WAGENINGEN WORLD
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Farmed fish production needs to double in the next 15 years

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Secrets of the Texel terns

Why have thousands of sandwich terns started brooding on the Dutch island?

Eat your way to health

Dietary advice is rarely used in treating diseases. But the potential is there.

More sustainable packaging

Producers are looking for more sustainable packaging materials.

WAGENINGEN UNIVERSITY & RESEARCH

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

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FEATURES

PHOTO GUY ACKERMANS

Cleaner and greener in 2100

'Humankind has done serious damage to the ecology of Planet Earth, clearing forests, polluting the air, overfishing the sea, ploughing the land, exterminating species and running down resources. But in recent years there has been a marked improvement on many ecological fronts, which is often overlooked.

'Population growth is slowing, the rate having halved since the 1960s. With famine largely a thing of the past, farming is steadily reducing the size of its footprint: it takes 68% less land to produce a given quantity of food today compared with 50 years ago. This 'land sparing', or 'sustainable intensification' has enabled the growth of nature reserves, the reforesting of many parts of Europe, North America and now Asia, and the return of wildlife such as wolves, whales and beavers in wealthy countries.

'The evidence suggests that as countries get richer they generally halt deforestation and the destruction of biodiversity, tackle pollution and the overuse of water, rely less on nature for fuel and food, and can afford to care about the environment. So the growing prosperity of the world – with the percentage of people living in extreme poverty having fallen rapidly in recent decades – promises to bring about environmental improvements all around the world.

'Climate change carries a risk of significant future damage but the evidence suggests that it is happening slowly enough and technology is advancing fast enough for humankind to mitigate its worst effects. Meanwhile, there has been a vast 'greening' of the planet caused by extra carbon dioxide in the air – equivalent over 33 years to adding a continent of new vegetation twice the size of the mainland United States. If the world is cleaner and greener in the future, it will not be because of luck or attitude, but because of the work of scientists, engineers and innovators.'

Matt Ridley, author and member of the British House of Lords, spoke at the Opening of the Academic Year in Wageningen on 4 September.

WATER MANAGEMENT

PHOTO HETSCHONEWATEREXPERIMENT.NL

Amsterdam's residents measure water quality

In July and August, over 500 residents of Amsterdam took their own measurements of the water quality in their city's canals, ditches, lakes and waterways. To do this, they were given a Water Box with tools for examining the opacity, odour, colour and taste of the water. The initial results show big differences in opacity and the presence of pathogenic bacteria. WUR is one of the organizations behind this clean water experiment. Thanks to these measurements by the public, a fuller picture of the water quality is obtained, and faster. *Info gerben.mol@wur.nl*

ENVIRONMENT

First groundwater atlas for pesticides

WUR and the National Institute for Public Health and the Environment (RIVM) have developed the first groundwater atlas for pesticides in collaboration with the drinking water sector. This database gives an up-to-date picture of the presence of active substances and breakdown products from pesticides in Dutch groundwater. The data is intended for use in assessments for the authorization of crop protection agents and biocides but it can also be used as an aid in water quality policy. In the Netherlands, groundwater samples are taken by provinces and water companies in thousands of locations. *Info: roel.kruijne@wur.nl*

FOREST ECOLOGY

Help wanted for sick ash trees

Ash dieback is threatening the continued existence of ash trees in the Netherlands. The Centre for Genetic Resources in the Netherlands, part of WUR, is calling on the general public to help.

The Netherlands has 13,000 hectares of ash woods and many kilometres of roads lined with the common ash (*Fraxinus excelsior*). An estimated 80 percent of Dutch woods have now been affected by ash dieback. 'In areas with a high risk of infection, 40 percent of the ash trees have already died in some cases and another 20 percent or so are predicted to go in the next two years,' says researcher Paul Copini. The disease is a problem elsewhere in Europe too. What is more, dozens of organisms depend on this indigenous species.

The guilty party is the ash dieback fungus *Hymenoscyphus fraxineus*. In the summer, this Asian fungus forms tiny white toadstools on leafstalks that have fallen on the ground and spreads its spores via the wind. It infects the indigenous ash through the leaves and gets into the sap that flows through the tree, causing more and more of it to die off. Weakened trees are also more susceptible to other infections, such as from the honey fungus. A cure has yet to be found, but some ash trees seem to be less vulnerable to the fungus. 'In our trial fields, around two to three percent seem to be completely unaffected,' says Copini. Researchers are therefore collecting twigs and branches from healthy trees for multiplying. The new multiplied trees are then deliberately infected in a trial field in order to determine their level of resistance. Copini: 'We hope eventually to create a source of seeds using the best trees that can then be used to reintroduce ash trees in the landscape.'

The general public is also being called upon to report dead, sick and healthy trees in an attempt to get a better overview of the extent of the infection in the Netherlands and to find ash trees that could be resistant or tolerant to ash dieback. People can go to essentaksterfte.nu for information on how to recognize ash trees and ash dieback, and to report their observations.

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PHOTO ANP

ENTOMOLOGY

Two diseases in a single bite

A study by Wageningen virologists and entomologists of yellow fever mosquitoes shows that the mosquito's saliva can contain both the Zika virus and the chikungunya virus at the same time. According to the researchers, this shows that people can be infected with both viruses from a single mosquito bite. The results were published in June in *PLoS Neglected Tropical Diseases*. There is still no vaccine for these diseases. A Zika infection has mild symptoms but it can cause severe damage to the brain of an unborn child. The chikungunya virus leads to fever, rashes and severe joint pain.

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NUTRITION

World Food Day 2018 in Ede

On 14 October, during the Dutch Agri Food Week, World Food Day will be held in Ede with workshops, debates, films, a market and other activities centring on food and the stories behind it. In 1979, the United Nations designated 16 October as World Food Day with the aim of drawing attention to the issue of food security. Famines still strike in various countries, even today. As in 2016 in Rotterdam, Wageningen is a World Food Day partner. You can use the discount code WFD17EDE to get a 50 percent discount on tickets ordered online.
Info: worldfoodday.nl

PHOTOS MITCHELL VAN VOORBERGEN, WILLEM DE KAM, PETRINA VAN DER MEER

TECHNOLOGY

New fund for start-ups

Wageningen has invested 1.5 million euros in a fund for new hi-tech knowledge companies, as have Eindhoven Technical University, the University of Twente and the Netherlands Organization for Applied Scientific Research, TNO. This contribution was a reason for the European Investment Bank to add 25 million to the fund. Several private financiers also came on board. The Innovation Industries investment fund plans to spend the 75 million in its kitty on support for at least 20 companies over the next few years. The fund also offers opportunities for Wageningen spin-offs wanting to grow, says Sebastiaan Berendse, director of Value Creation at WUR. Banks often find it too risky to invest in companies that have to simultaneously scale up their technology, production and business in order to attract customers. Investors are given shares in the companies they fund. The expectation is that they will be able to cash in those shares after five to ten years.
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WAGENINGEN ACADEMY

AgriFood Executive Global Programme

Part of Wageningen Academy's executive education palette is the new 'AgriFood Executive Global Programme', implemented by IESE Business School and Wageningen University & Research. This partnership of high-ranking academic institutions aims to offer the right combination of perspectives for value creation in the Agrifood industry, supporting participants as they learn to navigate the AgriFood field at the intersection of top scientific knowledge and business development. The programme lays out a journey through four continents and consists of four one-week modules which will be completed within one year. The programme is only open to those who meet the 'participant profile', and after an interview. The programme starts at the beginning of 2018. Potential participants can apply now.
www.wur.eu/academy

FARMING

Lettuce on open water

Wageningen Plant Research is experimenting in Lelystad with the cultivation of vegetables on floating polystyrene islands.

The rafts measuring two by three metres drift in a basin in the open air. They are made from polystyrene blocks wrapped in plastic foil that are bound together by nets. Lettuce, spinach and tomato plants are suspended in the holes in the polystyrene. Their roots touch the water, allowing them to absorb water and nutrients.
Vegetable islands are a particularly promising solution for open water, for example in places where there is a lack of farmland such as the city of Singapore, says Urban-Rural Relations researcher Marcel Vijn. 'Or in areas that are regularly flooded or submerged under water for brief periods.'
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PHOTO SÖREN KNITTEL

SMART FARMING

PHOTO STEVE COLLENDER / SHUTTERSTOCK.COM

Less nitrogen thanks to precision fertilization

The use of drones can make fertilizing potatoes with nitrogen more efficient, which is better for the environment.

A self-propelled drone with a multispectral camera flies over a field of potatoes to determine how much nitrogen is needed. The camera measures the amount of infrared, red and green light reflected by the crop, which is dependent on the amount of nitrogen in the plant. Software developed by WUR and the cooperative Agrifirm then combines this data with crop and climate data to give a recommendation on how much additional fertilizer is needed and a map for the fertilizer spreader. 'Potatoes are normally given nitrogen fertilizer around when they are planted,' says researcher Frits van Evert. 'But the amount of nitrogen that leaches or is released by the soil through mineralization varies from year to year depending on the weather. That's why it is better to start with an application of two thirds of the usual quantity and then apply additional fertilizer halfway through the season depending on the crop's requirements.' Initial results for starch and table potatoes show that average savings of 15 percent in nitrogen fertilizer can be achieved in this way without harming yields. Similar software could also be developed for other crops. *Info: frits.vanevert@wur.nl*

NUTRITION

A healthier diet in Africa and Asia

Wageningen plans to do research in Ethiopia, Nigeria, Bangladesh and Vietnam aimed at encouraging the consumption of fruit and vegetables. To achieve this, local production of fruit and vegetables needs to increase, problems with distribution and food losses need to be resolved and consumers need to be persuaded to eat more fruit and vegetables. A healthier, more varied diet is important in bringing an end to malnourishment, vitamin and mineral deficiencies and obesity. 'The meals you eat are the result of a complex food system,' explains programme leader Inge Brouwer. 'You have to understand that system before you can steer people towards a healthier diet.' Four million euros a year is being made available for the next six years for the study, which is part of a research programme run by CGIAR, a partnership of international institutes conducting agricultural research. *Info: inge.brouwer@wur.nl*

FOOD WASTE

Freezer reduces food waste

The Dutch discard a smaller proportion of their frozen food than their fresh produce or food in tins, according to a pilot study by Wageningen University & Research

PHOTO SHUTTERSTOCK

In Europe, about half of all food wastage is due to households. So far, studies on how to reduce food wastage have paid little attention to the form in which the food is purchased: fresh, frozen, tinned or bottled. A pilot study was therefore carried out within the public private partnership CARVE. Twelve kinds of products were investigated, including seven kinds of vegetables, potatoes, red fruit, fish and ready-made meals.

The survey of more than 500 households shows that most Dutch shop for food two to three times a week. Over 60 percent make a shopping list. One third of consumers do not check first what is already in the house. In the store, consumers are more likely to choose fresh products than deepfreeze or canned products. In relative terms, fewer frozen products are thrown away. Moreover, deepfreeze products are generally ditched because they are beyond the use-by date rather than because they have actually gone off.

'From a food wastage perspective, Dutch consumers could choose deepfreeze products somewhat more often,' says project manager Anke Janssen. But stock management needs to improve. A phone app or smart freezer might help here. She thinks it is too early, though, for specific recommendations at the national level. Janssen: 'First we need a better understanding of what exactly lies behind consumer behaviour when buying, storing and discarding food.'

The results were published in May in the scientific journal *Waste Management*.

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LIVESTOCK

Use of antibiotics continues to fall

The use of antibiotics in Dutch livestock farming is still falling, according to the figures for 2016.

Every year, Wageningen University & Research and a number of partners produce the NethMap/MARAN report on the use of antibiotics and resistance in humans and animals. Overall use of antibiotics in livestock farming has fallen by 64 percent since 2009. The reduction is evident from the reduced presence of resistant bacteria in farm animals and their meat. The big decline is the result of the policy that was initiated in 2008, explains Dik Mevius, a vet and microbiologist at Wageningen Bioveterinary Research. 'The government set reduction targets, after which the sector made its own agreements on how to achieve more responsible usage.' Another important factor was the establishment of the Netherlands Veterinary Medicines Authority (SDa), which revealed the state of antibiotics use in livestock farming. There is room for further reductions, for example by making changes in feed, housing and farming procedures.

PHOTO SHUTTERSTOCK

The report also shows that only a quarter of chicken meat is infected with ESBL-producing bacteria. ESBL is an enzyme that breaks down certain kinds of antibiotics, thereby making it more difficult to treat infections. As recently as 2010, all chicken meat in the Netherlands was infected.

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AQUATIC ECOLOGY

App for aquatic life

The new *Waterleven* ('aquatic life') app enables anyone to identify the commonest aquatic creatures and plants in the Netherlands or test the water quality. The app was launched at the same time as the revised edition of the nature guide *Vijver, sloot en plas* ('Pond, ditch and pool'). This book by the Wageningen aquatic ecologists Marten Scheffer and Jan Cuppen on water organisms, their way of life and the ecology of ponds, ditches and pools can also be used in nature education. Scheffer: 'We hope that this will encourage the Dutch to rediscover 300,000 kilometres of ditches and get a new generation enthralled by life in the water.' *Info: marten.scheffer@wur.nl*

HEALTH

Pneumonia near farms

People who live in the vicinity of poultry or goat farms are more likely to suffer from pneumonia. This finding comes from studies in the 'Livestock farming and local residents' health' programme run by WUR, Utrecht University, the Netherlands Institute for Health Services Research (NIVEL) and the National Institute for Public Health and the Environment (RIVM). It is based on anonymous data of 110,000 GP patients, more than 14,000 questionnaires on respiratory problems and medical examinations of nearly 2500 people. The higher incidence of pneumonia is probably due to fine particles and endotoxins, which irritate the respiratory tracts and increase susceptibility. The underlying cause in the case of goat farms is unknown as yet but there is clearly no relationship with Q-fever. The researchers had previously shown that people living next to livestock farms had a slightly reduced lung function but suffered less from asthma and allergies. The lung function also declines if there is a high concentration of ammonia in the air from fertilizer. *Info: thomas.hagenaars@wur.nl*

BIOBASED

More bio-asphalt

First a road in Zeeland province and now a cycle path to Wageningen Campus have been surfaced with bio-asphalt. In this asphalt, some of the bitumen (an oil product) has been replaced by lignin. This is a tough, elastic vegetable waste product from the production of paper and bioethanol. Wageningen developed the asphalt and is researching its potential applications. *Info: richard.gosselink@wur.nl*

GENETICS

Apple DNA reveals more of its secrets

An international research team including three Wageningen scientists published a new, much more detailed version of the apple genome in June.

PHOTO SHUTTERSTOCK

The publication offers new insights into how the apple genome is organized. Of a likely total of 42,000 genes, 93 percent have now been localized. That makes it possible to find genes that determine interesting properties and to develop DNA tests that allow new varieties to be bred more quickly and efficiently.
To achieve this, the researchers used a special variant of the Golden Delicious and the latest sequencing techniques. The first publication of the apple genome in 2010 was also for a Golden Delicious apple. Wageningen will be using the new information on the apple's DNA for targeted breeding of new varieties, in particular geared to sustainability, for example through resistance to disease and improved product characteristics. WUR previously developed the well-known variety Elstar, Santana and the recently launched Natyra.
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INSECT PLAGUES

PHOTO HOLLANDSE HOOGTE

Flowering verges to combat caterpillar

Verges full of flowers are not just important for bees, they may also help combat the oak processionary caterpillar. The caterpillar rarely develops into a plague in woods, but it does on the many English oaks on roadsides and campsites, for example. The caterpillar's poisonous hairs irritate humans' skin, eyes and lungs. However, many pest control agents affect biodiversity on and around the tree. WUR and Dutch Butterfly Conservation are investigating whether flowering verges can attract more natural enemies of the caterpillar such as the lacewing fly. Its larvae eat the eggs, larvae and caterpillar of the oak processionary moth. Adult lacewings rely on nectar and can survive the winter. With enough flowers, especially in early spring, lacewing larvae could be an important trump card in tackling the oak processionary caterpillar. The experiment is scheduled to continue into next year.
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FARMING METHODS

Bigger harvest with low-tech precision agriculture

Precision agriculture is an interesting option in many places, not least semi-desert zones of West Africa. Productivity can be improved by, for example, creating a favourable micro-environment in plant pits.

