



Dutch Delta Plan prompts transition in Vietnamese agriculture

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On CRISPR-Cas and GMO

'The European directive is no longer appropriate for modern technology'

Dutch bananas!

The first Dutch bananas grew on rockwool in a Wageningen greenhouse

Crickets in the porridge

Rearing crickets provides extra protein and income in Kenya



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HOW FARMERS CAN STORE CO₂

Dutch farmers and other land users are going to have to emit 3.5 million tons less CO₂ per year to help reach the country's climate targets. 'Technically, a great deal is possible.'

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ERNST VAN DEN ENDE ON CRISPR-CAS

CRISPR-Cas constitutes genetic modification, ruled Europe's highest court last summer. Ernst van den Ende, director of Wageningen's Plant Sciences Group: 'The European directive is no longer appropriate for modern-day technology.'



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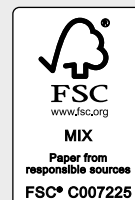
DYKES ARE BREACHED IN THE MEKONG DELTA

The Mekong Delta is poised on the brink of a revolution. In order to cope with salinization and climate change, dykes are going to have to be broken down and farming and freshwater fisheries replaced by shrimp farming.



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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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The first Dutch bananas were harvested to great acclaim in a Wageningen greenhouse last December. Not from the soil but from rockwool and coconut fibre.

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With funding from the Wageningen Food for Thought campaign, East-African small and medium entrepreneurs in the agri-food sector have built up a network. 'The income of more than one million small farmers has gone up by a third.'

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PHOTO MARK SASSEN

Pulse fishing

'The EU has decided to ban pulse fishing even though the International Council for the Exploration of the Seas (ICES) concluded that pulse fishing is better for the ecosystem than traditional beam trawling. So to catch flatfish, including lucrative sole, Dutch fisheries now have to go back to using the beam trawl, which drags heavy chains over the seabed.

Fortunately, Minister Schouten has reserved 15 million euros for fisheries innovation. That is great, but it won't buy you solutions in the short term. It has taken decades to develop pulse fishing as an alternative to beam trawling, which was coming under pressure. Innovations call for broad acceptance and for that you need dialogue between all the stakeholders.

And there has indeed been discussion for years in the Netherlands, within the sector and with NGOs, to create a support base for pulse fishing. The Europe-wide discussion only got going after that was achieved. Meanwhile, Dutch fishers were fishing with pulse trawl gear in areas they couldn't previously work in, because the heavier chains of the beam trawl would have got stuck. They caught more fish and at lower costs, using less diesel. It is logical that this met with opposition from neighbouring countries.

The fact that the fisheries now have to go back to the beam trawl has socio-economic effects as well as the obvious ecological consequences. If oil prices go up and fish prices go down, companies will go under. That will lead to takeovers and a concentration of quota, which will endanger the survival of family fishing companies.

The Netherlands is not the only country facing the issues of reducing the negative impact of fisheries, Brexit, wind farms at sea, and the ban on discarding unwanted bycatch. These challenges demand a transition throughout the European fleet. Ideally, we should tackle this together.'

Tammo Bult, director of Wageningen Marine Research

RIKILT and NVWA lab to merge in June

On 1 June, the Wageningen research institute RIKILT will merge with the Netherlands Food and Consumer Product Safety Authority (NVWA)'s Laboratory for Food and Feed Safety. The new institute will be called Wageningen Food Safety Research (WFSR). The organizations are already housed under one roof on the Wageningen campus. The NVWA laboratory employs 130 people and RIKILT 220. The new WFSR they will form will carry out statutory research tasks for the Dutch government in the field of food safety, including cases of food-related fraud. The merger, and the embedding of the new institute in WUR, will create more scope for innovation, expects WUR president Louise Fresco. Info: jeannette.leenders@wur.nl

DISTINCTION

Professor Moughan honoured



PHOTO WUR

Professor Paul Moughan from New Zealand received the Silver Medal of Honour on 7 December 2018. This is the highest award for those who have rendered

great services to Wageningen University & Research (WUR). Professor Moughan works at the Riddet Institute and at Massey University, and his career in the nutritional sciences is impressive. He has been collaborating with WUR since 1985, and has contributed to courses in topics including growth modelling in animals, as well as setting up joint research programmes on themes such as animal nutrition and protein transition.

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PHOTO HOLLANDE HOOGTE

‘Delta plan’ aims to reward farmer for successful nature management

To help halt the decline in animal and plant species in the Netherlands, farmers should now be rewarded for their contributions to nature conservation. This is one of the points in the Delta Plan for Biodiversity Restoration, which Wageningen researchers are involved in.

Nineteen science institutions, representatives of agriculture, companies, nature and environmental organizations and one bank want to combat the disappearance of animal and plants species from the Netherlands. They put their heads together and launched the Delta Plan for Biodiversity Restoration in December 2018. Wageningen professor of Plant Ecology and Nature Management David Kleijn helped write the plan. The main idea that underpins it is that land users such as farmers must in future be rewarded for their contribution to nature conservation and the restoration of biodiversity. ‘In the end we shall have to pay the real price of products, including the costs of nature conservation,’ says Kleijn.

Up to now, agricultural nature management has revolved around management measures

such as how early a farmer mows his meadows and how often he fertilizes them, explains Kleijn. The results were disappointing, however. He reckons it would be more effective if remuneration was linked with what is achieved, such as the number of hectares of species-diverse grassland a farmer manages to create. Networks of farmers, businesses and ecologists are going to try out measures to see which ones work best. For this, Kleijn emphasizes the importance of monitoring developments well, to get clarity on which measures really have an impact. The Delta Plan is an initial step. The aim is to involve more parties, including government bodies.

