of urban areas. I am critical of that, and I am pleased that the Chinese president Xi Jinping has embraced the giant panda as a symbol of China, and has pledged to protect it. We are contributing by creating green corridors for the giant pandas, together with the Worldwide Fund for Nature, so that isolated habitats are connected. The population in the wild is actually growing!

'In the 15 years that we'll have Wu Wen and Xing Ya here on loan, we'll have paid China a million dollars a year. We have verified that 85 per cent of that is spent in China on research, conservation of the panda's

‘In fact, the visitors fund all the research as well. I think that’s a good thing’

habitat – which benefits many other species too – and releasing pandas into the wild. We recoup that million dollars plus the investment in the giant panda pagoda from ticket sales and merchandising. In fact, the visitors fund all the research as well. I think that’s a good thing. I’m not the tree-hugging kind of biologist. I want to save animal species through green business.’

The Party for the Animals (a Dutch political party) talks of ‘harming animal welfare’ and wants an end to zoos ‘in their current form’.

‘Sadly, the Party for the Animals doesn’t let us – or any other Dutch zoo – inform them about the role of zoos in nature conservation. They have not responded to any of our invitations so far. They would be enthusiastic if they saw what we do here for the animals and for the survival of their species.

‘Just last year we provided photos of our polar bears for the development of a method for identifying polar bears in the wild. That’s what I do this for! Information from zoos is used to protect the species in the wild.’

Why did you study biology yourself?

‘When I was 11 we moved to Oostburg in Zeeuws-Vlaanderen, where I developed my love of nature. I learned to milk cows and shear sheep, I spent a lot of time on the beach and I was involved in a local nature conservation project. Biology was the obvious choice.’

Why at Wageningen?

‘The great thing about studying in Wageningen was the freedom of choice. As well as the compulsory biology courses, I did other things such as epidemiology. The logical fact-based reasoning skills that I learned still come in useful in my current work.

‘And the feeling I got when I came into Wageningen by bus in autumn 1977, after a false start doing Dutch for a year at Utrecht, and saw things like the Bijenhuis bee centre with its honey for sale. And then the dance parties at Unitas, the pub sessions with the basketball team in Loburg and Troost. That feeling of “yes, this is where I belong”. And I still feel that way, because I came back to live here again some time ago. It’s a small town in a beautiful area. The university has a cosmopolitan atmosphere – and it’s really multicultural.’

JOSÉ KOK (61)

Degree: Biology, Wageningen Agricultural College (1978-1987)
Job: Zoological manager at Ouwehands Zoo

Have you got the dream job you envisaged as a student?

‘I don’t think dream job is the right term. I’ve got an incredibly nice job with a lot of freedom that enables me to work towards my dream: conserving nature with a place in it for humanity. But there is also the ethical dilemma about keeping animals in captivity. I carry that around with me all the time. Every day there is the question: how can we keep the animals in a way that feels responsible to us, so that they can fulfil their ambassador role? How can we improve their housing so that they can display their natural behaviour such as climbing, digging or swimming? Is the make-up of the group right, and how can we improve the choice of partner? To that end, we’ve got a dating aviary for young vultures.

‘Upsetting things happen sometimes, too – like the death of a baby polar bear in June. It was taken by its older sister and the mother didn’t intervene. That is strange. Dissection at Utrecht University showed that the victim had a lung condition, which might be why the mother didn’t do anything. A polar bear doesn’t invest in new life that is not viable. We don’t know. But there is always the fear that we did something wrong. We are responsible for the animals’ wellbeing. That is the tough side of this work.’ ■

LOOKING FOR THE IDEAL AGROFORESTRY

‘These farmers deserve support’

In the rainforest of Brazil, food is produced by means of agroforestry: a sustainable method that both protects biodiversity and captures CO_2. ‘These farmers deserve support,’ says PhD student Jonas Steinfeld. With a donation from a European philanthropic foundation, he is studying what the ideal agroforestry farm looks like.