Small-scale farmers in the semi-desert struggle with crops that do not always come up, variable rainfall, poor soil fertility, labour shortages in peak periods and a lack of money. At the same time, the demand for food is increasing. It is therefore important to have efficient cultivation and to reduce the risk of a poor harvest.

Ken Giller, professor of Plant Production Systems, and two colleagues in Norway and Mali investigated how precision agriculture principles could be used to increase yields in this region.

Precision agriculture involves giving each plant precisely what it needs, on the scale of the individual plant rather than the field as a whole. The literature study begins with the importance of selecting large seeds, pre-germinating them and treating them with pesticides and fungicides. Pre-germinating increases yields by 20 to 30 percent while the treatment adds 15 percent.

The zaï system, a farming method that saves on water and is much used in dry regions of Africa, can also give good results. It involves digging small pits in the field before the rainy season and adding some organic fertilizer and compost. Later, the seeds are sown in the pits. A micro-dosage of artificial fertilizer per plant hole when sowing can almost double yields.

It is also important to adjust the dosage of fertilizer to suit the crop and soil, to return as much organic material as possible to the soil and to schedule the sowing sequence according to how precise the timing needs to be for sowing that crop.

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PHOTO LINEAIR

ANIMAL NUTRITION AND WELFARE

PHOTO HOLLANDSE HOOGTE

Tail biting in pigs

protein levels in animal feed are being reduced for reasons of sustainability. But protein deficiency in pigs causes them to start tail biting. This finding comes from a Wageningen study that was published in *PLOS ONE* in May. The state of health also affects biting behaviour. Pigs that had not been vaccinated, had not been given antibiotics and were put in a pen that had not been disinfected were more likely to bite one another.

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ENTOMOLOGY

Malaria parasite lures mosquito

People with malaria are twice as attractive to mosquitoes that have not yet been infected by the malaria parasite. This finding comes from research by Annette Busula from Kenya, who obtained her doctorate in Wageningen in May.

It only applies if the parasite is in the communicable stage, not in other stages of the parasite's lifecycle or if someone is being treated with antimalarial drugs. The parasite in the communicable stage probably makes humans smell more attractive to mosquitoes, as that increases the parasite's chance of reaching new hosts via the mosquito. Treating people with the disease is therefore crucial to the battle against malaria. This information can also be used to improve the mosquito bait in odour traps.

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COLONY OF SANDWICH TERNS ON DUTCH ISLAND REVEALS ITS SECRETS

The sandwich tern comes ashore

In the past few years, thousands of sandwich terns have started brooding on the Dutch island of Texel. An extraordinary development, as we generally associate these rare seabirds with remote sandbanks. What has made Texel so popular all of a sudden? Biologist Mardik Leopold has been investigating.

TEXT NIENKE BEINTEMA **PHOTOS** MARDIK LEOPOLD

Kirr-ick! Kirr-ick! A distinctive cry resounds across the mud flats behind the sea dyke. The unmistakable call of brooding sandwich terns. And not just one pair. No, a few thousand of them. A rare prospect in the Netherlands. 'Fantastic, isn't it?' says Mardik Leopold of Wageningen Marine Research. We are standing on the Wadden Sea dyke on Texel island with our binoculars, backs to the sea. Before us lies a wide expanse of pools and little islands, teeming with water birds. Black-headed gulls, avocets, common shelducks, redshanks – and an awful lot of sandwich terns. 'Look, that one has a fish in its beak,' Leopold points out. A stately grey and white bird with a black cap and a strong black beak is strutting across the sandbank with a fish. 'See that young bird begging. It's been able to fly for a while but it will be fed for another couple of weeks. Until they set off for South Africa.' And the fish is gobbled up. This nature area is aptly named Utopia. It was dug out between 2009 and 2011 by nature conservation organization *Natuurmonumenten* for the express purpose of creating breeding grounds for species such as the avocet, and the common and arctic terns. 'But much to our astonishment, 1500 pairs of sandwich terns started brooding there,' says Leopold, who has been studying the colony ever since. 'We think of sandwich terns as birds which brood on remote sandbanks, such as Griend. In the middle of the Wadden Sea, at the mercy of the wind and waves. But we didn't expect to see them here in this sheltered area behind the dyke.'

TAKING RISKS

On windy sandbanks sandwich terns face relatively little competition or danger from birds of prey. So they don't mind taking the risk of storm surges, says Leopold. 'They can live to be 20 or 30 years old,' he explains. 'So it's not such a problem if one brooding season doesn't work out. That is

> ‘Sandwich terns can live to be 20 or 30’

why we now wonder why all the sandwich terns have suddenly started brooding in Utopia. And why are they doing so much better here than on Griend? We are keen to find that out. Because once we have that kind of knowledge we might be able to protect them better.’

In Utopia pairs of sandwich terns tend to have one baby per year – which is 50 percent more than on Griend or anywhere else along the European coast. This is good news for those familiar with the history of this species. Until the 1940s there were as many as 40,000 pairs of sandwich terns in the Netherlands. But during the Second World War their eggs were collected in large numbers for human consumption. Then came the industrial pollution of the 1950s. And in 1964 the important breeding ground of De Beer island was lost to the development of the Europoort docks. This marked the low point in sandwich tern numbers in the Netherlands: there were only about 500 brooding pairs, most of them on Griend. Since then, the population has slowly recovered to its current levels of about 15,000 pairs in the whole of the Netherlands. Most of them now brood in the southern part of South Holland, and on Texel, Griend and Ameland. ‘And recently on the mainland in North Holland as well,’ says Leopold. ‘The first 110 pairs started brooding last year in De Putten bird sanctuary near Schoorl, which is behind the dyke too. This year there were already 2000. So they are thriving.’

NO FOXES

We drive along the Wadden Sea dyke towards the ferry port in Leopold’s car. We pass a whole series of pools with little islands, surrounded by reeds and swampy grassland. ‘A string of wetland jewels,’ says Leopold with enthusiasm. These ponds were created when sand was dug up for raising the dyke back in the 1970s. Here too, sandwich terns have been brooding since 2013 – this year in even greater numbers than in Utopia. ‘These human-made breeding grounds probably make a huge contribution to the recovery of the sandwich tern in the Netherlands,’ says Leopold as he drives. ‘You see, we think the lack of anywhere to breed could be a limiting factor.’

In the pre-war years, when sandwich tern numbers peaked, the birds bred in many places which are no longer suitable. These included the sandy heads of the Wadden islands and the Texel sandbank called De Razende Bol. ‘These days it’s just one big barbecue there,’ says Leopold cynically. ‘You don’t get any sandwich terns there any longer.’ And that is a pity, because the brooding birds are relatively safe on the Wadden islands, where there are no foxes.

All in all, the population is still nowhere near its earlier level. ‘We don’t know exactly why that is,’ says Leopold. ‘The possibility to brood is one thing, but maybe now more eggs and young are stolen by herring gulls and black-backed gulls. They are protected species these days, and have increased in number considerably.’

DECODING THE COLOURED RING

We get out of the car near the Wagejot nature reserve. Leopold expertly surveys the water birds with his binoculars. A lot of gulls, some ringed plovers and the occasional avocet. And here and there some sandwich terns: parent birds and brown and white young, now almost as big as their parents. ‘Hey, look at that!’ shouts Leopold. ‘A coloured ring!’ He grabs his telescope from the boot and focuses it on a stern on the sandbank. Reading the black letters on the yellow plastic ring around its leg takes >

PHOTO RICHARD DIEPSTRATEN

‘People who read a ring get sent a baby photo of their tern'

quite an effort. ‘What do you make it? I see 63T. Right leg. Can you write it down?’
Leopold and his colleagues started ringing sandwich terns on Texel four years ago. They’ve been doing it every year since then, with a dedicated group of volunteers. When the young can almost fly, the ringers wade out to the Utopia islands and load 150 chicks into large crates at lighting speed. They carry them ashore where they are all measured, weighed and ringed. And photographed.
‘Then, when people read that ring at some point and report back to us, we can send them a baby photo of ‘their’ tern as a thank-you. That works very well, keeping people motivated to report ring data.’
The ringed young birds are then quickly returned to the colony, where their parents track them down by their calls. And then the ringers start all over again, because they want to do another batch: 300 in all. ‘A major event,’ says Leopold. ‘Great fun, a ringing day.’

TO SCOTLAND

The coloured rings have a unique combination of numbers and letters that can be read from a distance. This enables the researchers to trace the birds individually. So now they know how widely they range: terns ringed on Texel fly effortlessly between the island and Denmark, Scotland or France. And Leopold now knows that the young only return to the breeding grounds for the first time after two to three years. ‘In the interim they stay at sea, somewhere between South Africa and Denmark.’
Thanks to the rings, Leopold hopes eventually to gain more understanding of how the population is built up. Who comes back to brood on Texel, and who tries their luck elsewhere? ‘With this amazing breeding success story, it is perfectly possible that Texel will become a source for new populations in other areas,’ he says. ‘Then we’d have a new Texel export product.’

We leave the bird areas and take the boat to Den Helder. There, in the former naval college, is the laboratory of Wageningen Marine Research, where Leopold is investigating exactly what sandwich terns eat.
‘Sandwich terns catch fish in the North Sea. It might simply be that they don’t have to fly as far from Utopia as from Griend. It can easily make a difference of 20 kilometres per feeding trip.’
Camera footage shows which fish the terns feed their young on: the parent birds always carry one fish quite visibly in their beaks.
‘The size of those fish tells us something about how the terns make their decisions. In practice it seems the bird eat up lots of small fish themselves out at sea and bring the bigger ones back for their young. But we want to know what the parent birds themselves eat too. That has never been studied. You don’t see it on the webcams because the parent birds eat out at sea.’ In formers times biologists would just have shot down the birds to study the contents of their stomachs, says Leopold. ‘But we don’t like doing that anymore.’ There is another method of finding out about the parent birds’ diet: by getting hold of their droppings. This is done by means of a dozen or so flat plates placed between the nests, which are close together. Each plate remains in place for a week, as long as the eggs have not hatched, so only the droppings of adult birds fall into it. The plate is full enough after one week, and the droppings contain miniscule clues as to which fish they come from: otoliths, or bones from the inner ear (see inset).

CAREFUL WASHING

‘Sprat, herring and sand lance,’ declares Ilse van der Beek, a student of Wildlife Management at Van Hall Larenstein in Leeuwarden. She is seated at a big lab bench studying a petri dish full of neat rows of what look like tiny rice grains, some of them less than half a millimetre in size. Their

shape and the pattern of grooves on them give away the fish species; their size suggests how big it was.
Van de Beek has carefully washed, sifted and sorted the contents of the plates of droppings, and is now studying each otolith under the microscope. She takes a photo of it, measures the little bone, and records her findings in an enormous data file. 'Ten poop dishes keep me busy for a couple of weeks,' she says. 'Do I go cross-eyed? Oh no. I only spend a short time looking at them through the microscope. I do the rest on the computer.' She sees this painstaking work as just part of the job. And she is fascinated by the underlying questions. And by the birds themselves: she helped with the ringing too, as well as with positioning and collecting the plates. And she reads rings daily in the field. 'Really nice to do.'
The research is still in full swing, so many questions are still unanswered. Such as why the terns have only so recently discovered the artificial nature reserves behind the dyke. Slowly but surely the secret of Texel's breeding success story is coming out. A safe breeding ground that is not prone to flooding, close to the best fishing grounds: Utopia lives up to its name. And Leopold thinks Griend has become less attractive: a short-eared owl has taken up residence there and more and more herring gulls and lesser black-headed gulls come there. 'That doesn't do the terns any good. On Griend they now live under constant pressure and apparently a few birds tried their luck elsewhere, and with success!' The working day is over, but the researcher is nowhere near ready. 'This evening I'm going to read a few more rings. And then analyse some data and email observers. No, I don't get much sleep in the summer months. Sleep takes up too much time.' ■

www.wur.eu/sandwichterns

Young terns are weighed, measured, ringed and photographed.

MICRO-BONES FULL OF INFORMATION

Otoliths, or ear bones, are found in the inner ear of fish. They are relatively hard so they decompose more slowly than the rest of the fish. You can find them in the poop of fish-eaters and in fossil deposits. Otoliths reveal a lot about their original owner. Just like trees, they have growth rings which give away the age of the fish. And the shape of otoliths is different for each fish species, varying from a simple oval to a complex shape with lots of grooves and appendages. Experts like Mardik Leopold can often tell at a glance which species they are dealing with. And that knowledge is useful for ecology (which animals eat each other?), for archaeology (what did humans use to eat?), and for fisheries (how old is the fish that has been caught?)
'Otoliths do disintegrate in the acid stomachs of fish-eaters,' says Leopold. 'They get smaller, which could cause you to underestimate the size of the fish.' He is therefore working on an extensive correction table. 'I am always looking for predator stomachs containing a ball of fish of the same age range. For example, if a whale has eaten a whole school in one mouthful. Getting hold of stomach contents like that is a golden opportunity.' If the ball of fish has not yet been completely digested, there is still intact fish inside it. Towards the outside of the ball the fish is more digested. So Leopold can make a nice graph with different levels of erosion and the correction factor to match, in order to calculate the length of the fish correctly. He has completed such a graph for eight species to date, and colleagues from around the world have expressed interest in them.

Protecting our forests' genes

Thousands of European forests have been designated gene conservation units. These locations are home to populations of indigenous trees and shrubs with valuable genes exceptionally. 'Indigenous trees and shrubs have come under pressure over the past few centuries.'

TEXT RIK NIJLAND **ILLUSTRATION** IEN VAN LAANEN

It is raining cats and dogs in the Heksenbos. But Hielke Alsemgeest, a forest warden for the Dutch State Forest Service *(Staatsbosbeheer)*, doesn't let that put him off. 'Nature decides what happens here, and just look, what a beautiful forest,' says a beaming Alsemgeest. Stepping out boldly, he leads the way through the dripping wet forest near Winterswijk, on the German border, to the old taxus trees that grow here. The taxus is mainly familiar as garden or graveyard vegetation, but the Netherlands' only indigenous conifer is only really in its element here: in the shade of oak, hornbeam and ash trees.
With its primroses and various species of ferns, the Heksenbos is a special Natura2000 area, explains the forest warden – who turns out to be a Wageningen alumnus – but these original taxus trees lend the forest some extra status. The Heksenbos is a link in a chain of 3406 European forests and copses which have been designated gene conservation units. What grows here is part of our national biological heritage and of international importance too. Including the taxus.

INDIGENOUS TREES

In the Netherlands, the Centre for Genetic Resources (CGN), which is part of Wageningen University & Research, has designated 13 such units – places with significant populations of indigenous trees and shrubs – in the past 10 years, at the behest of the ministry of Economic Affairs. We should take good care of these remnants of forest, says Joukje Buiteveld of the CGN. She is responsible for policy support for the Dutch government in relation to the conservation and use of genetic resources from trees.
'In the past centuries, indigenous trees and shrubs have come under pressure,' she explains. 'By the beginning of the 19th century, the amount of forest had decreased to 4 percent of the total land surface area, mainly due to deforestation and overexploi-

tation.' The species mix in forests, copses and hedgerows was also tampered with. Exotic species that are good for timber production, such as pine, larch, Douglas fir or Norway spruce, were planted in vast numbers. And since the 1950s, cheap seeds and saplings of many indigenous trees and shrubs have been purchased abroad. Our native trees and shrubs have therefore been pushed back to the margins of Dutch nature. If they give up the ghost, unique gene combinations that have adapted to the growing conditions in the Netherlands in the course of evolution will be lost. The common oak in this wet country, for example, differs somewhat from the same species in Poland, where conditions are drier and colder.