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DISTINCTION

Titles for De Vos and Scheffer

Professors Marten Scheffer and Willem de Vos were appointed distinguished professors at Wageningen University in December. They are the first to be awarded this new honorary title.

Professors who stand out for their major contribution to the work of Wageningen University & Research are to be awarded the title of distinguished professor. The title is for scientists who are big names in their field and who have brought in a lot of funding, research programmes and prestige. 'We want to keep our excellent researchers and make use of their qualities more broadly across the organization,' says rector magnificus Arthur Mol. The first Wageningen pacesetters to receive this honour are pro-

fessor of Microbiology Willem de Vos and professor of Aquatic Ecology and Water Quality Management Marten Scheffer. The distinguished professors will step down as chair holders, but will still be based in their chair groups and will continue to teach and do research. But De Vos and Scheffer will take on tasks at the strategic level as well. 'They are going to help think through our scientific priorities, our global positioning and our quality control systems,' says Mol. Info: jac.niessen@wur.nl



PHOTO JEROEN HOFMAN

Marten Scheffer



PHOTO BRAM BELLONI

Willem de Vos

ROYAL VISIT

Máxima in Bleiswijk greenhouses

Queen Máxima and President Halimah Yacob of Singapore visited WUR's Horticultural Centre in Bleiswijk on 22 November, as part of Yacob's state visit to the Netherlands. Yacob, her husband and Queen Máxima looked at innovations in a tulip greenhouse, a tropical greenhouse and a tomato greenhouse.



PHOTO ANP

EDUCATION

Best university again

For the 14th year in a row, Wageningen University & Research has come out as the 'best university in the Netherlands' in the degree guide Keuzegids Universiteiten 2019. Thirteen of Wageningen's 19 BSc programmes were listed as 'top programmes'. The highest scoring programmes were Plant Sciences, Forest & Nature Management and Molecular Life Sciences. The other six programmes were 'recommended'. Overall, the university received 74 points, by far the highest score.

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WAGENINGEN ACADEMY

Search for a new narrative for the food system

Journalist and author Charles C. Mann has made a significant contribution to the debate on how to feed the world with his book *The Wizard and the Prophet*. Mann distinguishes between 'wizards', who look for solutions to the global food supply problem in science and technology, and 'prophets', who think in terms of ecology. On Friday 29 March, Mann will be one of the experts at an English-language seminar, 'When Wizards meet Prophets',

on the Wageningen Campus. The day is part of the shared search for a new narrative for the future of the food system. How can we close the gulf separating ecologists from technologists? Mann and several other experts, including Louise O. Fresco, will share their views.

More information: www.wur.eu/academy

Snow cover getting thinner

Due to climate change, large areas of Europe are getting a lot less snow. The thickness of the snowfalls has been going down by 12 per cent per decade, shows an analysis by a Wageningen student.

In some countries, among them the Netherlands, the amount of snow has gone down by as much as 25 per cent per decade. Only in the north of Norway, Sweden and Finland is more snow falling. The downward trend has intensified since the mid-1980s, when climate change first became evident, write Wageningen researchers in *Geophysical Research Letters*. With the help of the Royal Netherlands Meteorological Institute KNMI, MSc student of Earth & Environment Adria Fontrodona Bach collected data from 10,600 European weather stations. This enabled her to establish the trend since 1951. Ryan Teuling, associate professor of Hydrology and Quantitative Water Management, is surprised by the result, which he calls 'worrying'. 'This is a big



PHOTO HOLLANDESE HOOGTE

change and not enough attention has been paid to it. In the past, the snow melted in the spring; now that is already happening in the winter. So you lack that water in the summer just at the moment when nature needs it the most.' The thinner

snow cover also spells additional global warming. 'Snow reflects sunlight. That has a moderating effect on warming. But less snow means less reflection and results in extra warming.'

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SOIL

New life for arid soil

Can arid and infertile soils, such as badly degraded farmland, be revived using moisture-regulating bacteria? Soil physicist Martine van der Ploeg and personal professor of Soil Biology Gerlinde de Deyn are going to study this question. Their plan has gained them a subsidy of 50,000 euros from the Open Mind programme with which the Netherlands Organization for Scientific Research (NWO) supports socially relevant research based on 'out of the box' thinking. 'We want to find an entire group of these kinds of micro-organisms,' says Van der Ploeg. Then the two researchers will start looking for the right connection between the bacteria and the soil.

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HORTICULTURE

Cucumbers without growers

Wageningen is organizing the first competition for growing cucumbers from a distance: the International Autonomous Greenhouse Challenge. The question was whether artificial intelligence (AI) with sensors and cameras can take over the control of climate and irrigation in greenhouses from the growers.



The main purpose of the challenge was to find out to what extent AI can play a role in horticulture in future. 'I am sure autonomous crop production is possible, with all the cameras and measuring instruments we have these days,' says Fred van Leeuwen of Wageningen Plant Research. 'But for the present, someone has to walk around in the greenhouse to keep an eye on diseases and pests.'

The jury announced the winning team on 12 December. Team Sonoma, with staff from Microsoft and PhD students from Wageningen and Copenhagen, narrowly beat Team iGrow, with members from the Chinese internet and technology company Tencent, and a Chinese agricultural university.

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HUMAN NUTRITION

The suggestion of alcohol is enough for beer drinkers

When beer drinkers taste alcohol-free beer without knowing it, the reward effect in the brain is just as big as when they taste alcoholic beer, showed a study by the Human Nutrition chair group.