TEXT ANJA JANSSEN **PHOTO’S** JONAS STEINFELD

Seven years ago, as a Bachelor’s student at the University of Maastricht, Jonas Steinfeld went to the University of São Paulo in Brazil on an exchange. There the German student not only met his wife but also developed a strong interest in agroforestry and the Brazilian farmers who practise it. ‘I was moved by their way of life,’ he tells me on Zoom from his house in São Paulo, where he is now doing doctoral research for Wageningen University & Research. ‘They don’t get subsidies, many of them are illiterate and they don’t have much access to knowledge. And yet they are very productive. These farmers deserve support. That would also benefit consumers, nature and the climate. It is a win-win situation.’ In agroforestry, forestry is combined with crop or livestock farming so as to stimulate a lot of positive interactions. In the endangered Atlantic rainforest of Brazil, for example, coffee bushes grow alongside bananas and turmeric plants next to papaya trees. Steinfeld shows a few photos from his research area. One of them is of a field where neat rows of eucalyptus trees are interspersed with rows of grass,

citrus trees and banana trees. Another shows a tract of almost natural-looking woodland with a lot of bananas and coffee, as well as trees for timber production. A third shows beef cattle grazing in the shade of eucalyptus trees.

FAST-GROWING TREES

Eucalyptus trees play an important role in the systematic approach to agroforestry developed by the Swiss Ernst Götsch, who has inspired a lot of Brazilian farmers. He moved to Brazil in the 1980s and starting applying his knowledge of agroforestry there. The fast-growing trees are pruned regularly and the wood is chipped and spread over the soil. The trees absorb nutrients from deeper layers of soil, thus making them available to the other plants. That is how eucalyptus and other trees increase the soil fertility. They also protect the soil against erosion and they capture carbon: examples of what are called ecosystem services.

Compared with monocultures, agroforestry also increases biodiversity. That effect has already been proven, says Steinfeld. In his PhD research, he wants to find out what an agroforestry farm ideally looks like. An important measure of its success is its complexity: the number of species of plants and trees per hectare and the number of different layers of vegetation. A system with many different species and layers demands more maintenance but also seems to produce more food, timber and ecosystem services. Steinfeld wants to know what level of complexity offers the best balance between yields and labour costs. That knowledge should help farmers to plant their farms optimally for food and timber production, the ecosystem and a decent income.

RESEARCH PROPOSAL

Steinfeld, Wageningen professors Rogier Schulte and Rachel Creamer, and Professor Maria Victoria Ballester of the University of São Paulo wrote a proposal for a study of 38 agroforestry farms in the Brazilian state of São Paulo. The farming systems varied from monocultures through simple forms of agroforestry – livestock and trees – to highly complex agroforestry.

> ‘Agroforestry creates a win-win situation’

A donor offered to fund this research through University Fund Wageningen. The donor is a European philanthropic foundation that wishes to remain anonymous, says Fusien Verloop, relations manager at University Fund Wageningen. ‘The foundation came knocking at our door because they wanted to support a project addressing nature conservation. Based on their interests, we came up with three suggestions, and they ended up choosing two of them. Along with the agroforestry project, called CANOPIES, the foundation is also supporting the WUR project REEFolution, which works on restoring coral reefs in Kenya.’

LASER BEAMS

Steinfeld was able to collect his first soil samples before the coronavirus outbreak started. He is now working on plans for a round of measurements on the farms. The idea is to make 3D scans using laser technology known as Lidar. The scanner is placed in the field on a tripod, from which it transmits laser beams, obtaining 3D images of its surroundings. ‘With these, we can establish how complex the structure is, meaning how layered and diverse the vegetation is,’ explains Steinfeld.

After analysing the data, the PhD student wants to do more detailed research on a selection of the farms and to interview the farmers to quantify their labour input. In the last phase of his research, Steinfeld wants to use a model to calculate how much agroforestry farms in the state of São Paulo can contribute to carbon sequestration in Brazil. The project is a logical follow-up to Steinfeld’s MSc thesis, in which he studied four types of farms in the Brazilian state of Bahia. ‘I saw there how productive agroforestry systems could be, both for food production and for the supply of ecosystem services. A farmer with a complex agroforestry system made 10 per cent more profit than a pineapple farmer with a monoculture, and over 70 per cent more than a conventional livestock farmer with livestock in open fields. I thought, wow, can this be true? If so, more people should hear about it. But first it is important to collect and analyse more data.’ ■

www.lighthousefarmnetwork.com

Cows graze in the shade of eucalyptus trees: a form of agroforestry in Brazil.

KLV

Study circles and networks now independent

Following the dissolution of KLV, the alumni society's 14 study circles and networks will operate independently. There is also a new initiative: the New Network, which is open to alumni from other universities too.

'The study circles and networks are volunteer organizations with small budgets. They must not suffer from the dissolution,' explains project manager Gerrianne Jansen of Agri Food Academy, who is coordinating the autonomy process for KLV. 'These are KLV's gems. They play an important role in initiating dialogue and debate, and they bring people together around a topic.'