VITAL

The international Convention on Biological Diversity (CBD), signed in Rio de Janeiro in 1992, boosted international interest in this genetic biodiversity. Plants and animals can only cope with changes such as global warming, new environmental conditions or diseases and pests if they have plenty of genetic diversity to draw on. Genes which do not seem very important now can end up playing a vital role.

In 2002 the Dutch government published a policy memo called 'Sources of Existence' which made clear that preserving genetic diversity is necessary not just for plants such as agricultural crops but also for trees and shrubs. Buiteveld: 'In many countries, the forest is of great economic importance, for timber and biomass for instance, as well as for recreation, water supply, soil conservation and CO_2 sequestration. Many trees and shrubs are also key species for the visual impact of a landscape. The characteristic riparian forest along the rivers would not be the same without the black poplar. So we should watch out that indigenous genetic material does not get lost or squeezed out. In Europe, more than 30 million hectares of forest is protected for the sake of biodiversity conservation, but no attention is paid to the genetic sources of trees.' >

Storing seeds in a gene bank, as is done with many agricultural crops, is not an option for most woody species, explains the Wageningen researcher. These seeds are 'recalcitrant': if they are frozen, they lose some of their germinating capacity. A good alternative is to create a tree garden: a collection of living trees that is properly protected and managed. The Dutch State Forest Service established a national tree archive in Roggebotzand in 2006, using grafts or seedlings from indigenous trees and shrubs. Seeds harvested there are used to establish new nature areas.

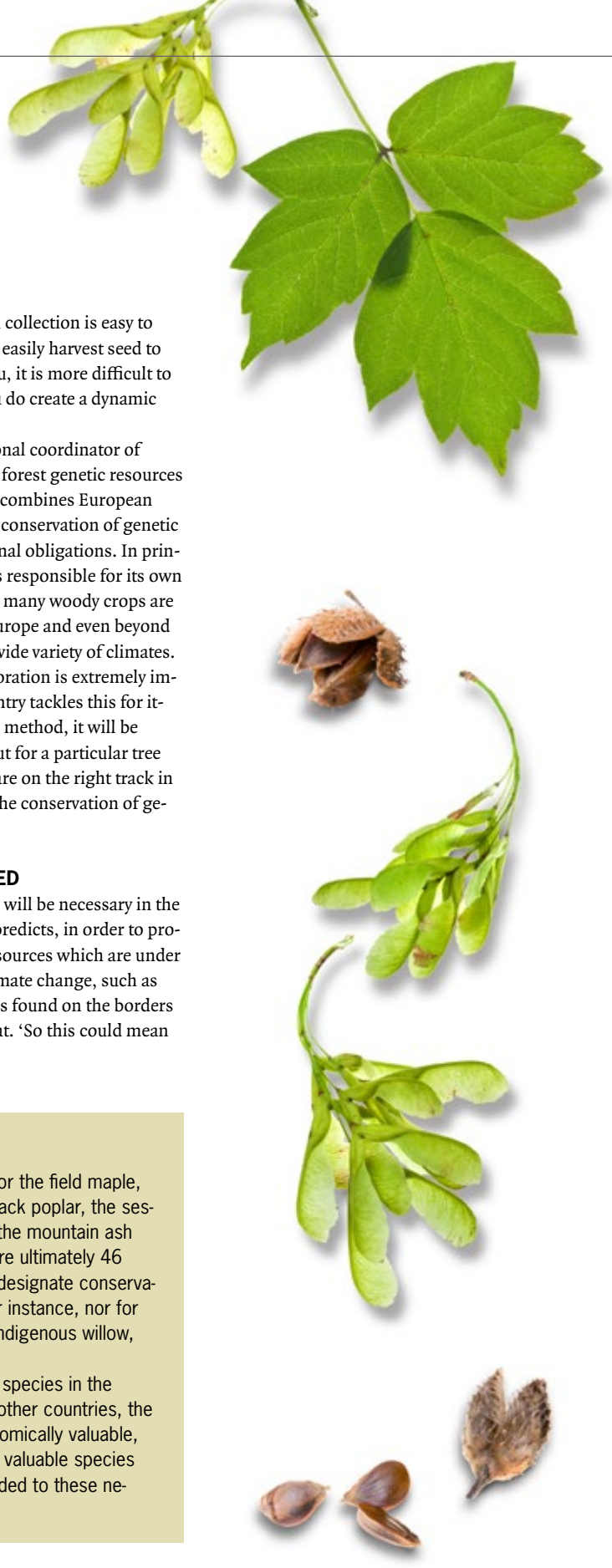
'This kind of tree garden is a snapshot, with all the genetic diversity there was at that moment put into the collection,' says Buiteveld. 'But we also want to keep populations in their natural habitats, to allow evolutionary processes to take their natural course. Hence the gene conservation units, where those populations can adapt to local conditions from generation to generation. The aim of this conservation strategy is to maintain the adaptive potential of the population, and not just of individual trees.'

These two conservation strategies – ex situ and in situ, in the tree collection and in nature – complement each other, says Buiteveld. 'An ex situ collection is easy to manage and you can easily harvest seed to use elsewhere. In situ, it is more difficult to harvest seed, but you do create a dynamic situation.'

Buiteveld is the national coordinator of Euforgen (European forest genetic resources programme), which combines European collaboration on the conservation of genetic resources with national obligations. In principle, each country is responsible for its own genetic diversity, but many woody crops are found throughout Europe and even beyond its boundaries, in a wide variety of climates. 'So European collaboration is extremely important. If every country tackles this for itself and with its own method, it will be impossible to find out for a particular tree species whether we are on the right track in our efforts towards the conservation of genetic variety.'

MOST THREATENED

Additional measures will be necessary in the long run, Buiteveld predicts, in order to protect those genetic resources which are under most threat from climate change, such as marginal populations found on the borders of the species' habitat. 'So this could mean



INDIGENOUS WOODY SPECIES

The Netherlands has established 13 gene conservation units: for the field maple, the white birch, the beech, the ash, the common juniper, the black poplar, the sessile oak, the common oak, the taxus, the European white elm, the mountain ash and the hornbeam. But that is not the end of the story. There are ultimately 46 indigenous woody species for which the Netherlands wants to designate conservation units. There is no unit yet for the small-leaved lime tree, for instance, nor for two species of prunus, the common alder, the five species of indigenous willow, the water elder, holly, hawthorn and honeysuckle.

'We want to establish units for at least the main tree and shrub species in the Netherlands in the next few years,' says Buiteveld. 'Just like in other countries, the emphasis has been on the tree species that are the most economically valuable, that are common, and that form stands. The less economically valuable species have come in for less attention. The strategy will now be extended to these neglected species.'

that material gets carried across national borders in future, in order to be able to conserve it.'

For Euforgen, Europe is divided into 10 climatic zones, mainly based on temperature and precipitation. Each of the 35 participating countries is expected to protect one population of each indigenous species within each climatic zone. So the Netherlands has a relatively easy time of it because the entire country falls within one ecological zone, described – this will come as no surprise – as cool and humid. Italy, by contrast, has five ecological zones within its borders, from hot Mediterranean to cold alpine.

In the Netherlands, the designation and establishment of the gene conservations is financed by the ministry of Economic Affairs. Because this kind of unit does not have a special conservation status, and genetic conservation is for the very long term, preference goes to putting ownership and management of the tract of woodland in the hands of a public party which is prepared to protect the population long-term. 'If you have a private landowner, he could decide tomorrow: I'm going to do something else with it,' says Buiteveld. 'And there goes your conservation unit.' Of the 13 Dutch units established to date, 11 are managed by the State Forest Service, and only the population of the European white elm (Limburgs Landschap) and the beech (Arcadis) are in the hands of 'well-intentioned' private parties.

FELLING ALLOWED

The protected trees are not 'off limits': forestry interventions are allowed in a unit. Older trees may be felled, as long as there is enough rejuvenation. Although the aim is for the populations to take care of themselves, some help is needed at times, explains Buiteveld. 'If you see that there is not enough regeneration in a population, it is okay to give it a helping hand. By freeing the target species, for instance. If the seed is not germinating properly, perhaps due to drought or lack of light, you can harvest it, sprout it and then plant it. The disadvantage of this is that you lose the natural selection at the seedling stage.'

The conservation of indigenous genetic material is no easy matter in the Netherlands, says Buiteveld. Populations of indigenous trees, preferably on public land, are rare and often very small. Species such as the wild apple or the small-leaved lime tree were always quite sparsely distributed, but there are other species too of which the Netherlands only has the remnants of woods left. Nowhere do we reach the 500 adult trees which Euforgen sees as the minimum for preserving local diversity in the long term. 'We have a very fragmented landscape, so we no longer have those large populations,' says Buiteveld. 'A great deal of the forest is plantation, often with material from elsewhere.'

A BIT OF PAMPERING

Hielke Alsemgeest is conscious of the State Forest Service's responsibilities. 'It is very important to conserve genetic diversity,' he believes. 'It is best if you can let nature take its course but sometimes you have to pamper it a bit, although we are not going to give the trees in the Heksenbos artificial fertilizer or go around with a watering can.'

No more than 100 metres away from the taxus trees, the woodland goes over into Willinks Weust, an area where indigenous juniper grows and which is part of the same gene conservation area. The juniper grows here in dense thickets surrounded by wet grasslands featuring devil's bit scabious, marsh gentian, potentilla and heather. This special grassy vegetation has to be mown annually, at the risk of cutting back young juniper bushes in the process. 'That requires a lot of care. You can see that there are now hazel bushes in amongst the trees, as well as some birches; we are going to take those out to prevent the junipers from being overrun. It's OK to do a bit of gardening now and then.' ■

www.wur.eu/forestgenes

Spotting plastic among the walruses

Most beaches on Spitsbergen rarely get any human visitors. And yet they are often littered with more plastic than a Dutch beach. An inventory of this plastic is a first step towards reducing the amount of waste that washes up here.

TEXT KORNÉ VERSLUIS **PHOTO** WOUTER JAN STRIETMAN

Large amounts of plastic wash up on remote beaches all around the world. Wouter Jan Strietman, a researcher at Wageningen Economic Research, went to sea twice this year to do research on the scale of the plastic litter problem in the North Pole region. Together with Eelco Leemans of the Clean Arctic Alliance and Norwegian researchers from the Norut Institute, he visited the islands of Jan Mayen and Spitsbergen. Although he knew in advance that the beaches were far from clean, he was shocked by the sight of the polluted beaches at deserted polar locations. 'We found the most litter on the remotest beaches on Spitsbergen. More than 1000 pieces per 100 metres.' By way of comparison: the North Sea Foundation has been recording quantities of waste on four non-tourist beaches in the Netherlands since 2004, and counts an average of 380 items of waste per 100 metres of beach.

Strietman and the Norut Institute want to find out where the waste comes from. A large proportion of it appears to come from fishing boats and other shipping. During the summer expedition to Spitsbergen, for instance, he found large numbers of straps used on fishing boats to close the polystyrene boxes in which frozen fish is stored.

> 'We found more than 1000 pieces of plastic per 100 metres'

SUDDEN SNUFFLING

This summer, Strietman and his fellow researchers joined a ship from Oceanwide Expeditions, a company which runs tourist expeditions to polar regions. 'They dropped us off on several beaches. The tourists went in one direction and we went in the other to inspect the plastic waste, often with walruses as the only spectators. On the first beach we visited, we were startled by suddenly snuffling sounds from the water. We thought it might be polar bears but it was walruses that were keeping a careful eye on us.'

The waste they found on the beaches was very diverse. From cotton buds and wrapped cucumbers on the beach at Longyearbyen, the largest settlement on Spitsbergen, to a tangle of fishing nets so heavy that three men could not lift it off the ground. There is increasing concern about plastic pollution on beaches and in oceans. Spitsbergen's litter problem is not unique. Shocking photos have also been published of extreme quantities of plastic waste on remote Pacific islands.

Although much of the waste on the islands in the Arctic Sea seems to come from the immediate vicinity of the islands, some of it also comes from further afield. The origin of some pieces of plastic can be pinpointed with reasonable accuracy. 'On Jan Mayen, we found a plastic bucket of a type used in Southern European oyster farming,' says Strietman. Or take the trademark of a Canadian crab fishery. 'We have very precise information on that one. It was granted to a fishery in Nova Scotia in 2000.'

The original of the plastic is not always as clear as this though. In the case of a deodorant can with a Russian label, did it come off a ship or from the Russian mainland? The innumerable anonymous stoppers and bags are equally impossible to trace. Strietman: 'Several different ocean currents meet at Spitsbergen. You find tree trunks from Siberia next to waste from European countries.'

Making an inventory of the waste is the first step. 'We want to draw up a top 10 of the commonest forms of litter. And we want to be as specific as possible. It is not enough to know that there is fisheries waste here. We want to know what kind of fishing net it is so that later we can tell fishers and governments: there is x percent of type A, so much of type B and so on. So that we know which types of fisheries the items come from, and perhaps what the alternatives are. We can then consult with fisheries, governments and other relevant parties to see what they could do to reduce the volume of waste in the polar region.'

NOT OVERBOARD

Fisheries in the Netherlands signed a covenant with the government in 2014 to reduce the amount of waste ending up in the sea. In this Green Deal for Fisheries, the government pledged to provide an efficient waste collection system in the harbours. Fishers promised in turn to collect their waste on board ship, and to sort it into three categories. Strietman: 'A similar kind of solution could work in the polar region. The inventory is important so as to see who we need to get around the table to talk about solutions, and what the options are for making sure less waste washes up on the beaches.' ■

www.wur.eu/arctic

Eat your way to health

Dietary recommendations are mainly used to prevent disease, and seldom to treat it. They do have curative potential, but the Dutch healthcare system is not geared to that. 'It is cheaper to prescribe pills than to supervise patients over a long period in changing their eating habits and lifestyles.'

TEXT TESSA LOUWERENS **PHOTO** HOLLANDSE HOOGTE

In future, lifestyle and diet should feature more prominently in the treatment of chronic diseases. This is the drift of a report produced in May 2017 for ZonMW, the Dutch organization for health research and healthcare innovation, by a team of experts from Wageningen University & Research, their colleagues from other universities, and the National Institute for Public Health and the Environment (RIVM). 'Recently we have been seeing a revival of interest in nutrition and lifestyle interventions,' says project leader Renger Witkamp, professor of Nutrition and Pharmacology in Wageningen. 'In this report we summarized the potential of nutrition and looked at what it would take to exploit it better.'

The biggest benefits, say the experts, can be gained in the treatment of cardiovascular diseases and type 2 diabetes, which tends to affect the elderly. But dietary changes can also benefit patients with certain types of cancer, kidney disease or lung conditions. 'A healthy diet not only supports the treatment but also improves the patient's general health, giving it a unique advantage over drugs,' says Witkamp.

HIGH COSTS

And the general health of the Dutch is not exactly blooming at the moment. Almost half of all adults are overweight and one third suffer from one or more chronic diseases, show surveys by the RIVM. 'These patients take a lot of medicines, with all the side effects and high costs that that entails,' explains GP Tamara de Weijer, chair of the Doctors and Nutrition Association. According to Statistics Netherlands, the Dutch spent almost 95 billion euros on healthcare in 2015. Overweight and unhealthy lifestyles are responsible for about 14 percent of this healthcare burden.