To find out whether the reward centres in the brain respond differently to alcohol-free beer than to alcoholic beer, researchers gave 21 regular beer drinkers little sips of beer while they were in an MRI scanner. The participants did not know that some of the beer they were tasting was alcohol-free. The result suggests that it is primarily the taste of beer that sets off the reward effect, and not the presence of alcohol. This is probably because people associate the taste of beer and the suggestion that they are drinking beer

with the reward effect of alcohol. Further research is needed on the effect, including research in a setting in which people are aware that they are drinking alcohol-free beer. Also, brain activity in other taste-related areas of the brain was greater after drinking alcoholic beer than alcohol-free beer. This appears to be down to the stimulation of sensors by alcohol rather than to a reward response. The study was published in the scientific journal *Chemical Senses*.

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PHOTO SHUTTERSTOCK

BIODIVERSITY

Unique species on Windward Islands

The islands of St Martin, Saba, St Eustatius and the Saba Bank are home to 223 endemic species and sub-species: animals and plants that only occur in a small geographical area. This unique indigenous life has been documented under the leadership of Wageningen Marine Research. The 223 species include many beetles, locusts, crickets, birds, snails and vascular plants. The true number of endemic species in this

zone is probably much larger: very little taxonomic marine research has yet been done around the Windward Caribbean islands.

Small populations on small islands make species vulnerable to extinction. So the researchers are putting the case for the development of conservation strategies.

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JOB MARKET

New graduates are finding jobs faster

Unemployment among new Wageningen graduates went down from 13 per cent in 2013 to 8 per cent in 2017, shows the National Alumni Survey. This nationwide survey of recent Master's graduates is done every two years at the behest of the Universities Association (VSNU). Nationally, unemployment among graduates went down from 10.3 to 5.5 per cent.

Wageningen alumni take a bit longer, on average, to find their first paid job: 3.7 months as opposed to 2.7 nationally. Many Wageningen alumni go on to do PhDs: 21 per cent compared to the national average of 12 per cent. And 40 per cent of WUR alumni do an internship abroad during their Master's degree, compared to the Dutch average of 16 per cent.

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GENETICS

DNA test for rare cow breeds

The Centre for Genetic Resources, the Netherlands, at WUR, has developed a DNA test for threatened Dutch cattle breeds such as *blaarkoppen*. The test determines the breed of a cow for which there is no pedigree information. The cow can then be entered in a stud book. The more stud-book cattle there are, the broader the genetic basis of the breed, and the bigger its chances of being maintained.

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PHOTO SHUTTERSTOCK

Sorghum as an alternative to maize

PHOTO SHUTTERSTOCK



Dutch cows eat mainly grass and maize, but a new crop, sorghum, is gaining ground. Wageningen is studying the potential of this tropical crop.

Sorghum is a cereal species from Africa which is also grown on a large scale for livestock feed in the US, among other places. There is growing interest in the Netherlands as well. Sorghum is higher in protein than maize and is better for the soil, says researcher Gerrit Kasper of Wageningen Livestock Research. The plant puts down much deeper roots than maize, and this has a positive influence on soil structure. More carbon is stored in the soil in the roots that are left behind, too.

As a result, sorghum contributes more to combatting climate change than maize does. Moreover, sorghum makes more efficient use of nitrogen fertilizer, which means the crop leaves hardly any nitrate behind in the soil. Lastly, sorghum is less prone to disease and survives on one quarter less water.

But there are still some unanswered questions. Sorghum seed is ten times smaller than maize seed. What are the implications of that for working the soil

and for sowing? Sorghum is more sensitive to frost and germinates more slowly than maize. 'In the tropics, the days during the growing season are shorter than here. So we should breed the plant to adjust to longer days,' says Kasper. He is currently testing sorghum in different soils in Friesland, Limburg and Utrecht, looking at how the soil is worked, fertilization, humidity of the soil, nitrate leaching, the nutrients in sorghum and their loss in silage. In follow-up research, Kasper wants to study how cows digest sorghum and what effect it has on their milk yield.

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NUTRITION AND HEALTH

Payment for healthy habits

The basic Dutch health insurance package now covers the Slimmer (Smarter) programme for overweight people. Wageningen scientists helped develop the programme, in which participants are supported by dietitians, lifestyle coaches and physiotherapists. Wageningen research shows that people on this programme lose weight, become healthier and succeed in keeping up their healthier lifestyle.

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WELLBEING

Working harder in a clean office

A dirty workplace has a negative impact on productivity, shows Wageningen research. Employees at five organizations filled in questionnaires about their work pace, the quality of their work and how clean their office was. Dirt levels in the workplace were also measured physically. The results suggest that a cleaner workplace leads to higher productivity and job satisfaction. How much higher is not yet clear, says Johan van Ophem, associate professor of Urban Economics.

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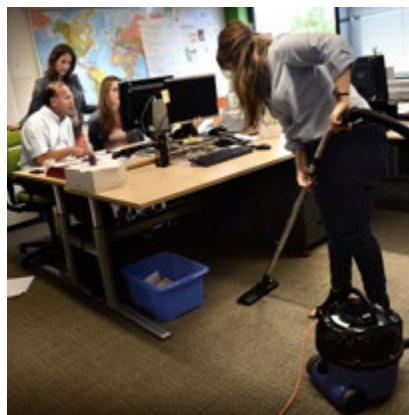


PHOTO HOLLANDESE HOOGTE

ROBOTICS

Four million for agri-food robots



PHOTO: GEA HOGEVEEN

The Netherlands Organization for Scientific Research is funding the Wageningen research programme Cognitive Robots for Flexible Agro Food Technology (Flexcraft), to the tune of 2.9 million euros. The business world will top that up with 1.3 million euros. The programme develops robots for the agri-food sector. Agri-food robots, for picking apples or packing chicken fillets for instance, can take over a lot of work now done by people, and they work hygienically. But they still have a lot to learn, such as how to identify what condition food is in, and to give it the right treatment. Info: eldert.vanhenten@wur.nl

MARINE ECOLOGY

Cooler beach can protect sea turtles from extinction

Simple measures could significantly improve the declining reproduction rate among sea turtles due to climate change, suggests a study in the St Eustatius Marine Park.