Some of the study circles and networks already operate independently. A number of them are currently drawing up articles of association. The membership administration and subscription collection are also being transferred. KLV will pay the costs of this until the end of 2021, and there is also money for PR and events.

Meanwhile, a package of services is being worked out in detail that study circles and networks will be able to purchase for a fixed price from University Fund Wageningen (UFW). In addition, the study circles and networks will be able to get money from the KLV Fund for alumni activities that encourage public debate and dialogue and that complement WUR's own alumni policy. This named fund is being set up with KLV's remaining capital and will be managed by UFW.

Meanwhile, five circles and networks have come up with a joint initiative: the New Network, which is also open to alumni from other universities. 'We want to speed up the sustainability transition in the Wageningen domains of food, nature and landscape,' says Pauline Schakenbos (WUR Biology, 1986) a member of the group behind the initiative. 'We're doing that by creating cross-connections.' The New Network organizes monthly meetings and sets up thematic WhatsApp groups.

Info: www.klv.nl

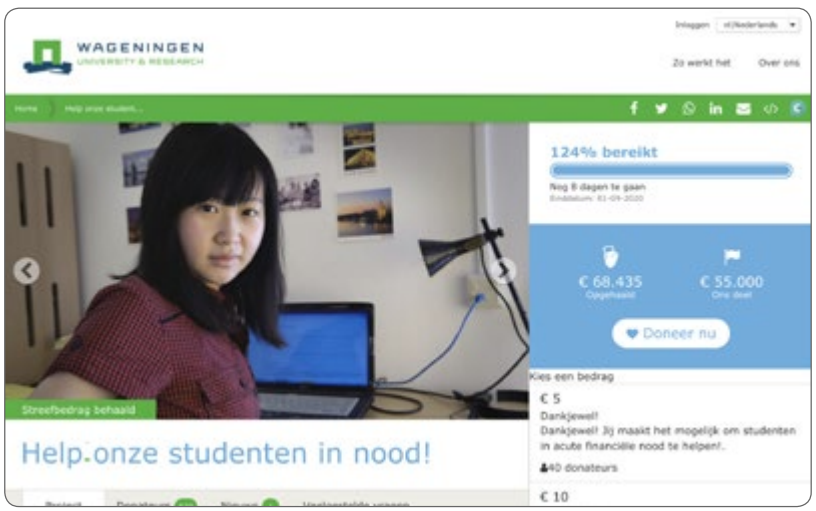
CORONAVIRUS

Lots of donations for students in need

Over 68,000 euros was raised via crowdfunding for Wageningen students who experienced financial problems because of the pandemic. The campaign, which was set up by University Fund Wageningen, resulted in donations ranging from 5 euros to 1000 euros.

That money has been used to help 19 students. One Peruvian student, for example, lost her part-time job in a restaurant that had to close because of the coronavirus. 'I considered cancelling my room and returning to Peru, but the country's borders were closed. The contribution from the emergency fund means I don't need to worry about how to survive for the coming months and can concentrate on my thesis instead.'

Info: ufw@wur.nl



LABOUR MARKET

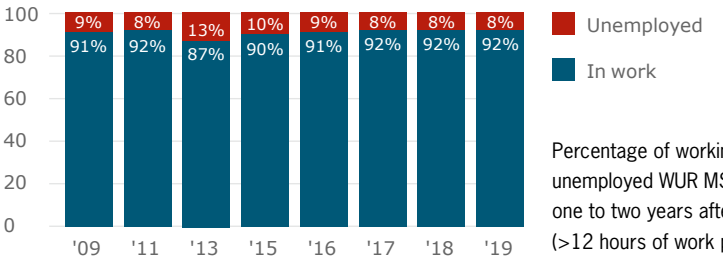
Young data scientists rarely unemployed

Hardly any recent Wageningen graduates with degrees that involve a lot of data science (such as Bio-informatics) are without jobs, according to the National Alumni Survey (NAE) 2019 among alumni who graduated one to two years ago. But unemployment is relatively high among Wageningen graduates in Biology and Forest and Nature Conservation.