The incidence of chronic diseases, with all the costs they entail, could be significantly reduced, believes >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Bildtstar
Doré
Koopmans Blauw
Bintje

PHOTOS ANP

In a few years it will be normal for a GP to prescribe changes in lifestyle and diet, says Tamara de Weijer, chair of the Doctors and Nutrition Association.

De Weijer. 'A healthy diet works on several fronts at the same time. Weight loss in patients with diabetes, high blood pressure and raised cholesterol not only enables them to stop their insulin injections but also to reduce their doses of drugs for lowering cholesterol and blood pressure.'

PERVERSE INCENTIVES

But nutrition and lifestyle interventions are still not being applied much in practice. According to Witkamp, this is partly to do with the way healthcare is funded. 'The current healthcare system works mainly with short-term models. It is cheaper to prescribe pills, the effect of which you see immediately, than to supervise patients over a longer period in changing their eating habits and lifestyles.'
This sounds familiar to De Weijer. 'As a GP you are exposed to perverse incentives. A doctor earns more if a chronically ill patient keeps coming to the surgery and having drugs prescribed. Health insurance companies cover operations and pills but rarely lifestyle interventions. A ten-minute appointment is too short to discuss dietary advice with the patient; you need more time for that, and that costs money.'
According to De Weijer, this is one of the reasons why GPs pay too little attention to diet and lifestyle. 'Whereas at least three quarters of the medical problems we see are directly related to these things. Take diabetes, high blood pressure, cardiovascular diseases and raised cholesterol. In these cases, the drugs are not really treatments; they only keep the disease in check.'
There are a few diseases, however, for which the treatment protocol used by doctors does include discussing lifestyle interventions. But, says Witkamp, little is known about the extent to which doctors actually comply with these guidelines. From talking to colleagues, De Weijer's impression is that they do not often follow through on them. 'They find it difficult, it is time-consuming, or they do not think it is their responsibility. Whereas research shows that 95 percent of patients see their doctor as the main authority on dietary issues.'
An added factor is that doctors do not learn much

‘It doesn’t feel normal yet to prescribe vegetables for our patients’

about nutrition during their training. At medical school, students get an average of 29 hours of teaching on nutrition and 30 hours on lifestyle, says a 2017 report commissioned by the ministry of Health, Welfare and Sport.

NO PLACEBO FRIES

A further obstacle is the difficulty of obtaining scientific evidence in nutritional studies. Witkamp: ‘In drug research you can carry out studies in which one group is given a pill and the other a placebo (a fake pill). But in nutrition research it is not easy to conduct these kinds of studies: there is no such thing as placebo French fries.’ And, adds Witkamp, nutrition studies often lack a clear end point. ‘Maybe you want to know how many people in the study have a heart attack. But you usually only see the results of dietary interventions decades later, which makes this kind of study extremely expensive and well-nigh unworkable.’

In the report, therefore, the experts argue for alternative research methods which take into account knowledge based on the practical experience of healthcare workers and patients. Witkamp: ‘We are thinking in terms of things like eHealth programmes. People can monitor their blood sugars at home, for instance, using continuous glucose monitors, and send in their data. The advantage of this is that you can collect data from a lot of people over an extended period, and in a natural situation. It is important, though, that these data are processed and interpreted by experts.’

NEW CURRICULUM

For the healthcare system to make better use of the potential of diet, several things need to change, says Witkamp. He thinks doctors and policymakers could make better use of the expertise of health professionals such as dieticians and lifestyle coaches. And more attention should also be paid to the importance of diet and lifestyle in the training of doctors, nurses and other healthcare workers. ‘In response to this report, a committee is being formed in collaboration with the ministry of Health, Welfare and Sport and the medical faculties, which will be tasked with developing a new curriculum for medical students, with more emphasis on diet.’

De Weijer is pleased with this initiative. ‘Prescribing vegetables for our patients instead of drugs might take some getting used to now but in a few years we shall consider it completely normal. If lifestyle adjustments do not work well or fast enough, drugs are plan B.’ Witkamp agrees. ‘This requires more investment in the short term, but in the long term it will probably pay back when we have a healthier society.’ ■

www.wur.eu/foodasmedicine

PHOTO JAN HARRYVAN – OPUS56FOTOGRAFIE

RENGER WITKAMP
Professor of Nutrition and Pharmacology at Wageningen University & Research

TURN AROUND TYPE 2 DIABETES

In a Dutch group programme called *Keer Diabetes2 Om* (‘Turn around Type 2 Diabetes’), patients work on changing their lifestyles for six months, supported by a team made up of a dietician, a lifestyle coach, nurses and a cook. They try to cut down on their drugs by changing their diets and getting more exercise and relaxation. The programme is an initiative of several organizations, including health insurer VGZ, nutrition awareness organization *Voeding Leeft* and a GP network focusing on chronic diseases, *Zorggroep Synchroon*. ‘We see it as our responsibility to society to concern ourselves with preventive healthcare,’ says VGZ spokesperson Dennis Verschuren. ‘We want to do something about the rising costs of healthcare, and at the same time make patients less dependent on drugs.’

Preventive care is tricky territory for health insurers, according to Verschuren. ‘Because you are investing in something that might save money many years down the line. Whereas clients can switch insurance companies every year. We don’t know yet what the long-term effects of this programme will be. We will be monitoring people over a longer timespan after they have rounded off the programme.’

The provisional results are highly promising: the project started in 2014 and already two thirds of the 55 participants are taking smaller drug doses, or even none at all, for their diabetes. Verschuren: ‘I think this kind of healthcare is the way ahead. In any case we are going to expand the programme to 2500 participants. If that is a success, we want to see whether we can include it in the basic health insurance package.’

SUSTAINABLE FISH FARMING SAVES THE ENVIRONMENT

Green to the bone

We are already consuming more farmed than wild-caught fish, and that level of consumption is set to go on soaring. Whether the environment can cope largely depends on new fish-farming technology and improvements to fish, feeds and vaccinations. 'A farmed trout grows to ten times the weight of a wild trout in the same time.'

TEXT ARNO VAN 'T HOOG **PHOTO** GETTY IMAGES **INFOGRAPHIC** STEFFIE PADMOS

The hundred metre-long hall of Kingfish Zeeland on the former island of Noord-Beveland in the Netherlands resounds with the humming of pumps and murmur of air bubbles and running water. The sound is only dampened in the small room where the air is warm and humid and a round tub one metre high and two metres across teems with thousands of miniscule fish larvae the size of rice grains. The landscape outside is typically Dutch, with fields of potatoes and sugar beets and the Zeeland bridge, which punctuates the flatness. Indoors swim young sub-tropical yellowtail kingfish – a fish which does not have a Dutch name but is known to some here as amberjack or as the hiramasa served in a sushi bar.

'These larvae are now three weeks old,' says Sander Ruizeveld de Winter, the hatchery manager responsible for raising the fish larvae. 'They get fresh fairy shrimps which I breed myself every morning. Next week they will be put on dried food, and that's always a tense moment, seeing whether the larvae will eat it. Meanwhile I have to watch out that the larger larvae don't eat the smaller ones. For that reason we are going to >

> ‘The challenge is not to fall into the same traps as the livestock industry’

sort them soon with a fine sieve. Actually, I have been pleasantly surprised by the way things have gone up to now. To my knowledge this is only the second time anyone has succeeded in breeding yellowtail in Europe.’
As soon as the yellowtails are a couple of centimetres long, Bram Rohaan takes over. Rohaan is production manager, and, like his colleague Ruizeveld de Winter, a Wageningen graduate. As is Kees Kloet, co-founder and operational director of Kingfish Zeeland.

LIKE A RUGBY BALL

The warehouse houses tall tanks with a diameter of four and a half metres. In one of the tanks, 90 silvery grey fish swim in slow circles. Their heads are pointed like rugby balls and their streamlined bodies taper off into a crescent-moon-shaped yellow tail. At 70 centimetres and 15 kilos, these fish are still relatively young, explains Rohaan. Yellowtail kingfish *(Seriola Ialandi)* can live for 30 years and grow to 40 kilos and nearly 2 metres in length. ‘They really do grow incredibly fast. These parent fish are now four years old. If we gradually increase the temperature and daylight hours, they think it is summer and they spontaneously start spawning – and that can go on for months on end. Once fertilized, the eggs float to the surface and we can collect them easily.’
Much of the technology at this company is for the purpose of maintaining water quality and purifying water. Yellowtails eat protein-rich food and the waste products – ammonium and phosphate – get into the water. So the shed is full of big water pipes leading to water filters, deaerators, protein skimmers and bio filters. This is high-tech fish farming in a ‘recirculation system’ in which water is continuously recycled, while it is refreshed daily with a small proportion of clean water from the Eastern Scheldt estuary. This high-tech approach differs from conventional fish farming in ponds or net cages in open water, through which waste products enter the environment.
Farming fish in net cages is cheaper at present but in the end, land-based fish farming in a recirculation system is the way ahead, says Wageningen professor of Aquaculture and Fisheries Johan Verreth. ‘Closed systems provide more scope for intensive fish farming, which is what we need to meet the growing demand for fish. And it offers better prospects of doing so in a way that is ethically sound.’
The point is that global fish consumption is set to grow uncontrollably in the coming years, says Verreth, whose research includes studying the composition of fish feed and water purification in aquaculture. ‘Globally, people already eat more farmed than wild-caught fish. If we take world population growth into account, and the growing middle class in developing countries, fish farming production needs to double in the next 15 years. Everyone believes we can manage that, but to manage it in an ethical, sustainable manner really does pose a massive challenge.’
According to Verreth, the prospect of such growth raises a host of questions about feed consumption, water pollution and fish diseases. The manufacture of fish feed, for instance, involves processing large quantities of anchovies, herrings and sardines into fishmeal and fish oil. Fish oil is a key ingredient of fish feed, and depends on fisheries. With global fish catches already at their limit, fish oil is set to become an increasingly scarce resource, especially if aquaculture expands.

AVOIDING TRAPS

There is more to sustainable fish farming than technology and the environment, says Verreth. ‘You must also keep an eye on its place in the landscape and on socio-economic issues: accessibility and pricing of fish, and the labour conditions of people working in the industry. Aquaculture is farming in water. The challenge is not to fall into the same traps the intensive livestock farming industry has done. Because it is a new field, you can try to take all kinds of precautions and make the right decisions.’
One of the concerns is animal welfare. The issues in aquaculture are not really any different to those in livestock farming, says researcher Hans van de Vis of Wageningen Livestock Research. ‘It is important that the farming system is appropriate for the animal. You must look, for example, at its natural habitat, to identify the essential elements for the animal’s wellbeing. Of course, in the farm context, you can’t just randomly plant vegetation in a fish tank. You need to check which structures fit well and don’t hamper the flow of water, for instance.’
Together with Nijmegen researchers, Van de Vis studied zebra fish and demonstrated that they are far more resilient if they grow up in a tank with natural elements such as a sandy bottom and plants. They cope better with change and stress than members of their species raised in a bare aquarium. ‘That demonstrates the importance of meeting a fish’s natural needs. The diurnal rhythms and degree of light in the tanks should also match the fish’s needs, as should the temperature, oxygenation, acidity, and levels of waste products such as ammonia in the water.’
But techniques and measurements don’t solve everything, says Van de Vis. ‘It is important, too, to look at animal-based criteria: what does the animal “tell you” about the quality of the farming system. If a fish reacts strongly to, say, a net in the tank and takes a long time to recover from the stress, that is a signal that the farming system is not optimal.’ The same issues crop up at the end of the farming cycle, and during slaughter, says Van de Vis. ‘What conditions can you create so as to avoid unnecessary suffering? This applies to methods >

FISH FARMING

Global fish consumption is growing steadily, and farmed fish accounts for most of it. A new trend is farming fish in closed land-based systems: an innovative sector in which a lot of research is going on.

The growth in global fish consumption

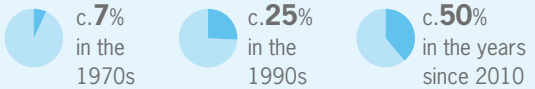
Fish consumption per person per year:

c. **10** kg in the 1960s

c. **14.5** kg in the 1990s

c. **20** kg in 2013

The percentage coming from fish farms:

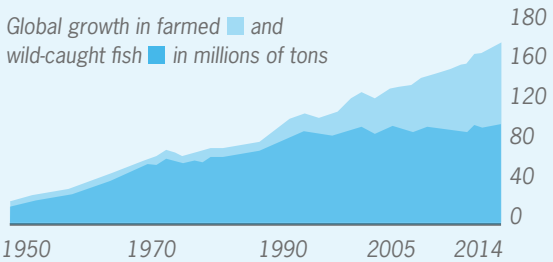


c.**7**% in the 1970s

c.**25**% in the 1990s

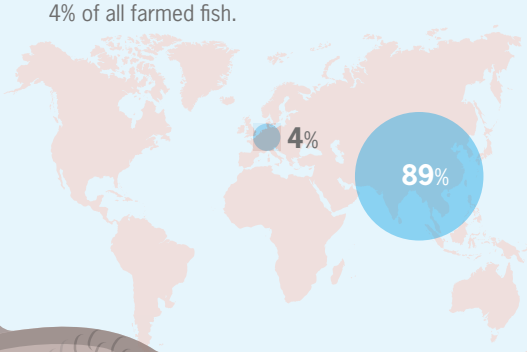
c.**50**% in the years since 2010

Growth in global fish production



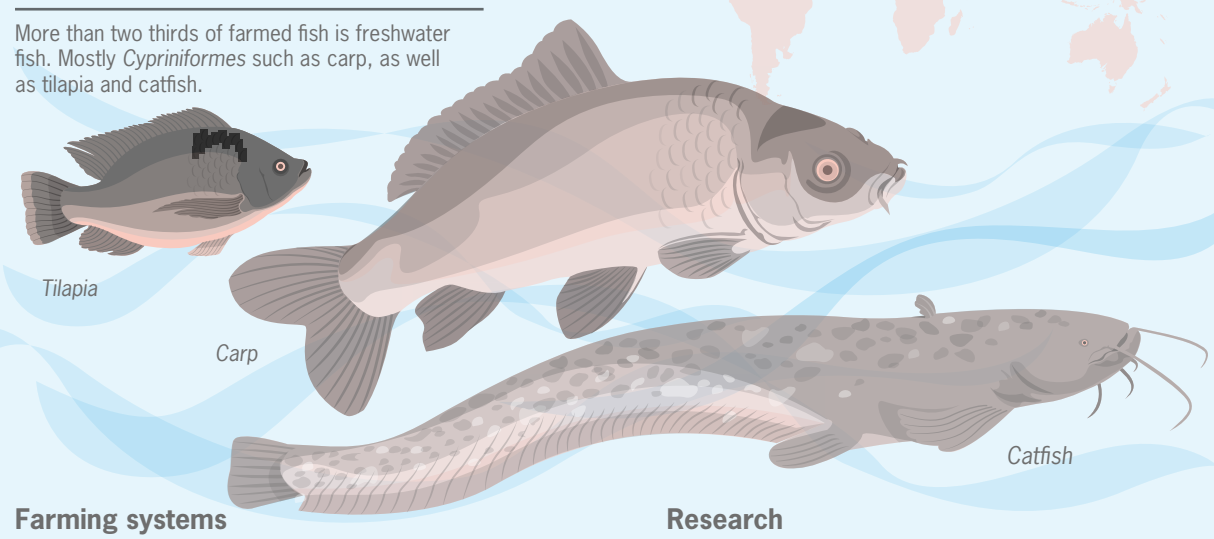
Location

By far the biggest volumes of farmed fish (89%) come from Asia (60% from China). Europe produces about 4% of all farmed fish.