On the beaches of the Dutch Caribbean islands, the sea turtles born in recent decades have almost all been females. The temperature in the nests determines the sex: at lower temperatures, mainly males are born, and at higher temperatures, mainly females.

By shading the nests with palm leaves or removing them to cooler beaches, the sex ratio can be influenced, the researchers saw. 'The results surprised us,' explains Wageningen researcher Marjolein Christianen. 'They show that simple measures can cause the sea turtle sex ratio to change from the current 97-100 per cent female to 60-90 per cent female.' The study was done by Swansea University and WUR in collaboration with St Eustatius National Parks, the University of Groningen and Deakin University, and was published in *Scientific Reports*. Info: marjolijn.christianen@wur.nl



PHOTO: SHUTTERSTOCK

FOOD CHECK

Road salt sounds different to sea salt

Salts dissolved in a liquid all have their own sounds, discovered Saskia van Ruth, professor of Food Authenticity in Wageningen. This is akin to the changing sounds you get if you stir cocoa powder into hot milk: the tone of the spoon against the cup rises steadily. The same thing happens with salt. Using a special spectrometer, developed at University College Cork, Van Ruth established the unique sound curves of table salt, low-sodium salt and Himalaya salt. Road salt costs 50 eurocents per kilo, while Yuki Shio salt costs 100 euros. You can tell the salts apart with a sound test, and detect food fraud. But first, further research will now be done. Info: saskia.vanruth@wur.nl



PHOTO: SHUTTERSTOCK

NATURE MANAGEMENT

Inbreeding threatens Veluwe wild boar

Groups of wild boar on the Veluwe plateau in the Netherlands do not have much contact with each other, which leads to inbreeding. Joost de Jong of the Resource Ecology chair group collected DNA material from about 500 wild boar from dozens of populations across Europe. He used it to make a European wild boar genetic map, linking the genetic information with data on their distribution. The wild boar on the Veluwe do not move around much and live very isolated lives, concluded De Jong. The populations are growing, but he is concerned about the genetic erosion. According to the PhD researcher, 'ecoducts' built across main roads are not helping sufficiently to stop inbreeding. 'Game managers should do more to tackle inbreeding, through breeding programmes, for example.' Info: joost.dejong@wur.nl



RESEARCH ON REDUCING GREENHOUSE GAS EMISSIONS

How farmers can

Dutch farmers and other land users are going to have to emit 3.5 million tons less CO₂ per year as their contribution to reaching the country's climate targets. Wageningen is studying the options. 'Technically, a great deal is possible. A lot depends on what farmers can put into practice.'

TEXT RENÉ DIDDE ILLUSTRATION RHONALD BLOMMESTIJN

The illustration features a background with a green-to-purple gradient. In the foreground, there are several large, blue, rectangular blocks, each with a circular opening in the center. These blocks are arranged in a way that suggests they are part of a storage system. In the background, there are silhouettes of a rural landscape, including trees, a cow, wind turbines, a tractor, and a house. The text 'store CO2' is prominently displayed in the lower-left corner in a large, white, sans-serif font.

store CO₂

‘Farmers must become more aware of the importance of organic matter in the soil’

Poultry farmer Johan Verbeek proudly displays the meadow where he has planted 200 walnut trees. The now still slender saplings fill part of the space over which 16,000 free-range chickens roam. ‘On hot summer days, the leaves will provide shade,’ says Verbeek. But on this snowy January afternoon in Renswoude, the white hens are wisely taking shelter under the overhanging roof of the barn. The chicken was originally a forest bird, says the farmer. ‘Once there is a nut tree in the field, they will roam a couple of hundred metres further from the barn than they do at present,’ expects Verbeek. ‘They’ll move around more and spread the manure over a larger area.’ Planting trees is one of the proven ways of combatting climate change. In just over 10 years, the Netherlands aims to almost halve its CO₂ emissions from over 220 million tons per year (1990) to 113 million tons. The agriculture and land use sector – including forestry, nature management, livestock and horticulture – has cut its greenhouse gas emissions by at least 5 million tons in the past 25 years, and is required to cut a further 3.5 million tons in the next 10 years.

The project in Renswoude, small as it is, numbers among the many model projects in which Wageningen researchers work on reducing CO₂ emissions in the forestry, nature management, arable farming, livestock farming and horticulture sectors.

BUSINESS MODEL

Gert-Jan Nabuurs looks on with satisfaction throughout the guided tour of Verbeek’s poultry farm in Renswoude. The

Wageningen professor of European forests explains that this little stand of nut trees will capture eight to nine tons of CO₂ per hectare. It is also a viable business model for the farmer, Martijn Boosten of the sustainable forest management institute Probos has calculated. ‘The farmer gains a good sideline. It is true that nut trees only start to bear sufficient quantities of fruit after 12 years, but then the farmer can earn 4000 to 6000 euros per hectare from them.’ And that is not all. ‘The trees absorb the chicken manure and in the long term the farmer gains some nice nut wood that is good material for furniture or veneer. And that can save on energy-guzzling materials such as plastics,’ adds Nabuurs.

The nut trees at the poultry farm are one of 16 trial projects Gert-Jan Nabuurs and Martijn Boosten are running in which ‘climate-smart’ forest and nature management approaches are being studied. They are going to monitor the development of the forest, the storage of CO₂ and the yields very carefully.