Unemployment among recent Wageningen graduates is slightly higher than among graduates of other universities. The figure for MSc graduates from WUR is 8 per cent while the national average is 5 per cent. WUR alumni who have recently graduated also spend a little longer than average searching for their first job: 3 months compared with 2.5 months for other young graduates. 'These results are not much different from previous years,' says WUR policy officer Silvia Blok. 'It seems to be difficult for us to bring down the slightly higher unemployment rate.' Alumni with a Master's in Nutrition & Health can also have difficulty finding a job. Sharon van Stralen, for example, graduated in April 2019 but it took six months before she got a job as a researcher for the youth health monitor of Zeeland Municipal Health Service. 'There were hardly any vacancies in nutrition or health and there were a lot of graduates. So you have to start looking at jobs in related disciplines and then you're competing with graduates from the biomedical and health sciences,' says Van Stralen. She now works as a researcher at the Netherlands Institute for Health Services Research in Utrecht.

Another survey will be held this autumn. Alumni who graduated one to two years ago will be sent an invitation.

Info: www.klv.nl/loopbaanservice/wo-monitor/



Percentage of working and unemployed WUR MSc alumni, one to two years after graduating. (>12 hours of work per week).

NETWORKS

Open day and reunions entirely online

The Alumni Open Day will be online this autumn because of the coronavirus crisis. It will be on Saturday afternoon, 3 October. In addition to the plenary sessions, there is a diverse selection of events for participants to choose from.

There will be a preliminary programme beforehand with a ceremony to officially say goodbye to KLV. KLV members will reflect on the rich history of the alumni society, which was founded in 1886, and will look to the future.

The reunions for alumni from 25 and 50 years ago will also take a virtual form: alumni will be able to catch up online, reflect on their Wageningen days and raise a toast. The 25-year reunion is on Saturday, 31 October and the 50-year reunion on Saturday, 21 November. 'It's a real shame the alumni won't be able to meet up in person but we hope to get as close as possible to that experience with virtual chatrooms,' says Denise Spiekerman of the alumni office.

Info: alumni@wur.nl

WUR CONNECT

Strawberry tart

The winner of University Fund Wageningen's last photo challenge — intended to bring the WUR community together during the coronavirus crisis — is Roman Puchko (WUR Management, Economics & Consumer Studies 2011). Alumni were invited to submit photos of their favourite dishes or cakes. Puchko's submission was a strawberry tart with the WUR logo, which he made with his wife and his mother. 'The strawberries are really local,' says Puchko, 'and they're in the tart too.'

PHOTO ROMAN PUCHKO

Connecting stories

In the 'Nice to (e)meet you' initiative, a virtual pen is passed between alumni who have to then explain how they know the alumnus who added them to the story chain. The initiative will continue until the end of October.

Get involved

If you want to find former fellow students and discover what they or doing now, or if you'd like to offer an internship, job or mentoring, go to www.wurconnect.nl and register for the WUR alumni platform with more than 9000 members.

Birgit Boogaard PhD, WUR Zootechnics 2003, has won the WUR Excellent Education prize in the Specialized Courses category for the new subject African Philosophy. The jury praised the way Boogaard draws her students out of their comfort zone while maintaining a safe learning environment. 6 June 2020.

Jeroen Dijsselbloem MSc, WUR Economics of Agriculture and the Environment 1991, former Minister of Finance, has been appointed a member of the Central Plan Commission, the body charged with advising and supervising the Netherlands Bureau for Economic Policy Analysis. Dijsselbloem is also the chair of the WUR Supervisory Board and of the Dutch Safety Board. 15 June 2020.

Prof. Louise O. Fresco, WUR Rural Sociology of the Non-Western Regions 1976, President of the WUR Executive Board, has become the deputy chair of the scientific committee for the UN Food Systems Summit, due to take place in 2021. The committee consists of 29 leading scientists working on food systems. 26 June 2020.

Ab Groen PhD, WUR Zootechnics 1986, has been appointed a director of the GOO foundation. This foundation provides childcare and education for over 5000 children in Gemert-Bakel, Boekel and Laarbeek. Groen has previously been chair of the board of Helicon Opleidingen and a director at WUR. 1 June 2020.

Prof. Alfred Hartemink, WUR Soil & Water 1994, professor and head of the Soil Science department at the University of Wisconsin-Madison, has been appointed chair of the National Committee for Soil Science in the US. 5 June 2020.

Prof. Leo den Hartog, WUR Zootechnics 1978, director of R&D at Nutreco and professor by special appointment in Sustainable Animal Nutrition in Production Chains at WUR, has been appointed a member of the 'top team' in the Agri & Food top sector. He has taken over the Internationalization portfolio from Ruud Huirne. 6 May 2020.

Gerrit Hiemstra MSc, WUR Farming Technology 1986, meteorologist and weather presenter for the NOS TV company, has been appointed a member of the supervisory board of Omrop Fryslân, with the media as his focus. Hiemstra provides advice about extreme weather and climate change through his company Weather Impact. 19 June 2020.