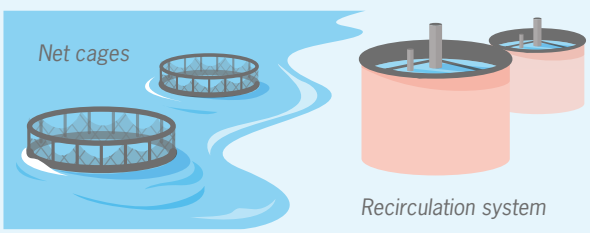


Freshwater fish

More than two thirds of farmed fish is freshwater fish. Mostly *Cypriniformes* such as carp, as well as tilapia and catfish.



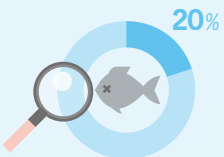
Farming systems



There is a long-standing tradition of farming fish in net cages in open water. The new trend is to use closed recirculation systems. Research on sustainable fish farming focuses on issues such as feed consumption, water pollution and fish diseases.

Research

European aquaculture loses c. 20 percent of its production value to diseases. A lot of research is going on to find ways of preventing this, through vaccination for instance.



Large quantities of anchovies, herring and sardines are processed into fish meal and fish oil, requiring catches of wild fish. Research topics include plant-based fish food.

Tilapia eggs in a hatching tray at a tilapia hatchery.

of transport, maintenance, anaesthetizing and slaughter. The conditions must be adapted to the species. Putting fish in a stunning device shows up the differences. While catfish can breathe in the air and do not suffer much from being lifted out of the water, salmon can't cope with it at all. These are big differences, and they dictate how you should handle a fish.'

CARP ARE CHAMPIONS

Compared with livestock, fish farming is a very small sector in the Netherlands. The chief farmed fish is eel, with some catfish and some pike-perch, as well as sturgeon for caviar. Globally too, the emphasis lies on freshwater fish-farming, which accounts for more than two thirds of farmed fish. Species such as tilapia and catfish are very popular, but the carp family are the champions of aquaculture. Worldwide, four million tons of common carp are produced by fish farms, far more than the global production of farmed salmon. Much farmed freshwater fish comes from Asia, often from small farming systems that are compatible with local customs and traditions. This diversity and the small scale make it harder to do research than it is in the livestock sector, says Verreth. 'Altogether, we are talking about 600 farmed fish species, as opposed to 15 species of animals in livestock farming. All those fish species make their own demands on the farming system and the water quality.'

The most advanced industry when it comes to research and technology is salmon farming, says Verreth. 'There are already pioneers in Denmark and Norway who are experimenting with land-based closed seawater systems. Another innovation is a closed system at sea: floating tanks in which the fish droppings are collected so they don't get into the sea.'

RESISTANCE TO SEA LICE

The salmon sector has made the most progress with selective breeding too. Farms started collecting wild Atlantic salmon from several Scandinavian rivers back in the 1970s, with a view to improving them by means of selection. The main breeding objectives were faster growth and efficient feed utilization, but steps have also been taken recently towards improving resistance to infectious diseases and parasites such as sea lice.

Commercial lines were developed by companies such as Salmobreed in Norway, Marine Harvest in Scotland and Hendrix Genetics in the Netherlands. Today salmon farmers can choose from a catalogue offering five or six lines with specific characteristics such as improved rate of growth, resistance to disease and fillet colour. Forty years of selective breeding have led to remarkable improvements, says Kaspar Jansen, a PhD student supervised by Hans Komen, professor in the Breeding and Genetics chair group. At his inauguration in June, Komen called for breeding for healthier, more efficient fish which could be fed on plant-based feed. Nowadays a commercial salmon reaches three times the weight of its wild counterpart in one year, Jansen calculated in a study published recently. The difference is even greater in rainbow trout. 'A farmed trout grows to ten times the weight in the same amount of time,' says Jansen. 'By comparing the growth data on wild and farmed trout, I arrive at an estimated genetic improvement of 900 percent.'

ASSESSING BREEDING VALUE

Jansen is trying to gauge the economic value of these kinds of improvements more precisely. This entails questions such as how exactly an improved growth rate or resistance to disease contribute to a fish farmer's profit margin. 'I try to describe the relation between breeding and the costs and benefits for fish farmers. Fast growth stimulates profitability, and efficient feed utilization cuts costs. Reducing disease or infection with sea lice has economic value too: roughly 5 to 15 percent of fish die prematurely due to a combination of factors.'

The key point when combining so many useful characteristics, says Jansen, is for breeders to find a balance. 'You can't score a maximum improvement on all the breeding objectives, so you have to balance them out when you select. Once you know all those economic values precisely, you are better

> ‘Fish farming production needs to double in the next 15 years’

placed to choose the right balance of breeding objectives. Maybe in the end, accelerated growth will bring fewer benefits than resistance to sea lice. My aim in this is to use economic models to provide a compass for the salmon farming sector to find the right direction to go in.’
Because resistance to disease cannot always be boosted sufficiently through breeding alone, a lot of research is being done on vaccines and/or stimulating the immune systems of fish. ‘In comparison with the use of vaccines in the livestock sector, we have a way to go in fish farming,’ says Geert Wiegertjes, professor at the Cell Biology and Immunology chair group, where he is studying how fish fight off pathogens.

TREATMENT WITH VACCINES

Wiegertjes is also the coordinator of the European research project Targetfish, which has been running for five years and is aimed at improving fish immunity through measures including vaccination. European aquaculture loses an estimated 20 percent of its annual production value to outbreaks of diseases. ‘In people and animals you usually administer vaccines through injections, so you are talking about an awful lot of injections. That is labour-intensive. What is more, a fish has to be of a minimum size, otherwise the needle will come through on the other side,’ says Wiegertjes. ‘From talks with the industry, I have understood that if administering a fish vaccine costs more than a few cents it is not really cost-effective for many of the cheaper species of fish.’
This means that for the present it is mainly only the more expensive fish such as salmon and salmon trout that are vaccinated. As long as for most types of fish farming it does not pay to vaccinate, pharmaceutical companies will be in no hurry to develop new vaccines, explains Wiegertjes. And even if they do so, patience is required. ‘Take six major fish species in Europe: carp, salmon, trout, bass, sea bream and turbot. Each species is just that bit different, biologically, and each species has three of four pathogens of its own. If you see how many years it takes to develop a vaccine for humans, you shouldn’t expect that we can come up with one for fish farms in two years.’
In order to get around the need for labour-intensive injections, Targetfish has carefully considered the option of vaccines that are administered via the feed. This kind of immunization is cheap but has proven difficult. Wiegertjes: ‘A key exception for humans is polio vaccination. Apparently it is difficult to vaccinate as effectively by that route as by injection. We have incorporated vaccines into fish feed so they get into the intestines in the right form. The only problem is that subsequently they do not provide enough protection.’
An alternative strategy to vaccination is general stimulation of the fish’s congenital immunity, which spontaneously reacts within hours to parts of a bacterium, fungus or virus. That congenital immunity is active from a young age, unlike the immunity that is stimulated by vaccines.
Wiegertjes: ‘I want to study in fish whether exposure to pieces of yeast cell wall can contribute to better general immunity. This should be seen as an additional support or an option for fish species for which vaccination is too expensive.’
The question of whether vaccination is necessary depends a lot on the kind of farming system. In the closed recirculation system at Kingfish Zeeland, water from the Eastern Scheldt estuary is disinfected, so vaccination is not necessary.

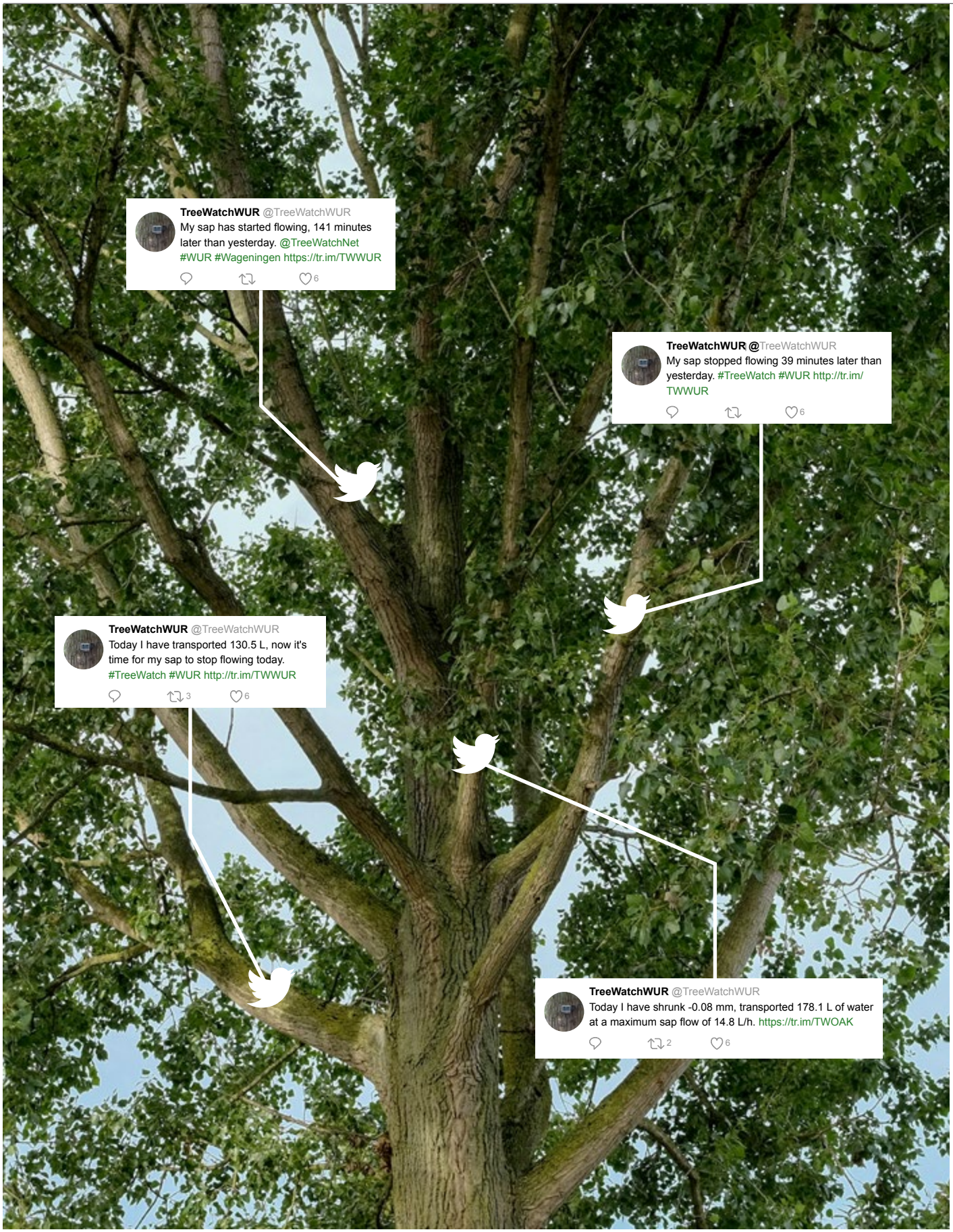
FLOWN IN FROM CHILE

At the Kingfish plant another few thousand young yellowtails, now about 15 centimetres long, are swimming around in several large tanks. They were flown in from Chile six weeks ago as babies weighing one gram. Bram Rohaan wants to get some experience with these fish.
When the fish weigh one kilo, in a couple of months, sales will start to restaurants. These will form the main client base: chefs in the more exclusive restaurants in Europe, who currently consider kingfish too expensive or too unsustainable to import from farms in Japan and Australia. Connoisseurs see the fish as a delicatessen, with its white to light pink, rather meaty flesh that is reminiscent of tuna.
Despite its impressive size, this plant is really just a trial run. The real production facility is under construction 500 metres away, and will be completed at the end of this year. The building will include eight tanks of 12 metres in diameter, and 14 of a somewhat smaller size.
The current building will then be converted into a research facility. ‘That is what those glass boxes are for, for instance,’ says Rohaan, pointing to a wall of empty aquaria. WUR is mentioned on the website as one of Kingfish’s strategic partners, and that collaboration will revolve mainly around involvement in research. Because however well the breeding has gone up to now, continued research is needed. Rohaan: ‘for one thing, there is no manufacturer that makes a feed specifically for kingfish in a recirculation system. We can try out all sorts of options here before we apply them on a large scale.’ ■

www.wur.eu/fishfarming

AQUACULTURE COURSE

Wageningen Centre for Development Innovation will be running the course on Responsible Aquaculture Development at the beginning of 2018.
www.wur.eu/cdi/shortcourses2018


TreeWatchWUR @TreeWatchWUR
My sap has started flowing, 141 minutes later than yesterday. @TreeWatchNet #WUR #Wageningen https://tr.im/TWWUR
6
TreeWatchWUR @TreeWatchWUR
My sap stopped flowing 39 minutes later than yesterday. #TreeWatch #WUR http://tr.im/TWWUR
6
TreeWatchWUR @TreeWatchWUR
Today I have transported 130.5 L, now it's time for my sap to stop flowing today. #TreeWatch #WUR http://tr.im/TWWUR
3
6
TreeWatchWUR @TreeWatchWUR
Today I have shrunk -0.08 mm, transported 178.1 L of water at a maximum sap flow of 14.8 L/h. https://tr.im/TWOAK
2
6

Tweeting about sap flow

A poplar on the Wageningen campus has about 4000 followers on Twitter. The 28-metre-tall tree tweets a few times a day with updates on its physiological condition.

TEXT ROELOF KLEIS **PHOTO** GEA HOGEVEEN

'Good morning!, My sap has just started flowing.' This is the kind of tweet you can expect from the Canadian poplar growing in front of Orion on campus. Or perhaps the more than 30-year-old tree with its diameter of nearly a metre will tell you at the end of the day how many litres of water have evaporated from its foliage today (account: @TreeWatchWur). All this is made possible by sensors in the tree and technology for converting the data they collect into text messages.

Project leader Ute Sass-Klaassen of the Forest Ecology and Forest Management chair group is enthusiastic about the Twittering Tree, the latest publicity gimmick in her field – in the Netherlands at least. The tweeting tree was the brainchild of Belgian professor Kathy Steppe and her team at the University of Ghent. There is a beech, a maple and an oak tree in Belgium fitted out with the equipment. And in Germany there is a tweeting Scots pine.

The tweeting tree is an educational gadget, says Sass-Klaassen. The aim is to introduce a wider audience to Wageningen's tree research. 'We want to show people what goes on inside a tree. What is the impact of a warm, windy day like today on evaporation? At what time of year does a tree's growth accelerate, and how fast does it then grow? A lot goes on inside a tree.' The daily tweets keep interested members of the public abreast of developments. Already, about 4000 people are keeping in touch with what's going on inside the campus poplar.

SHRINKING AND SWELLING

Key sources of information are a sap flow meter and a dendrometer. The former measures the speed at which the tree transports water, while the latter measures changes in the tree's diameter. This not only changes over time through growth, but also in the course of 24 hours. The tree shrinks by day when a lot of water evaporates and its reserves run low, and it swells measurably by night when it absorbs water to replenish its reserves. To complete the measuring equipment, there is a climate station to provide data on atmospheric humidity and temperature, and a soil moisture sensor.

Do not imagine, however, that all this technology is just for show. 'Behind that gadget there is hard science,' says Sass-Klaassen. 'The measurements are used to describe the tree's physiological response to environmental factors. And the nice thing is that the tree documents these changing environmental factors. We all know about growth rings. The width of a growth ring tells us something about the general growing conditions for the tree. But we are going one step further and looking at the size of the cells within each growth ring too.'