The Netherlands Environmental Assessment Agency calculated that Dutch nature captures and stores about 0.6 million tons of CO₂ per year, a negligible contribution to the over 100 million tons that the Netherlands needs to achieve by 2030. ‘We think that the CO₂ storage in forests in the Netherlands can be increased by half through active interventions,’ says Nabuurs. By rejuvenating forests at certain locations that absorb less CO₂, for instance, and by planting more robust species such as fluttering elm and aspen at locations with a lot of ash deaths. The relative contribution of forests to CO₂

sequestration is much larger in Europe, and forests are already compensating for 10 per cent of the total CO₂ emissions. ‘We want to double that,’ says Nabuurs. ‘Large European countries with lots of forest can learn from the Dutch example.’

Besides storage of CO₂, Nabuurs is researching measures that contribute to the agreements on climate by producing sustainable energy, such as the cultivation of fast-growing trees like willows for biomass power stations, or turning pruned wood from landscape maintenance into compost and heat. Nabuurs: ‘All these measures and the knowledge we gain from them will be brought together in an online toolkit for Climate-smart Forest and Nature Policy for the benefit of practitioners.’

TWENTY MILLION

Nabuurs’ forest research comes under the four climate projects that Wageningen started in 2018 under the leadership of Saskia Visser, Sustainable Land Use programme leader at Wageningen Environmental Research. The ministry of Agriculture has allocated 20 million euros for research on measures that can get greenhouse gas emissions under control in the four areas of forest and nature management, greenhouse horticulture, livestock farming and land use. The projects must be implemented in close collaboration with partners such as the state forest service Staatsbosbeheer, the Centre for Agriculture and Environment (CLM), the Louis Bolk Institute and farmers’ own networks. ‘The funds come from the agreements made in the Climate Treaty,’ explains Visser. She mentions the example of the nut



PHOTO SVEN MENSCHER

BRAM BREGMAN, CLIMATE AMBASSADOR

Slow-going, laborious, tough. That is how Bram Bregman, climate researcher at the Radboud University Nijmegen and since November, Wageningen University & Research's climate figurehead, describes the progress of the negotiations at the climate summit. 'The enthusiasm of the Paris agreement in 2015 has totally disappeared,' says the Wageningen-educated environmental scientist. 'A bloc of serious climate sceptics has emerged, with Trump in the lead of course, but don't forget Putin and the new president of Brazil, Bolsonaro, either. And it was already difficult to get all the countries in the world to pull together to limit global warming to 1.5 to 2 degrees. To do that we have to be emitting less CO₂ by 2050 – preferably 80 to 95 per cent less.'

As climate ambassador, Bregman is trying to specify for several ministries the knowledge that they still need in order to make the Netherlands climate-proof in future. 'I think we need to fundamentally change the way we look at climate resilience. Up to now it has primarily been seen as a water safety issue. But with increasing warming, an accelerating rise in sea levels, and increasing soil subsidence, our current spatial planning choices won't work. So we shall have to develop alternative scenarios for future land use in the Netherlands, going along with nature more and taking a different view of urbanization and infrastructure.' 'And we must keep our fingers on the pulse. Do all the measures work well? Measuring, checking, analysing and, where necessary, adjusting. That is what is often lacking. And that is what Wageningen is good at. I want to make that known in The Hague. The Netherlands says it wants to boost emissions reductions but in reality emissions are going up in the Netherlands and worldwide. At this rate we shall cross the 1.5 degree line in 2030 rather than in 2040. I find that alarming.'

trees on the poultry farm, one third of which are paid for from a grant. 'It is a practical project, simple to execute and some secondary objectives are achieved along the way,' says Visser.

Along with such practical trials, there is also a need for a measuring and monitoring standard with which the various sectors can learn how to ascertain precise quantities of CO₂ or how to avoid emitting it, thinks Visser. 'Good monitoring will be important for the reporting and communication, including at the European level.' Visser has submitted a proposal for this to the EU, asking for 80 million euros to raise the level of knowledge about soil processes among farmers and policymakers in 24 member states, mainly under the leadership of Wageningen University & Research and the Institut National de la Recherche Agronomique (INRA) in France. 'Farmers must become more aware, for example, of the importance of keeping organic matter in the soil.'

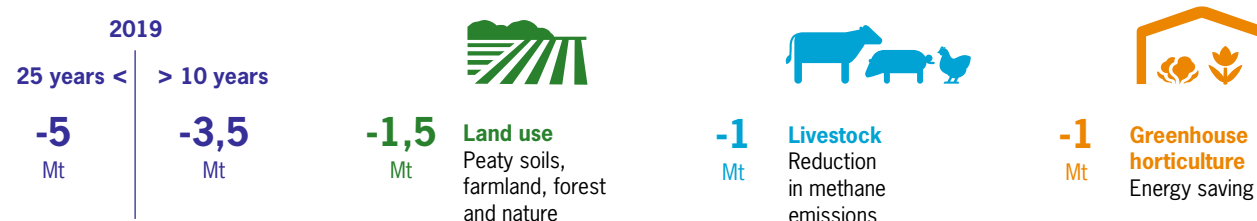
CAPTURING CO₂

The soil is a vast storehouse to which carbon is added as organic matter through plant remains, dead roots, compost and manure. 'Some of that carbon escapes in the form of CO₂, because micro-organisms break down the stocks. To some extent that is unavoidable and even useful, because it also makes nutrients such as nitrogen and phosphate available to the plant,' says soil specialist Peter Kuikman of Wageningen Environmental Research. But the unnecessary breakdown of carbon should be avoided. Kuikman is researching the potential: ➤

AGRICULTURE AND LAND USE

Targets for reduction in greenhouse gas emissions by 2030

In CO₂ equivalents per year



SOURCE: SER, DRAFT CLIMATE AGREEMENT

‘There is no single solution to this; it has to be approached case by case. We still need to do a lot of observing to find out what works best.’ He reckons that one million tons of CO₂ can be captured and stored through improved land use: about one per cent of the contribution agreed by the Netherlands. On higher sandy and clay soils, arable farmers can already make a contribution by ploughing less often and less deep, so that less organic matter is exposed to oxygen and therefore less CO₂ is formed, says Kuikman. ‘Farmers can also return crop remains and manure to the soil more often and use green fertilizers such as lupins.’ This is not just good for capturing CO₂ and preventing emissions, it also makes the soil more resistant to drought and pests, and makes for a more diverse soil life.