Otto Hospes PhD, WUR Rural Sociology of the Non-Western Regions 1987, associate professor in the WUR Public Administration and Policy group, has been appointed professor holding an endowed chair at IPB University in Bogor (Indonesia). His research is on the politics and governance of sustainability, focusing on palm oil. 27 November 2019.

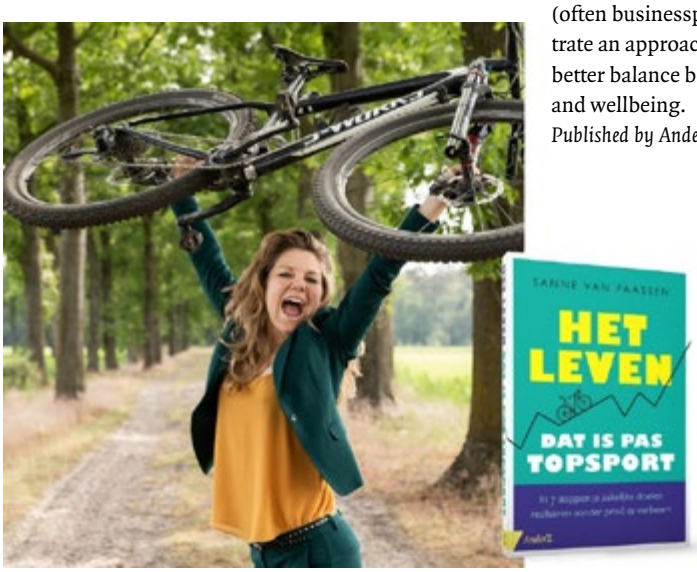
Joline Brouwer MSc, WUR Management, Economics & Consumer Studies 2017, project manager at Oost NL, is the new Gelderland provincial chair of the Dutch Federation of Agriculture and Horticulture (LTO) Woman & Farm North section. 1 January 2020.

Life as the ultimate sport

Sanne van Paassen MSc, WUR Management, Economics & Consumer Studies 2012, winner of the Cyclo-Cross World Cup in 2011, has written the book *Het leven, dat is pas topsport* ('Life, now that's a high-performance sport'). 'I give people tools that let them combine an elite sport mentality with listening to their feelings,' explains mental coach Van Paassen. 'If you only focus on winning and don't listen to your feelings, you will eventually pay the price.'

Van Paassen speaks from experience. 'I combined my degree with elite sport. 'I always kept going, even when I was tired, in a bad mood or had a cold. In the end, my body itself put the brakes on. I got problems with my lungs, and my legs blocked up completely.' In her book, she uses her own experience and that of other professional sportspeople and her clients (often businesspeople) to illustrate an approach that gives a better balance between winning and wellbeing.

Published by Anderz, 20 euros



'I always kept going'

Prof. Eveline van Leeuwen, WUR Land-Use Planning Sciences 2002, professor of Urban Economics at WUR, has been appointed scientific director at the Amsterdam Institute for Advanced Metropolitan Solutions (AMS Institute). Van Leeuwen was already a principal investigator at the institute. 1 September 2020.

Janine Luten MSc, WUR Horticulture 1997, will start in October as the managing director of GroentenFruit Huis, the organization that promotes the interests of companies distributing and selling fruit and vegetables. Luten was previously a director of the dairy supply chain association ZuivelNL and of Wageningen Academy. 9 June 2020.

Rianne Meester-Broertjes MSc, WUR Environmental Protection (water purification) 1972, former councillor in Oestgeest, has been appointed Knight of the Order of Orange-Nassau. She founded the Oegstgeest Environmental Education Centre, where she is still the secretary. 3 July 2020.

Lobke van Oorschot-Coppens MSc, WUR Economics of Agriculture and the Environment 2003, has been appointed the Zuid-Holland provincial chair of the LTO North Woman & Farm section. Van Oorschot is a training manager at Handel Groeit and a council member for the CDA party in the municipality of Goeree-Overflakkee. 1 January 2020.

Prof. Bas Rodenburg, WUR Biology 1998, has been appointed professor by special appointment at WUR. He will study behavioural problems among chickens and pigs. Rodenburg is professor of Animal Welfare at Utrecht University, which is funding his post in Wageningen. 2 July 2020.