The size and shape of the cells in each growth ring provide information about environmental factors during the growth period. Smaller cells are formed in times of drought, for instance. Sass-Klaassen: 'So you can get information about the climate and the way trees respond to it from the size of the cells. Every tree is an archive. But first you have to find the key to deciphering that information.' The tweeting tree is an aid to finding that key, providing as it does a continuous flow of data about growth, moisture absorption and evaporation. Data which are fed into models which predict how trees will respond to climate change.

The tweeting poplar is just one of the trees being used for this research, says Sass-Klaassen. There are another hundred or so trees of various species being used in the Netherlands. But their contribution is anonymous and silent, without the aid of tweets. ■

www.wur.eu/twittertree

More sustaina

More and more manufacturers are focusing on finding more sustainable methods and materials for packaging and transporting their products. Wageningen is involved in this development on several fronts. ‘Packaging is an important channel of communication.’

TEXT RENÉ DIDDE **PHOTO** HOLLANDSE HOOGTE **INFOGRAPHIC** JORRIS VERBOON

able packaging

BIOBASED PACKAGING MATERIALS

The best-known biobased packaging materials are the biobased plastics. For consumers it is not always clear what the properties of these materials are.

PLA *(polylactic acid)*

Relatively common and one of the cheapest biobased packaging materials.

Raw materials

Sugars from sugar beets, sugar cane and maize.

Properties

Porous and breathable. Can be substituted for polypropylene as packaging for fruit and vegetables.

Disposal

Biodegradable in professional composting installations.

PEF *(polyethylene furanoate)*

A new biobased plastic. Can replace PET *(Polyethylene terephthalate)*.

Raw materials

Glucose from sugar beet, maize, and other grains.

Properties

Has proven in lab tests to retain carbon dioxide longer.

Disposal

Not biodegradable; can be recycled like PET.

Take a stroll through any supermarket and you'll see a vast and ever-growing assortment of bottles, jars, packets and trays containing vegetables, fruit salads, ready meals, desserts and countless other fresh products. And nearly all of the packaging is made of plastic, a by-product of the oil industry. In the near future, however, we shall increasingly find ourselves filling our supermarket trolleys with products packaged partially or wholly in biobased or recycled material: a new bottle of washing powder made entirely out of old ones, for instance.

You can already get PET bottles – Coca Cola's 'plant bottle' is one – which are made partly out of cane sugar, and more and more plastic trays and foils are being manufactured from polylactic acid (PLA), sourced mainly from the waste products of sugar beet and maize. Another sustainable innovation is the Rondeel egg box made of PaperFoam, which consists of starch and natural fibres. Coming soon, too, is a tray for vine tomatoes made out of tomato foliage.

AVERSION

'Public attitudes have been changing fast in recent years in favour of sustainable packaging,' notes Christiaan Bolck, Renewable Materials programme manager at Wageningen Food & Biobased Research. 'You can see a widespread aversion to materials based on coal and oil. Serious attention is being paid at last to the plastic soup in the oceans, and people are going into action on the Paris climate agreement. Also, the European Parliament has ruled that member states must take steps to reduce the use of disposable plastic bags.' Producers are responding to these trends and realize that the story behind the packaging of a product is becoming more and more important, notes researcher Marieke Meeusen of Wageningen Economic Research (formerly agricultural economics institute LEI). 'Consumers want to know where their product comes from. If a product is grown organically, for instance, and comes from the local region, many consumers feel a stronger connection with it. The packaging, and what it is made of, are an important channel of communication for that.'

No research has been done yet, though, on whether consumers are also willing to pay more for sustainable packaging, says Meeusen. She thinks packaging made of biobased material only has a persuasive impact on the consumer if it also has a function of some kind: 'If it makes ice cream melt more slowly, for example, or keeps salad fresh for longer.'

ON THE COMPOST HEAP

Rondeel's PaperFoam egg boxes are an example of biobased packaging which adds something to the product's narrative. The boxes stand out on the supermarket shelves. They are brown, contain seven eggs rather than the standard six, and are made of a foam-like material. 'But the packaging can be recycled after use, or it can go on the

Bio-PET *(polyethylene terephtalate)*

Made partly with renewable resources. Familiar from Coca Cola's plant bottle.

Raw materials

Ethylene glycol, one of the building blocks of traditional PET, is replaced with cane sugar.

Properties

Like traditional PET, suitable for bottles and materials such as fleece.

Disposal

Not biodegradable; can be recycled with traditional PET.

PHA *(polyhydroxyalkanoates)*

A family of bioplastics based on fatty acids.

Raw materials

Can be manufactured by bacteria, yeasts and plants from a wide range of substances.

Properties

Very versatile: can be used for carrier bags, foils, coatings and medical products.

Disposal

Biodegradable in most environments.

compost heap or into the organic waste bin,' says Thomas van Sintmaartensdijk, business developer at PaperFoam's factory in Barneveld, where he give a guided tour of the production process.

PaperFoam packaging is made of a combination of potato starch, paper fibres and a secret blend of additives. The ingredients are mixed with water in a large tub, and brown colouring is added. A machine like a Belgian waffle iron then bakes the mixture for one minute at 200 degrees. The egg boxes land with a soft plop on the conveyor belt, at the end of which a woman in a pink hairnet checks the freshly baked packaging. 'Busy and hot today,' she puffs.

Communicating with consumers through packaging is important, thinks Van Sintmaartensdijk. 'A box of seven eggs not only encourages consumers to eat an egg a day; it also relates to the chicken-friendly Rondeel barn, which consists of seven segments like seven slices of pie.'

Producer Rondeel and retailer Albert Heijn accept the fact that the biobased packaging is a bit pricier than standard paper pulp egg boxes. 'Because of the striking appearance and the fact that the packaging is biobased, they sell more eggs. The price is becoming less and less important,' says Van Sintmaartensdijk.

Van Sintmaartensdijk shows other PaperFoam packaging: mainly trays which protect the FairPhone (a sustainable smartphone), the Nest (a smart thermostat) and the Valve game controller (a joystick) in their boxes. And then there is the special packaging provided for the famous brand of champagne, Veuve Cliquot. The champagne bottle sits in a PaperFoam holder which keeps the bubbly cold for at least two hours.

> 'It has to be clear at a glance where to dispose of packaging'

NICHE WITH GROWTH POTENTIAL

Wageningen researchers have made significant contributions to the formula for several new packaging materials such as PaperFoam. Wageningen was involved, too, in the development of ice cream packaging made of Biofoam. Christiaan Bolck: 'We developed this polystyrene packaging made of polylactic acid (PLA) in collaboration with polystyrene producer Synbra Technology in Etten-Leur. Thanks to the insulating foam, you can keep the box out of the freezer for a couple of hours before the ice cream melts. It is no problem to take ice cream along to the beach.' Biofoam can also be used as transport packaging for fish, and >

> ‘Where three trucks were needed to transport flowers, one is enough now’

Wageningen is doing research on whether it could be used for a cool box in Post NL vehicles.
‘Companies can see that the end is in sight for fossil fuel-based polystyrene, and they want to get off that road to nowhere,’ says Bolck. ‘They want to take sustainability further in their own company. We’re still talking mostly niche products, but something like the ice cream packaging could be of interest to major players such as Ben & Jerry’s.’
The holy grail for the Wageningen researchers is packaging material which keeps food fresh for a long time and can replace aluminium and glass. The material has to be highly impermeable to water vapour and gasses. ‘We are already well on the way,’ says Bolck. ‘In fact, biobased polyethylene furanoate (PEF) is less permeable than its fossil fuel equivalent PET, which is already in use as a substitute for glass. The barrier requirements for products such as coffee or crisps are even stricter and we are still looking for a substitute for the packaging of those products. We have found one for coffee, with the proviso that the familiar thin layer of evaporated aluminium film is still necessary,’ says Bolck. But the biodegradable plastic that has been developed meets the European norm for compostable packaging material, even with the evaporated aluminium film. ‘The material falls apart quickly enough, micro-organisms break down the plastic and the aluminium particles have no ill effect on the compost. In fact, aluminium is a trace element for bacteria, fungi and earthworms.’

REUSABLE OR BIODEGRADABLE?

Previous research has shown that it is important to consumers that packaging is ‘reusable and biodegradable’. This poses quite a communications challenge because ‘reusable’ material is not biodegradable and, by definition, ‘biodegradable’ material is not reusable as new material. Meeusen of Wageningen Economic Research: ‘It is very important to have a simple, clear logo that makes clear to the consumer at a glance where the packaging should go: into the bin for organic waste, for paper or for plastic.’
This is Ulphard Thoden van Velzen’s research field. ‘We are looking at how we can improve the quality of the ever larger volumes of synthetic packaging,’ says the researcher at Wageningen Food & Biobased Research. Thoden van Velzen measures the returns on sorting waste by waste disposal and recycling companies by comparing the amount of packaging that goes there with the amount of secondary material that is sent on for recycling. ‘This tells us which packaging contributes less or not at all to the recycling system, and we can provide packaging companies with precise advice on improving their process design. We advised one companies to change the material it uses for its PET bottle labels, thus making the bottles more reusable.’
The infrared techniques used by waste disposal and processing companies then separate the PET better from all the other kinds of packaging consumers dispose of. Paper producer Van Houtum in Swalmen uses it for toilet paper and other products. ‘There too, we contribute technical know-how so as to raise recyclability levels and possibly find methods of making sure less

MAKING BIOBASED PLASTICS PLIABLE

Biobased plastics are less pliable than fossil fuel-based plastics. ‘So PLA, for example, is only suitable for making trays and foil for food packaging and magazine wrappers,’ says Gerald Schennink, a researcher at Wageningen Food & Biobased Research. ‘To make complex forms such as salad boxes and butter tubs with thin walls, or to make rounded shapes, curling edges and spray tops with hinges, the material has to be very fluid.’
You can make a mushroom tray out of a sheet of biobased plastic 0.8 mm thick by heating it up and pushing it into a mould using compressed air or vacuum technology. ‘But if you need packaging in complex forms that is only 0.4 mm thick, this thermoform technology is not up to it. The plastic has got to reach all the corners of the mould during this injection-moulding process, as it is called,’ explains Schennink. And biobased plastics are too thick for that. Schennink: ‘We are trying to get these gooey plastics to flow better.’ In the Agri&Food public-private Top Sector research consortium made up of WUR, SFA Packaging, Arburg and TN Plastics, researchers are going to see whether they can achieve this by adding additives to the biobased materials. Another route is research into adaptations to the injection-moulding process, including looking for ways of improving the barrier function of the packaging. ‘If less water vapour escapes from the packaging, the cookies stay fresh longer. PLA exhibits some negative characteristics in this regard. We are going to see whether we can improve the barrier qualities of bioplastic by integrating an extra layer of foil made of other material into the tray.’

PHOTO APA

Mark Geerts, director of Paperfoam, exhibits one of his products: the Rondeel eggbox made out of potato starch and paper fibres.

recycled material has to be rejected because of contamination,' says Thoden van Velzen.

SALVAGING

Another material that interests him is aluminium, which has been reclaimed from the ash after waste incineration for years. 'Aluminium from trays that quiches come in, or from lightweight whipped cream cans, can easily be salvaged from the ash,' explains Thoden van Velzen. This is less successful with ultrathin aluminium kitchen foil. 'We are studying whether the recycling works better if the aluminium is collected with all the other packaging material.' This does of course have implications for the already rather complicated waste-sorting rules for consumers.

The packaging industry is aware of this problem. 'It has to be clear where you are supposed to dispose of packaging, whether it is biobased or fossil fuel-based,' says Hester Klein Lankhorst, director of the Netherlands Institute for Sustainable Packaging (KIDV). She too knows that more and more chemical companies are looking into how to make packaging more sustainable. 'Biobased is trending, even if the global volume of four million tons is still only a little over one percent of the 300 million tons of conventional packaging.' It is good to see, though, that the market for biobased packaging is slowly growing and the environmental impact is growing too, she says. 'A lot more research is needed on biobased materials. For the time being I expect both kinds of materials will be in use, with the proportion of both biobased and recyclable fossil fuel-based packaging increasing.'

TULIPS AND CARNATIONS

There is more to making the packaging industry sustainable though, including transport and storage issues – the field of Eelke Westra of Wageningen Food & Biobased Research. He is collaborating on making improvements in new trends such as home delivery of fresh fruit and vegetables in the form of meal boxes and standing orders for vegetables. There are gains to be made by reducing the size of the often hefty boxes and bags and by extending the shelf life of products. Some companies have the produce delivered in special refrigerated trucks but even the postal service PostNL is involved in this market, delivering perishable goods along with letters and parcels. 'We are helping these transporters come up with improvements to the insulated boxes they deliver fresh goods in, and we have been testing packaging' says Westra. 'We also provide information which helps the distributer see quickly how many cooling elements are needed in the insulated boxes in a truck at a given outdoor temperature.' And it is better to pack tulips, carnations and some roses in boxes when transporting them internationally, adds Westra. This does away with the need for buckets of water. 'Flowers turn out to be less perishable than we thought,' he says: 'If we add fluid-retaining packaging in the form of a foil around the leaves and keep the environment cool, the flowers stay fresh for three weeks. And without the buckets of water you can get a lot more flowers in a truck. Our research shows that one truck full of flowers now takes the place of three on the road to Germany or France. The environmental impact of that is huge, even if the insulating foil cannot be made of biobased material because it is too expensive.' ■

www.wur.eu/sustainablepackaging

POST-HARVEST TECHNOLOGY

Technological developments in the storage, packaging and processing of fresh horticultural produce are the focus of the course on Post-harvest Technology offered by Wageningen Academy in October. *www.wur.nl/academy*

BROTHERS EXPERIMENT WITH DUTCH SOYA BEANS

From dairy farmers to entrepreneurs

Bart and Tom Grobben's parents have 70 dairy cows. To which they have recently added a hectare of soya beans. This is an experiment by the two brothers, one a Wageningen alumnus and the other a Master's student at Wageningen University & Research. They want to develop their own soya products. 'Cultivating contacts with others is huge fun.'

TEXT LINDA VAN DER NAT **PHOTOGRAPHY** SVEN MENSCHEL

The plants on their parents' farm in Enschede are looking healthy, says Tom Grobben (25). They are about 50 centimetres tall with fresh-looking leaves, but the weeds between the plants are running wild. The Master's student of Management, Economics & Consumer Studies and his brother Bart (28), an alumnus who did the same degree, recently spent an entire Sunday pulling up the unwanted greenery. 'Until nine thirty in the evening,' sighs Bart. 'We were aching all over the next day.' As the sons of dairy farmers, they have some experience of growing crops such as maize for the cows, but soya is a new venture.

Bart, who graduated in 2016, works at Het Foodatelier in Enschede, where he helps food producers come up with strategies for marketing new products. Tom is nearing the end of his Master's programme in Wageningen; he expects to graduate in the autumn. He is currently on an internship at Wageningen Economic Research, where he is researching business succession in the farming sector. An appropriate topic because, like the farmers' sons and daughters Tom has spoken to for his research, the Grobben brothers have also thought long and hard about taking over their parents' business.