WETTER PEAT

It’s quite another story in the low-lying peat land which accounts for about 10 per cent of Dutch farmland – mainly for dairy – and from which four to five million tons of CO₂ escape every year. This would seem to offer a promising project for capturing CO₂ but it has far-reaching consequences for livestock farming, says Kuikman. ‘Farmers have to raise groundwater levels there, which makes the peat wetter and reduces the oxidation, so less CO₂ is released. But that leads to fewer cows, wetter fields and ultimately to a less open landscape.’ At various places in Friesland and in the ‘green heart’ between the big Dutch cities, farmers are cautiously experimenting with a higher groundwater level.

It would be good if we encouraged better

land use in the peat meadows, but equally on sandy and clay soils, thinks Kuikman. ‘A financial incentive to store CO₂ and work on the quality of the soil could be added to the European agricultural subsidies. Our research should soon produce a set of measures that are the most effective for each soil type and branch of the sector.’

BREATHING OUT METHANE

There is another climate-wrecking factor at work on the peaty soils besides CO₂ emissions through oxidation. ‘By breathing out methane, cows themselves are responsible for over 65 per cent of the contribution of livestock farming to climate gases,’ says Leon Šebek, animal nutrition project leader at Wageningen Livestock Research.

Methane is a very strong greenhouse gas – 25 times as strong as CO₂ – and is released during digestion in the rumen. The methane of all the cows in the world causes roughly the same climate damage as all transport, show FAO figures.

About 20 per cent of the methane that escapes from the cow does so through the manure, while 80 per cent exits through the animal’s mouth and nose, show measurements taken in Wageningen measuring chambers. Researchers have measured the metabolism and the manure and urine production over five years, in relation to different kinds of livestock feed. ‘This contributed to our expansion of the Annual Nutrients Cycling Assessment - an instrument that shows the nitrogen and phosphate cycles on a farm – to include carbon. That enables farmers to steer their business towards a reduction in methane emissions,’ says Šebek.

He thinks methane emissions from stored manure can be reduced to almost zero by further improving the way the manure is stored, covering it and then digesting it to form biogas. Emissions via nose and mouth are a trickier question. ‘Technically speaking, those emissions can be almost halved by adapting feed, but in practice we shall have to be content with a reduction of 20 to 25 per cent for now,’ thinks the feed researcher. ‘The quality of raw feed is important here. If dairy farmers feed cows on young grass, the micro-organisms in the rumen make less methane. They do that too if the cow is fed on starchy feed such as maize,’ says Šebek. That means mowing more frequently and using young grass to make silage for the winter feed stocks too.

HIGHER MILK PRICE

To get this message across to dairy farmers requires extension services and communication, but Šebek has high expectations of price incentives as well. ‘If their Annual Nutrients Cycling Assessment is good, the dairy farmer qualifies for a higher milk price,’ says Šebek. The dairy sector is starting to pay more attention to milk’s ‘footprint’, and will increasingly use prices as an incentive for environmental measures, just as there is already a higher price for milk from cows that are put out to pasture.

Šebek expects results from another quarter within five years, too. He is doing research on the still unexplained differences in methane production between cows. ‘We suspect this has to do with differences in the micro-organisms in the cow’s stomach. If

‘Theoretically, methane emissions can be almost halved by adapting feed’



PHOTO GETTY

The exhalation of methane causes two thirds of climate gas emissions from livestock.

we can discover which of the dozen or so species of micro-organism in the cow's stomach produce the least methane, and get them to work for us by, for example, changing the feed composition, methane emissions will go down. Another question is whether the animal can adapt. If it can, that could pave the way for a breeding programme for a “low-methane cow”. The research on restricting methane emissions from cows is one of the 12 climate research projects at Wageningen Livestock Research, coordinated by Karin Groenestein. They range from the development of new barn systems, installing filters with micro-organisms that break down methane in the stored manure, to the further development of sensor

technology for measuring the cow's emissions in the barn 24/7. ‘Farmers still don't know much about the climate problem. It's yet another thing for them to have to think about, on top of manure, ammonia, stink and fine particles,’ says Groenestein. Even more book-keeping, even more regulations. So the research coordinator has allocated some money to communication about the research results. ‘Technically, a great deal is possible. A lot depends on what aspects of the climate solutions farmers can put into practice – apart from the measures for conventional issues such as ammonia emissions. As well as whether they can make a good living, and whether consumers are prepared to pay for it.’

GREENHOUSES AS AN ENERGY SOURCE

Unlike the dairy industry, in greenhouse horticulture, saving energy and reducing CO₂ emissions has already been a topic for 45 years, says Frank Kempkes, a horticulture technology researcher at Wageningen Plant Research in Bleiswijk. Greenhouses used to be massive natural-gas guzzlers, but little by little, the greenhouse as a source of energy (the name of a 2008 Ministry of Agriculture research programme) is coming closer. Horticulturalists started closing the curtains at night back during the energy crisis of 1973, just like householders. Kempkes sums up the trends: ‘In standard greenhouses there are now two or three curtains, which help keep a lot of heat in. Heat is also extracted from the escaping ventilation air, and heat pumps are being introduced as

gas-free heat sources.’ Emissions have gone down by one third to 4.4 million tons of CO₂ per year, in spite of a doubling of production per surface area.