Geert Smant PhD, WUR Phytopathology 1994, has started as professor holding the chair in Nematology at WUR. He succeeds Prof. Jaap Bakker, who was Smant's supervisor for his PhD in 1998. 1 March 2020.

Prof. Patrick Verkooijen, WUR PhD 2010, has been appointed professor holding a chair in the Climate Adaptation Governance programme of the Faculty of Spatial Sciences at the University of Groningen. Verkooijen was previously the special representative on climate change at the World Bank Group. He is professor of Practice in Sustainable Development Diplomacy at the Fletcher School of Law and Diplomacy. 28 May 2020.

Prof. Jack van der Vorst, WUR Agricultural Systems Science 1994, managing director of the Social Sciences Group and professor of AgriFood Supply Chain Logistics at WUR, has been appointed a member of the 'top team' in the Agri & Food top sector. He has taken over the post of captain of science from Raoul Bino. 6 May 2020.

Prof. Arjen Wals, WUR Environmental Protection 1987, professor of Transformative Learning for Socio-ecological Sustainability and holder of the UNESCO Chair for Social Learning for Sustainability, has been appointed honorary doctor of the University of Gothenburg in Sweden. 3 June 2020.

Prof. Dolf Weijers, professor of Biochemistry at WUR, has been appointed a member of the European Molecular Biology Organization (EMBO) in Heidelberg, Germany, for his achievements in the life sciences. 7 July 2020.

PHOTO ANNABEL JEURING

Prof. Tom Veldkamp, WUR Soil and Fertilization Sciences 1987, will become the new rector magnificus at the University of Twente in November. Veldkamp has been dean of the faculty of Geo-information Science and Earth Observation (ITC) at the same university for nearly 10 years. 23 June 2020.

IN MEMORIAM

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

Prof. J.P.A. Van den Ban. WUR Agricultural Plant Breeding 1953, emeritus professor of Land Development. 31 October 2019.
Ms G.J. van Bergen MSc. WUR Environmental Protection (water purification) 1988. 30 May 2020.
Prof. J.M. Bloemhof-Ruwaard. WUR PhD 1996, emeritus professor of Operations Research and Logistics. 5 June 2020.
Mr P.H. Fischer MSc. WUR Environmental Protection (water purification) 1983. 17 March 2020.
Mr U. Geling MSc. WUR Rural Economics 1961. 2 March 2020.
Mr H.J.F. Groeneveld MSc. WUR Soil, Water & Atmosphere 1994.
Mr B.A. Ten Hag MSc. WUR Agricultural Plant Breeding 1971. 6 May 2020.
Mr W.Y. Heida MSc. WUR Zootechnics 1955. 15 May 2020.
Mr J.J. Hopster MSc. WUR Farming Technology 1988. 23 July 2019.
Mr A. Kamphorst MSc. WUR Soil & Fertilization Sciences 1962. 30 May 2020.
Ms C.J. Knoppers MSc. WUR Human Nutrition 1977. 17 December 2019.
Mr J.W. Kylstra MSc. WUR Land Development 1981. 15 December 2019.
Mr B.E.J.C. Lekanne gezegd Deprez MSc. WUR Rural Sociology of the Non-Western Regions 1962. 23 May 2020.
Mr A.B. Meijer MSc. WUR Agricultural Plant Breeding 1967. 23 May 2020.
Mr G.A. Pieters PhD. WUR Tropical Forestry 1955. 6 March 2020.
Mr H.J. Poot MSc. WUR Food Technology 1971. 29 October 2019.
Mr H.A. Tennekes PhD. WUR Human Nutrition 1974. 7 July 2020.
Ms A.R. Van Tuil-van den Berg MSc. WUR Agricultural Plant Breeding 1964. 29 June 2020.
Mr M. Verkroost PhD. WUR Horticulture 1967. 31 May 2019.
Mr W.J.A.R. Viveen MSc. WUR Zootechnics 1992. 21 March 2020.
Mr C.D. Voogd MSc. WUR Agricultural Plant Breeding 1955. 16 January 2020.
Mr P.C.W.M. Vossen MSc. WUR Biology 1983. 19 September 2019.
Mr A.P. de Vries MSc. WUR Plant Breeding 1968. 27 June 2020.

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

The life of a vegetable fan

Gérard Grubben PhD, WUR Plant Breeding 1964, retired consultant in agriculture and vegetable cultivation, has written the book *Sjraar oet Bree. Uit het leven van een groentefanaat* ('Gerard from Bree. The life of a vegetable fan'). In 400 pages, this farmer's son from Maasbree in Limburg (born 1938) tells the story of his life, from toddler to old man. The book covers the war years, his separation from the Catholic Church, his studies in Wageningen and his work in countries including Côte d'Ivoire, Benin and Indonesia.