'The farm has become a part of us'

LITTLE ROOM FOR MANOEUVRE

'Cows are great animals,' says Tom, 'and my brother and I both love them but the question is whether we've got enough enthusiasm. You always have to be on the spot >

BART GROBBEN

Age: 28
Studied: Bachelor's in Natural and Social Sciences, University of A'dam 2009-2013
MSc in Management, Economics & Consumer Studies, Wageningen 2014-2016
Works: New Business Product Manager, Het Foodatelier, Enschede

‘We don’t want to come up with yet another veggie burger’

with cows, 24/7, including nights. I’m not sure yet whether I want that.’ ‘What is more, the position dairy farmers are in wouldn’t really satisfy me,’ adds Bart. ‘You have a business, but you haven’t got much room for manoeuvre with a dairy farm. You don’t have many options for product differentiation when you deliver your milk to a cooperative. You’re paid based on the volume of milk and the fat, protein and lactose percentages. That is what it boils down to. That’s a position I’d rather not be in.’
That doubt is a frequent topic of conversation around the kitchen table. Tom: ‘Bart and I are real entrepreneurial types. We’d like to continue with the farm; we have a fantastic location with 60 hectares. It definitely has a future. But the question is what kind of future.’ Bart: ‘Given current prices for milk, there are two options for a financially viable business. We can scale up or we can go for quality and differentiation. Scaling up means buying a second robotic milking machine and doubling the number of cows. That doesn’t fit with our views on sustainability so we looked at other options.’ Lots of different ideas have been discussed over the past few years. The proposal that got the entire family enthusiastic was Dutch soya beans.
‘At the moment,’ says Tom, ‘most soya is imported from South America, where unfortunately they’re still chopping down tropical forests to plant soya fields. You’ve also got to consider the small farmers being driven off their land by the big soya companies, the carbon footprint of the transport and the whole debate around genetically modified crops. It would make a big difference if we could grow our own non-modified soya here in the Netherlands.’

TOM GROBBEN

Age: 25
Studied: Bachelor’s in Business Administration, Management, Economics & Law, Saxion University of Applied Sciences 2009-2013 MSc in Management, Economics & Consumer Studies, Wageningen 2014-2017

BENEFITING FROM WAGENINGEN

There are only a few Dutch farmers growing soya beans as the cold conditions in the Netherlands are not ideal for this tropical crop. But the Grobben family, with their two Wageningen-educated sons, were still prepared to go for it. That’s the nice thing about studying at WUR, says Tom. ‘An article by the Wageningen soya expert Ruud Timmer was one of the things that got us enthusiastic about growing soya beans. I sent him an email early on asking for advice. Wageningen has so much expertise on soya bean cultivation, for example know-how about new varieties and ways of increasing yields. That’s a real luxury and you can benefit from this as a student.’
Even so, the two brothers worked out a lot of things for themselves, according to Bart. ‘We were able to choose between three or four varieties that are suitable for human consumption. We gathered the basic information about growing soya beans from various sources. We started with a Google search and ended with a seed supplier paying a visit to the farm.’
The soya seeds were sown at the end of April. ‘We took a very practical approach,’ says Bart. ‘There’s just one right time of year for sowing and that moment was coming closer and closer. We still didn’t have a firm plan of what we wanted to do with the soya but we decided to take the plunge anyway. I’m normally the kind of person who thinks twice before taking a decision but we didn’t want to wait another year.’

PULLING UP WEEDS

Tom: ‘We were able to borrow the farm machinery from our neighbour and he helped us with the sowing. It was new for him too. Every time his phone rang, he’d say: “I’m planting soya beans at the Grobbens,” and then he’d have to explain our experiment. That was quite funny and eventually all the neighbouring farmers knew about it. They like the fact that we’re trying something new but they are also sceptical. They don’t know anything about soya cultivation and find it strange that we’re putting so much effort into it, spending all day pulling up weeds with our bare hands.’
After they had finished sowing, Bart – who lives and works in Enschede – sent his brother in Wageningen regular text messages with status updates. ‘They say soya is an easy crop, but it was still nerve-racking,’ explains Tom. ‘Once the first shoots appear, pigeons can demolish the entire field in a week.’ Fortunately, they were in luck this year. ‘Perhaps the pigeons in Twente haven’t learned to appreciate the delicious taste of young soya plants yet. Or else they weren’t paying attention.’
The Grobben brothers not only plan to grow soya beans, they also want to develop a soya product for human consumption. Tom: ‘In the West, soya is mainly used in the production of animal feed, but food products like tempeh, tofu, soya milk and soya yoghurt are becoming increasingly hip.’ That is another reason why it is so good that the lads have links in Wageningen. ‘For example, I’ve talked to Professor Huub Savelkoul of the Cell Biology and Immunology Group,’ says Tom. ‘He told me about the positive influence that soya has on the human immune system, as well as the effect of a soya allergy.’
Jannet de Jong and Gitte Schober at the Wageningen organization StartLife are helping the brothers contact people who can assist them in working out the details of their

WUR alumnus Bart Grobben (right) and his brother, WUR student Tom, want to continue with their parents' farm, but preferably not as a dairy farm.

initiative. 'StartLife supports startups in agriculture and the food sector. They give advice on what steps we can take to improve our soya plan. We want to make something that there is demand for, rather than yet another veggie burger,' says Tom.
The two brothers are not sure yet what this will be. They would like join forces with a head chef and nutritional expert to develop a product that is both healthy and – most importantly – tastes good. Preferably a chef from the Twente region, say the proud Twente boys. They are already in contact with a local restaurant that is interested in their project, says Bart: 'Cultivating these kinds of contacts with others is huge fun. The harvest may fail but we'll still already have made these investments.'

The two Grobbens will be able to harvest the plants when they have grown waist-high, after the summer. Until then, the brothers can regularly be found at their parents' home. They do everything together where possible, such as pulling up weeds all day. A lousy job, but they can still have a laugh if they do it together. Tom: 'That the two of us – Bart and I – are exploring this entirely new terrain is just fantastic.' Bart: 'It's become a kind of brother bonding. We are in closer contact now than ever before.'
Their parents do have difficulty with the fact that their dairy farm may come to an end, says Tom. 'They have never said it in so many words, but they themselves work day and night with the cows. Of course it's difficult to think that might stop – for us too. At the same time, whenever we discuss the subject they always stress that we should do whatever makes us happy. Our intention is to carry on with the farm – that's our top priority.' Bart: 'We grew up with the farm, which has become a part of us.' We don't want to just abandon it. We're just taking things one step at a time. For the moment this is an experiment, a project in addition to our work and studies that gives us energy. But we both want to get some work experience. We'll be really pleased with anything that's a success. And if there are some failures, so be it.' ■

Info: you can follow the Grobben brothers' soya bean experiment on their Facebook page 'Natuurlijk Twents'

CROWDFUNDING FOR CENTENNIAL ART WORK

Beetle sets out into the wider world

Professor Marten Scheffer hopes to get people thinking with a large artwork on the campus. Crowdfunding has started for the work, to be unveiled at the start of the university's centennial celebrations in 2018. 'I want everyone to experience a shock effect.'

TEXT YVONNE DE HILSTER **PHOTOGRAPHY** MUGMEDIA

I'd like to do something with this idea some time, thought professor of Aquatic Ecology Marten Scheffer when he was bowled over by giant models of water insects in the AQUA Aquarium and Zoo in Silkeborg, Denmark. It was 1993 and he was at a conference on lakes. 'The objects were not specifically intended as art: children were playing on them. What appealed to me was how surreal they looked. It was pure, intuitive attraction.'

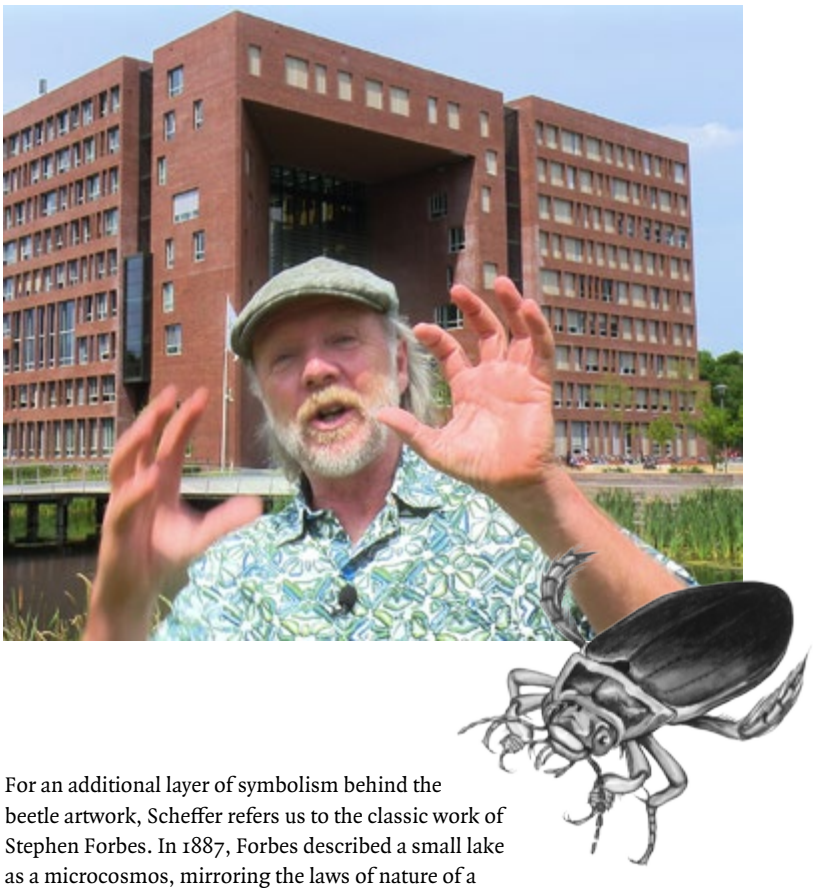
Artist Vagn Iversen (left) talking to Marten Scheffer on the campus.

Scheffer's 1993 wish will come true at the start of the celebrations of the university's 100th anniversary in March 2018. On that occasion he wants to unveil an outsized great diving beetle poised to fly out of the pond near the Forum. The creature will have a wingspan of over five metres, and will light up in the dark thanks to a combination of solar-powered lighting, light-emitting fibres and a mineral finish with a glow-in-the-dark effect. Crowdfunding started in September to finance the project. 'I am underwriting the costs, nearly 90,000 euros, from the Spinoza grant I got in 2009; you are allowed to spend part of that money on collaborative projects with artists. But I would like it to be an artwork that belongs to everyone. Everyone who helps fund the implementation will be a co-owner.'

WRONG-FOOTED

Scheffer received the Spinoza grant from the Netherlands Organization for Scientific Research (NWO) for his research on the stability and resilience of complex systems. This research was prompted by the question of what makes a lake become and remain cloudy. As a biologist, Scheffer has been fascinated for decades by all forms of aquatic life. 'I have spent hours studying creatures and plants with a magnifying glass. In Silkeborg the insects were in your face, in hugely

‘For a lot of people, art holds more appeal than science’



magnified form. That took you by surprise, wrong-footed you in the way a painting or a book can do. I want to give everyone on Wageningen campus that shock effect and then get them thinking. It’s a bit like ambushing someone.’

Because such a sculpture would be a nice symbol for Wageningen, and with the centennial celebrations coming up in 2018, Scheffer called the museum in Silkeborg earlier this year to find out who created the statues that made such an impression on him. The artist, Vagn Iversen, was enthusiastic about collaborating from the word go. They were on the phone for hours. ‘It clicked right away. We could criticize one other, and then one thing led to another and the idea got refined.’

Originally, Scheffer had enormous, hovering water fleas in mind, but Iversen turned out to have a long-cherished ambition to make a great diving beetle poised to take off. Scheffer saw appropriate symbolism here for the university – captured in the title of the work, *Must Leave*. It links in with Darwin’s ideas about why you find the same freshwater insects all around the world: sooner or later a pond dries out so that animals are forced to adapt in order to set out into the wider world. Scheffer sees parallels with human migration. ‘I had just written a review for *PNAS* about a study of the collapse of human civilizations in the New Stone Age, the Neolithic era. I make links in the article with the sudden exodus of the residents of what is now Mesa Verda national park in America, and with Syrians: at some point disaster strikes and people are forced to leave. Climate change, on which I do research, is leading to more migration too. That causes tensions which we need to think about as a society. At the same time, migration also produces many great things. Did you know that Baruch Spinoza’s parents were refugees, and that Apple CEO Steve Jobs’ father was a Syrian émigré? Without them we wouldn’t have the Spinoza prize or the iPhone. A lot of scientists are migrating now too. Together we form a network around the world which speaks the same language and works towards deeper insights. That gives me hope.’

For an additional layer of symbolism behind the beetle artwork, Scheffer refers us to the classic work of Stephen Forbes. In 1887, Forbes described a small lake as a microcosmos, mirroring the laws of nature of a much larger world. This description is seen as the start of the science of ecology. ‘My work developed in the same way, actually. From studying a small lake to looking for fundamental principles in complex systems. I am now trying to use them to understand other phenomena such as processes in the brain, financial markets and society.’

AROUND THE WORLD

Scheffer has been linking up art and science for a long time. He once put on a theatrical performance about creativity in science (vimeo.com/105356840), and he collaborated with Norwegian artist Tone Bjordam on an abstract film called Critical Transitions, for which he also wrote the music (vimeo.com/51029828). ‘For a lot of people, art holds more appeal than science, and it can be thought-provoking in a playful way.’ Once the great diving beetle is in place, Scheffer hopes people will wonder, above all, why it is there, and that they will take lots of photos of it and share them on social media, and then go in search of the story behind it. ‘So that story takes off and travels around the world as well.’ ■

Fancy co-owning Must Leave?
https://crowdfunding.wur.nl/project/mustleave

Getting together around the globe

In 2018, Wageningen will be celebrating its centenary as an academic institution. One of the activities is a worldwide alumni day on Saturday 23 June.

'We hope that on that day, alumni will gather at 100 locations around the world to celebrate the centenary,' says Han Swinkels, who is in the alumni day project group and chairs the KLV alumni network. Sustainable food and nutrition has been chosen as the theme for the day. 'That is a major Wageningen theme that everyone feels some affinity with, whether from the point of view of food security, food safety, health or production.'

Any alumnus can organize an alumni gathering, whether at home or at some other location. There will be a huge reunion that Saturday on campus for Wageningen graduates. People will be able to follow a live stream of the associated symposium, says Swinkels. 'We also want to organize live streams of the alumni events around the world to emphasize and show the connectivity.'
Anyone who wants to organize a gathering is advised to contact the University Fund Wageningen (UFW). The UFW can also help track down fellow alumni living locally.

Info: alumni@wur.nl

PHOTO GUY ACKERMANS

100years
1918 — 2018

PHOTO MARTE HOFSTEENGE

'I'd quite happily go back to university'

There are a hundred different ways to contribute to the celebration of WUR's centenary. Many people in the Netherlands and abroad have already supported one of the five jubilee projects via http://www.100x100.wur.nl/lang/eng. For example, Erik de Groot (Plant Breeding 1983) gave a donation for the book covering the history of the past 25 years. 'I often give to UFW because I owe a lot to my Wageningen education, and I like reference books and photo series.' Camilla Moonen (Biology 1995) donated money because the university still gives her a special feeling. 'I'd quite happily go back to university.' She contributed to the memorial forest. 'Trees grow and symbolize the future and a healthy living environment. And WUR helps achieve this by training first-rate researchers.'
Miranda Smit (Animal Sciences 2007) made a donation to the Big Dutch Student Championships (GNSK). 'I used to be on the committee of the student horse-riding club and I think it's important to play a sport and have a balance between studying and being active. I've never donated to a WUR project before, but the centennial anniversary is a special occasion.'

Together in Taipei

In July, 25 alumni met up in a Taipei cafe. 'We have a closed Facebook group for Taiwanese people who are studying in Wageningen or used to study or do research there. The 120 members can ask one another questions or swap experiences,' explains the chair Jenny Huang (International Development Studies 2009). 'There was a typhoon on the day of the meeting but 25 people still turned up, with graduates from 2003 and later.' One alumna who graduated last year brought them up to date on the latest developments in Wageningen. 'Something changes every year.'

BEQUEST

Inheritance helps 40 additional students

FOTO GUY ACKERMANS

Anne van den Ban in September 2015 surrounded by the board of the Fund and the new students.