The sector is also experimenting a lot with new, sustainable energy sources such as geothermal energy, in which heat is brought from up to three kilometres below the earth's surface. Kempkes thinks a gas-free greenhouse is feasible and will be affordable. But there is a major stumbling block, he warns. ‘For year-round cultivation of flowers and greenhouse vegetables, the availability of light in the winter months is the limiting factor for production. Of course we work with energy-saving LED lights, but electricity will always be needed, for the heat pump as well. And the green sources for that are still limited.’

Electricity from solar energy seems an obvious answer, given the vast surface of greenhouse roofs. But there is one problem, says Kempkes. The solar cells compete with the plants, even if the cells of the future are no longer in blue-black panels but can allow sunlight through selectively. To grow, plants need the wavelength of 400 to 700 nanometres. And that is precisely the wavelength required to produce electricity. ‘Maybe breeding will make it possible to produce tomatoes, for example, that can grow in slightly different light. But it might be easier to find out whether the greenhouse area can be provided with storage capacity for the large amounts of electricity produced by wind farms at sea at night.’ ■

www.wur.eu/climate-smart-agriculture



‘We didn’t have
to spray our bananas’



GREENHOUSES HOLD OUT HOPE FOR THE TROPICS

Dutch bananas!

The first Dutch bananas were harvested in a Wageningen greenhouse last December, to great acclaim. They had not been grown in the soil but in rockwool and coconut fibre. This could help farmers in the tropics to outsmart the dreaded Panama disease, say the researchers.

TEXT RIK NIJLAND PHOTOGRAPHY GUY ACKERMANS

It was a media hit last December: the harvesting of six bunches of bananas – about 800 pieces of fruit – at the first Dutch banana plantation, in a greenhouse on the Wageningen campus. ‘There were 15 camera crews,’ says Harold Meijer, a researcher at Wageningen Plant Research. ‘Bananas appeal to the imagination. I used to do research on potatoes, and occasionally somebody would come and have a look; but with the bananas we sometimes hosted 10 excursions a day.’ The greenhouse cultivation was an experiment to mark Wageningen University & Research’s centenary. It was suggested by extraordinary professor of Tropical Phytopathology Gert Kema, as a way of put-

ting Wageningen in the spotlight. He had been wondering whether bananas could be grown on substrate. And the experiment was a resounding success, albeit only in the nick of time before the centenary year ended.

A BIT NERVOUS

The bananas were put in the greenhouse in January 2018, as undersized houseplants. They grew rapidly, but by August there was some doubt about them, says Meijer, because none of the plants had flowered. ‘We were getting a bit nervous: will we make it in 2018? Then we cut one up to see if there was a bud coming. A few days later we realized that was unnecessary, as the first plants began to flower.’ ➤

On a visit a week after the media hype, peace has returned to the greenhouse complex. As the December rain patters on the glass, it is pleasantly warm inside, but not boiling hot. A borderline temperature for the development of the fruit: these heat-loving plants are not in their element, says Meijer. ‘The hot summer was very welcome. The temperatures were high and there was plenty of sunlight: tropical conditions in fact. Now, in the winter with the short days, the lack of light is limiting and temperatures are on the low side. The bananas lack the energy to make the fruit grow fast. In retrospect, we should have started months earlier.’

These are not the only teething troubles the experiment has suffered from. The 53 banana plants are very close together, in six rows with a bit more than a metre between the plants. The lowest leaves have been removed to create some room for manoeuvre in this jungle. ‘If we could have left those leaves on the plants, production would have been higher,’ says Meijer. And the top leaves at over six metres got stuck between the pipes at the top of the greenhouse. We are now working on a demonstration collection for visitors, and there the individual plants get a lot more room.’

RIPENING

But the plants are now full of lovely bunches of Dutch bananas, ready for the second harvest – even if they are on the small side due to the light and temperature conditions. The fruit is harvested green, just as it is in the traditional places of origin in the tropics. Those bananas travel by sea to destinations such as western Europe, where they go into a ripening facility. Here they ripen evenly under the influence of the plant hormone ethylene – through which starch is converted into sugars – and a smart temperature regime. The Wageningen bananas don’t have so far to travel: they are ripened at a Chiquita



Pieter Vink of the Boerenhart cooperative proudly receives the first bunch of Dutch bananas from Professor Gert Kema.

facility in Gorinchem.

So it has been established that bananas can indeed be grown on substrate. This has important advantages. ‘It enables us to avoid soil pathogens and prevent the waste of nutrients,’ says Kema. In the greenhouse, the plants are either in tubs of coco peat (a coconut waste product) or in mats of rockwool. It is a strange sight: a bag of rockwool with drip tubes for water and nutrients, and a gigantic banana plant growing out of it. ‘We chose coco peat because it is widely available in most of the production countries,’ explains Meijer. ‘Rockwool because we have a lot of experience with it in Dutch greenhouse horticulture. For plant growth we have not seen any difference between the two types of substrate. We have delivered proof of principle here: you can grow bananas above the ground, and that is an innovation. It has never been done on such a large scale.’ On substrate, nutrients can be better adjusted to the needs of the plants, and no nutrients are washed away and wasted. ‘Substrate cultivation also makes research on what the crop wants easier,’ says Meijer. ‘What does a plant need, and when? We don’t know much about that in the case of the banana.’