'I wrote it primarily for my children and grandchildren,' says Grubben. 'I never liked the fact that I didn't know how my ancestors lived and died. All I had was dates of birth, marriage and death. Such a lot has changed during my lifetime so my life story is also a record of an era.

I was able to look up lots of facts because I still have all my diaries from 1957 onwards, in which I always wrote a lot.' The book has attracted considerable interest. The first print run of 150 copies was sold out in a month, says Grubben, who is a consultant to East-West Seed and still in contact with former fellow students. 'Many Wageningen alumni buy the book, often out of nostalgia.'

Paul Seelen Productions, 28.75 euros (incl. shipment); purchase via paul_seelen@live.nl.

Birdwatching on Rottumerplaat

Barwolt Ebbinge, WUR expert on geese from 1975 to 2014, served as a bird sanctuary keeper on Rottumerplaat island after his retirement. He and his wife Doortje Dallmeijer would regularly spend months on end on the Wadden island to count birds breeding or wintering there, or just passing through. He gives a detailed account of his observations in the book *Rottumerplaat*, bringing this bird paradise to life for all the nature lovers who are not allowed on the island.

Published by Atlas Contact, 24.99 euros

Thesis prizes for four alumni

Four WUR alumni have received a thesis prize from University Fund Wageningen. **Jasper Roebroek MSc** (WUR Soil, Water, Atmosphere 2020), received the Overall Thesis Award for his thesis 'Global distribution of hydrologic controls on forest growth'. The other winners are **Roman Meier MSc** (WUR International Development Studies 2018), **Dries Hulst MSc** (WUR Animal Sciences 2019) and **Javier F. Reynoso Lobo MSc** (WUR Biotechnology 2020). 12 June 2020.

KLV

KLV | WAGENINGEN ALUMNI NETWORK

Dissolution of the society
KLV, the alumni society for Wageningen University & Research, is working on the final stages in the process of winding up the society. At the AGM on 22 September 2020, members will be able to vote on the proposal for the dissolution of KLV for a second time. This will almost bring an end to the Recalibrating KLV 2020 project, which started with the AGM in December 2017. The 14 study circles and networks will continue as independent entities after the dissolution and will receive practical and financial support.

On Saturday 3 October, there will be an online farewell event dedicated entirely to looking back at over 130 years of KLV and looking forward at the alumni policy of the future. A book will also be presented on the history of KLV, giving a vivid picture of its rich past.
A complete overview of activities can be found at www.klv.nl/events.

KLV Annual General Meeting
AGM with a vote on the proposal to dissolve KLV.
22 September 2020

KLV – Farewell event
Online farewell event for KLV in a programme preceding the online Alumni Open Day.
3 October 2020

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

More information
www.klv.nl

KLV

Karin Schroën

KLV member since 1990

Food Technology, 1990

A PASSION FOR Softball

Karin Schroën has been mad about the sport ever since she was asked to join the softball team at secondary school. 'You need good fine motor skills for softball, for example to be able to throw the ball well,' says Schroën, a professor holding a personal chair in Food Process Engineering. 'On the other hand, it's all very tactical. I'm fascinated by that combination of thinking things through and technical skills.' As a player, Schroën was a pitcher who played in the Dutch first division. These days, she trains and coaches the Matchmakers ladies' team in Wageningen. 'The challenge for me is to make sure the women are in the right position, have good skills and can think properly about what they do. People sometimes joke that we are the smartest team in the Netherlands.'