The Anne van den Ban Fund received a rather special gift this year: one third of the estate of its namesake. Mr Van den Ban passed away in 2016.

Van den Ban was one of the founders in 1992 of the fund that helps students from developing countries cover the costs of studying in Wageningen. In his will, Van den Ban stipulated that the fund must spend the bequest over a period of 20 years. 'He made annual contributions from day one and this will let him continue to do so for some time yet,' says the chair Pim Brascamp. 'We can use the money to fund two students a year.'

GOOD FEELING

Van den Ban's heirs, the three children of one of his brothers, knew about the provision. 'He had already asked us in around 2000 how we felt about such a bequest,' says Greetje van den Ban. 'I thought it was really nice of him to ask. I didn't feel I was entitled to anything; people should decide for themselves what to do with their money. The important thing for us was that he should feel good about it. His priorities were for his family to be all right and people in developing countries to be able to study here; development work in the form of knowledge transfer.'

NAMED FUND

The University Fund Wageningen (UFW), which manages the fund, does not get such large gifts every year, says its head Delia De Vreeze. 'What we usually see is that married couples set up a named fund during their lifetime and then include it in their will so that they can leave a lasting legacy. Gifts to research and education also qualify as charitable.'

> 'I fully support his final wish'

Inheritances are an increasingly important source of income. Over the past few years, UFW has set up various named funds with money from a bequest or from a gift while alive. The first big bequest came from Professor Wellensiek, who left a large portion of his estate to fund PhD grants in horticulture.

INSPIRE OTHERS

If you have any assets left when you die, it is a good idea to use your inheritance to express what's important to you, says Greetje van den Ban. 'What inspired me about my uncle was the way he knew how to inspire others. I have met a few of the fund students and I fully support his final wish. I hope more people opt for this.'

Info: delia.devreeze@wur.nl, www.universityfundwageningen.eu/benefactors

Prof. Noelle Aarts,
WUR PhD 1998 and professor holding a personal chair in Strategic Communication at WUR, is leaving Wageningen after 25 years to become professor of Socio-ecological Interactions at Radboud University Nijmegen. 1 September 2017.

Robbert Biesbroek PhD, WUR Landscape, Architecture and Planning 2007, has been awarded a Veni grant for research by the Dutch Organization for Scientific Research (NWO). 28 July 2017.

Prof. Tiny van Boekel, WUR Food Technology 1977, WUR emeritus professor of Product Design & Quality Management, will temporarily hold the position of professor by special appointment in Dairy Science & Technology. 1 September 2017.

Prof. Arnold Bregt, WUR Soil and Fertilization Sciences 1983, WUR professor of Geo-information Science and Remote Sensing, has been appointed Director of the Educational Institute at WUR. 1 August 2017.

Arend-Jan Both PhD, WUR Farming Technology 1988, has been appointed full professor of Controlled Environment Engineering at Rutgers University, USA. 1 July 2017.

Wout Dekker MSc, WUR Zootechnics 1983, has been appointed supervisory director of FrieslandCampina and chair of the remuneration and appointments committee. 1 July 2017.

Ronald van der Giessen MSc, WU Forestry 1985, has been appointed Officer in the Order of Orange-Nassau for his services as director of the Oranje Fonds. 20 June 2017.

Prof. Anton Haverkort, WUR Agricultural Plant Breeding 1978, has been appointed an honorary member of the European Association for Potato Research. 14 July 2017.

Prof. Thea Hilhorst, WU Rural Sociology of the Non-Western Regions 1988, has resigned from her position as WUR professor of Humanitarian Aid and Reconstruction and has joined the Institute of Social Studies at the Erasmus University Rotterdam. 7 July 2017.

Mesharch Katusiimeh PhD, WUR PhD 2012, has been appointed vice-rector of Ankole Western University in Ghana. 21 July 2017.

Prof. Eveline van Leeuwen, WUR Land Use Planning Sciences 2002, has been appointed professor of the new WUR chair group Urban Economics. 1 October 2017.

Hans van Meijl PhD, research coordinator for the bio-economy and energy-climate-water-food nexus at Wageningen Economic Research, has been given the Alan A. Powell Award for his work on the Global Trade Analysis Project (GTAP). 28 June 2017.

Prof. Eddy Moors, WUR Land Development B 1985, professor of Climate Change, has left WUR after more than 25 years to become the rector at IHE Delft. 28 June 2017.

Prof. Rudy Rabbinge, WUR Phytopathology 1971, emeritus university professor and a former WUR board member, has been awarded the Rachel Carson Oeuvre Prize 2017 by the environmental professionals association VVM. 7 June 2017.

Masha van der Sande PhD, WUR Biology 2012, has received a Rubicon grant, which she will use to do research at the Florida

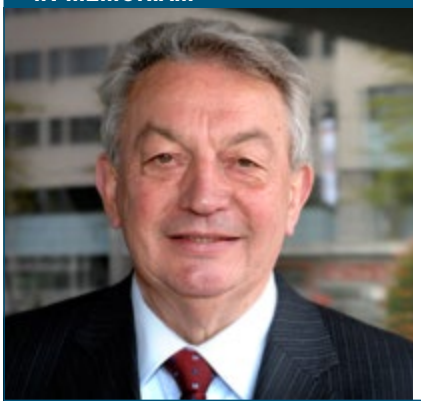
PRIVAT PHOTO

Herbert Prins, second from the right, with WUR PhD candidate Joost de Jong on the right and researcher Tsewang Namgail (WUR PhD 2009) on the left with the flag.

Prins in the Himalayas

He doesn't actually like mountaineering at all. But despite this, Herbert Prins, WUR professor of Resource Ecology and originally from Groningen, is posing here with the Groningen flag at the summit of the 5420-metre Tia La in the Himalayas. 'I climb mountains for my research and when supervising students' graduation projects.' He always takes the flag with him on his foreign trips as he is proud of his roots. 'For an evolutionary biologist, the Himalayas are scientifically fascinating as mammals have really had to adapt to survive in the highest mountain range in the world. There are villages with arable farms up to an altitude of 4200 metres. But they are being abandoned because of droughts in the summer, caused by glaciers melting due to climate change.' Vexillologists will have realized that the flag is hanging upside down.

IN MEMORIAM



Gerrit Braks MSc,

WUR Agricultural Plant Breeding 1965, former minister of Agriculture, has passed away at the age of 84. After serving as a minister, he was chair of the KRO broadcasting company, senator, chair of the CDA party in the Upper House of Parliament and chair of the Upper House itself. He was acting mayor of Eindhoven in 2007 and 2008. In 1993, he received an honorary medal from the Agricultural University of Wageningen. 12 July 2017.

Institute of Technology in the USA. 13 July 2017.

Joris Sprakel PhD, WUR Food Technology 2005, assistant professor of Physical Chemistry and Soft Matter at WUR, has been awarded a Vidi grant by NWO for research. 30 May 2017.

Prof. Katrien Termeer, WUR Land Development A 1987, has been appointed a member of the Council for Public Administration of the Ministry of the Interior. 1 July 2017.

Wilfred Vermerris PhD, WUR Molecular Sciences 1993, has been appointed professor of Microbiology & Cell Science at the University of Florida, USA. 1 July 2017.

PHOTO SYLVIA HUISMAN

Mariënne Verhoef MSc,

WUR Land Development A 1984, will succeed Harm-Evert Waalkens in the WUR Supervisory Board. The chair, Job Cohen, has been reappointed. Verhoef is on the board of the youth care institution Spirit and is vice-chair of the Wageningen Ambassadors. 27 June 2017.

Sonja de Vries PhD, WUR Animal Sciences 2009, has been awarded a Veni grant for research by NWO. 28 July 2017.

Harry Webers MSc, WUR Environmental Protection (water purification) 1983, has been appointed chair of the Social and Economic Council for Overijssel. 1 July 2017.

Mark Zwart PhD, WUR PhD 2008, WUR Laboratory of Genetics, has been awarded a Vidi grant for research by NWO. 30 May 2017.

Scholarship for Wageningen women

In June, the Wageningen PhD candidates **Lies Zandberg MSc** (WUR Biology 2013), **Chantal Vogels MSc** (WUR Biology 2012) and **Carolina Levis MSc** (INPA 2012) received scholarships of 1500 euros each from the Storm-van de Chijs Fund for study or conference trips. The fund's objective is to strengthen the position of Wageningen women in science and reward PhD candidates who stand out internationally, in interdisciplinary terms and in terms of contacts with wider society. Zandberg, who is researching the choice of partners by birds in the wild, sees the prize as a huge compliment. 'What motivates me is my fundamental curiosity. I look for contacts with other specialists in order to get as far as possible with my research. If I find something interesting, I do indeed want to share that with others,' she says.

IN MEMORIAM

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

Mr H.J. ten Berge MSc, WUR Food Technology 1963. 14 February 2017.
Ms T.T. van den Bergen MSc, WUR Soil and Fertilization Sciences 1975.1 February 2017.
Mr G.J.M. Braks MSc, WUR Agricultural Plant Breeding 1965.12 July 2017.
Mr C.J.K. van Dam MSc, WUR Land Development 1952. 2 June 2017.
Mr W.B. van Doorninck MSc, WUR Forestry 1949. 20 May 2017.
Mr D.R.J. Catz MSc, WUR Agrarian Economics 1981. 25 October 2014.
Ms M. Davelaar-Boer MSc, WUR Horticulture 1950. 3 August 2017.
Mr J. van der Harst MSc, WUR Tropical Plant Breeding 1951.17 August 2017.
Ms E. van der Have-Burger, WUR Agricultural Plant Breeding 1950. 14 April 2017.
Mr B. van Heuveln MSc, WUR Land Development 1953.16 June 2017.
Mr W.H. van der Hoofd MSc, WUR Landscape Architecture 1973. 13 April 2017.
Mr T. van Ingen MSc, WUR Zootechnics 1970. 16 June 2017.
Ms M.D. Janse PhD, WUR Food Technology 1967. 14 July 2017.
Mr G.N. Kok MSc, WU Rural Sociology of the Western Regions 1970. 10 July 2017.
Mr R.A.L. Marcelis MSc, WUR Biology 1983.17 June 2017.
Mr P.J.H. van Maris MSc, WUR Horticulture 1954. 11 February 2017.
Ms A. Martin PhD, WUR Food Technology 1998. 2 February 2017.
Mr P.L. Melser MSc, WUR Forestry 1989. 7 June 2017.
Prof. A.L. Mok, emeritus professor SSG. 5 August 2017.
Mr A.D. Oostra MSc, WUR Land Development 1954. 20 February 2017.
Mr J.W.G. Pfeiffer MSc, WUR Land Development 1954. 10 July 2017.
Prof. R.F.M. Steveninck, WUR Tropical Animal Husbandry 1951. 15 July 2017.
Mr R.J.M. de Quaij MSc, WUR Agricultural Plant Breeding 1958. 17 September 2016.
Ms B.I. Rattink-van den Berg MSc, WUR Horticulture 1966. 10 May 2017.
Mr A.J. van Zanten MSc, WU Domestic Science 1982. 18 December 2016.

If you wish to inform us of the death of a fellow former student or relative, you can email alumni@wur.nl or call +31 (0)317- 485 191.

Mini seminar 'Decisions affected by climate change'

Uncertain climate

Climate change is a hot topic that affects everybody, overlapping with various aspects of the Wageningen domain. Almost everyone agrees that the climate is changing. Not only the sciences but also businesses and the governmental authorities are increasingly taking this into account and taking action both to stop climate change and to cope with it more effectively.

Uncertainties

It is not quite that straightforward in practice. All the scenarios for the future are packed full of uncertainties. This is partly due to a lack of knowledge about the system: we simply don't know well enough how it works. And that is without allowing for the socio-economic developments, which also have an influence but are difficult to predict. Fake news is affecting the public debate. What effect will international agreements such as the ones made in the Paris Climate Agreement have? Or failure to implement them?

Own ideas

Those uncertainties mean that it is not only awkward for companies, public authorities and scientists to develop definite strategies, but also that they are all doing so on the basis of their own ideas and beliefs. We hope to get some of those convictions out into the open on 1 December. A number of experts and stakeholders – from academia, the business community and government, but all with links to Wageningen – will be showing how they deal with the uncertainties in their choices and strategies, in a lively discussion that has been included in the conference programme as a mini-seminar.

More information about this mini-seminar and the complete conference programme will be available on the KLV website shortly.

Inspired by Uncertainty

KLV conference moved to 1 December

KLV knows how to keep things interesting. Inspired by Uncertainty: invitations for the conference with that title had barely landed on people's doormats before the message followed cancelling the invitation as the conference would be postponed to after the summer. The jokes wrote themselves: KLV really was taking uncertainty a bit far... Nevertheless, postponing the conference was a carefully considered decision.

'The reason's very simple,' said the chair, Han Swinkels. 'There were just nowhere near enough registrations by 1 June. So the board took the decision to pull the plug on it. We also went and asked our members straight away what could have been done better.' An online survey was set up using the WUR Connect platform. Members – including those who had registered – were contacted by phone and on 23 June, which would have been the first day of the conference, the representatives of the study groups, networks and Young KLV met up after all for an evaluation.

What were the results? KLV is making no secret of it all: there is a detailed report of the evaluation session on the website. Swinkels summarizes it neatly: the theme was too broad, two days was too long, an awkward date had been picked, and the registration fee was too expensive. 'We had wanted a theme that is attractive to all the members. That's a nice idea, but we've seen that it leads to a lack of focus – and too few triggers for people to want to register.'

'These considerations led to us deciding to move the conference to after the summer,' says Swinkels. To Friday 1 December to be precise. The day will focus on a single substantive theme: climate uncertainty. Hugely topical, overlapping at various points with a number of Wageningen's themes. There will be speakers who are leaders in their fields, followed by a seminar. As well as elements of the earlier conference, such as a mix of substantive topics and personal skills in the workshops, so that everyone can put together a programme that will suit themselves. All with a highly attractive registration fee for KLV members!

Han Swinkels

ACTIVITIES

Info: klv.nl/en

14 October 2017
50-year Reunion (alumni who started in 1967)

4 November 2017
25-year Reunion (alumni who started in 1992)

9 March 2018
100th Dies Natalis and start of celebration of 100th anniversary of Wageningen University
The official anniversary programme will be presented during the Dies.

23 June 2018
World Wide Wageningen
International alumni day, with 100 meetings in 100 different countries around the world, on 'Sustainable Food & Nutrition'.

YOUNG KLV WORKSHOPS

5 & 31 October, 23 November 2017
CV training

19 September 2017
Debating

26 September 2017
LinkedIn for students

3 October
Scientific English

7 November 2017
To do a PhD: a pleasure or a burden?

PHOTO LINEAIR

Collaborating for a strong sesame network in Ethiopia

Ten thousand farmers in north-western Ethiopia have managed to boost their sesame harvests by 50 to 100 percent. This is one of the success stories of the Sesame Business Network (SBN), which was started in 2013 with funding from the Dutch embassy in Addis Ababa, and is coordinated by the Wageningen Centre for Development Innovation (WCDI).

Sesame is Ethiopia's second biggest export product after coffee. 'The crop forms an economic base for more than 100,000 farms in the country, which in peak periods provide work for more than 300,000 seasonal labourers. This makes it an engine of local economic development,' says SBN coordinator Ted Schrader of WCDI.

The SBN is a collaborative endeavour by all the parties involved in the production, processing and marketing of sesame, and aims at strengthening the entire sesame chain and boosting incomes. 'The essence of SBN is that we combine the production and the market sides,' says Schrader. 'The programme supports the sesame farmers, processors and traders in this, in areas such as entrepreneurship, financial literacy and doing business with foreign buyers.'

Knowledge about growing and storing sesame is also disseminated through courses, brochures, newsletters and films.

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