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

Visit our website www.klv.nl

PHOTO GUY ACKERMANS

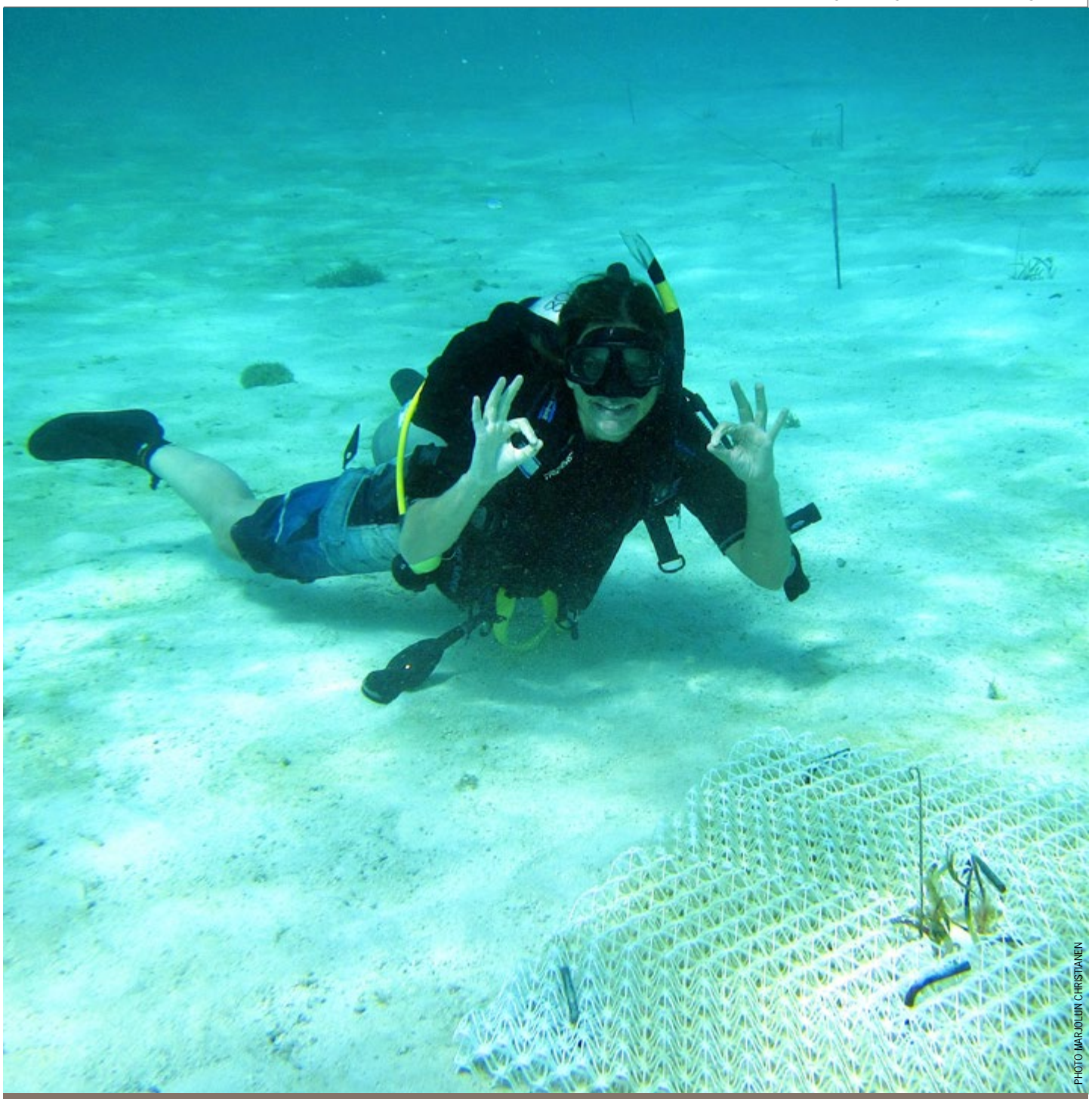


PHOTO MARJOLIJN CHRISTIANEN

Restoring coastal regions with mats made from potato waste

Marjolijn Christianen – one of the scientists in an international team – placed biodegradable mats made partly of potato waste on the seabed off the coast of Bonaire. She is studying whether the mats help to restore the seagrass and salt marsh ecosystems that are disappearing around the world.

Shoreline vegetation dampens the waves and is therefore important for protecting the coast. The plants also provide a nursery for fish, which are an important link in the food chain. Experiments on the islands of Texel in the Netherlands and Bonaire in the Caribbean, and in Sweden and the US have shown that the mats give new, young plants sufficient protection from the waves. 'Without extra support, the waves pull the plants out of the ground straightaway,' says Christianen, assistant professor in the Aquatic Ecology and Water Quality Management chair group, and one of the coordinators of the study. The mats automatically biodegrade within a few years, by which time the plants are strong enough to survive without support.

The biomats consist of portable units that click together. Christianen: 'The next challenge is to find out whether this approach can be applied on the ecosystem scale. Meanwhile, we are looking at whether the method is also applicable to oyster banks, mussel banks and mangrove swamps.'

The research team is made up of scientists from Wageningen, Nijmegen, Groningen and abroad, the Royal Netherlands Institute for Sea Research and Bureau Waardenburg.

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