The main reason to get banana plants out of the soil, however, is that farmers in

Central America, Asia and Africa are plagued by two fungal diseases: Black Sigatoka and Panama disease. Black Sigatoka causes the leaves to deteriorate and can only be controlled with large doses of chemicals – spraying the plants 60 times a year. As for Panama disease (see inset), no plant can resist it. The disease is caused by the fungus *Fusarium*, which lives in the soil and attacks the plant’s vascular system. Once soils are infested with this pathogen, a plantation is unusable for at least 30 years, and probably longer, and the farmer has to find another location. The fungus poses a threat not just to our western fruit bowls, stresses Meijer, but also to food security. Most local banana varieties are vulnerable to the fungus too. ‘There are regions of Africa where people literally live on bananas, eating a kilo of them per day.’ The thinking in Wageningen is that by keeping the plants out of the soil, the farmer can outsmart Panama disease. Bananas can then still be grown on infested plantations, on substrate.

GENETICALLY UNIFORM

Professor Kema was in the Philippines in December for consultations about upscaling the substrate experiment in the open air. ‘That is a pragmatic approach to soil-related problems, but the real Achilles

‘This is proof of principle: you can grow bananas above the ground’

heel of global banana farming is its genetic uniformity. About 95 per cent of the dessert bananas worldwide are of the Cavendish variety,’ he explains. The plant’s DNA doesn’t get changed through sexual reproduction, as these bananas are propagated using tissue cultivation, a form of grafting really. Over hundreds of thousands of hectares in tropical countries there is a monoculture of clones, a paradise for pests. According to Kema, more genetic diversity is a must for tackling the fungus problems. ‘That’s why we have set up the MusaRadix company, which has joined forces with breeding company KeyGene to take the initiative on breeding bananas. A programme like that doesn’t develop by itself, and it takes a lot of time and money,’ says Kema. ‘Chiquita opted recently to work with Wageningen and partners on tackling genetic uniformity. Not just because of resistance

to disease, but also for other reasons, such as flavour. The ultimate goal is to make global banana cultivation more sustainable.’

REGIONAL PRODUCT

Meanwhile, the question is whether there is any commercial mileage in the Dutch banana. The first harvest was marketed by Boerenhart, a cooperative that supplies regional products from the province of Gelderland to companies, hospitals and catering outlets. The Wageningen banana project fits the cooperative’s vision on sustainability and corporate social responsibility, as Pieter Vink of Boerenhart told the media. Kema and Vink are exploring the potential for a semi-commercial trial in the Netherlands. Harold Meijer: ‘You might think in terms of a niche market for banana varieties that taste delicious but are not yet for sale here.

Perhaps because the skins are not tough enough to cope with transport, or because their appearance is spoiled by insect and fungal damage. Western Europeans only want nice yellow bananas. We don’t get those pests in our greenhouses, and we don’t even have to spray the crop. Of course it is more logical to pick countries with more sunshine for the cultivation. But the question then is: won’t those bananas be black and blue after two days in a truck from Spain? And banana farming is hard work: it remains to be seen whether it is commercially viable here.’

Later in December, Meijer emails: ‘We received the bananas from the ripening facility on the last day before the Christmas holidays. Tastes differ, but we were very pleased with them, and so was Chiquita. They tasted fantastic.’ ■

www.wur.eu/banana-cultivation



Gert Kema

AGGRESSIVE FUNGUS

Until the mid-20th century, most of the bananas in our fruit bowls were of the Gros Michel variety. That was until Panama disease, caused by the *Fusarium* fungus, ravaged banana plantations all around the world. The resistant Cavendish banana provided a solution, but this variety is not unassailable either. In the 1980s, a new strain of *Fusarium* appeared in Asia, the Tropical Race 4 (TR4), which loves Cavendish bananas. Given that most bananas are clones, this new fungus poses a huge threat to the sector.

An international team led by Gert Kema from Wageningen is trying to find out more about the cause of the disease. In October, team member Martijn Rep, professor of Molecular Phytopathology at the University of Amsterdam, Kema and his colleague Harold Meijer made an important discovery: the protein that makes the banana fungus so aggressive. The model in the research was a related fungal disease in tomatoes. ‘In that tomato fungus, the protein SIX1 contributes to the virulence of the fungus,’ says Rep. ‘The fungus is not nearly as aggressive without that protein. We found a similar protein in the banana fungus.’

Tomatoes have a receptor on the cell wall that recognizes the SIX1 protein and sets an immune response in motion. The Cavendish banana lacks this defence mechanism. Rep: ‘We could now look for a banana variety that recognises this protein and is therefore resistant to the disease.’

‘We want to make a dif

Wageningen will be collaborating even more with partners. That is one of the main themes of the strategic plan for the next four years. Executive Board members Rens Buchwaldt and Arthur Mol explain the choices.

TEXT ALBERT SIKKEMA AND ANTON VAN ELBURG PHOTOS ALDO ALLESSIE

Innovation is concentrated at the areas where fields of knowledge overlap,’ says Arthur Mol, rector magnificus at Wageningen. ‘If we want to remain at the top, we need to have strategic partnerships with other universities and science institutes.’

In January, the Executive Board presented the strategic plan for the period 2019-2022. A central element in the plan, entitled Finding Answers Together, is the call to current and potential partners to collaborate even more. Rens Buchwaldt, the Executive Board member responsible for finance and HR: ‘We need to be more proactive in collaborating with one another within WUR. And we need to partner other organizations more.’

The priority is impact, stresses Mol. ‘We want to make a difference in the world. But we can’t do that alone. We want to collaborate more with Utrecht University, for example, on biological systems and sustainability. We will also be working on hi-tech areas such as robotics in partnership with the technical universities.’

DIGITAL TWINS

The strategic plan identifies three investment themes that Wageningen plans to spend four million euros a year on: Connected Circularity (renewable raw materials), the Protein Transition (alternative sources of protein such as plants, insects and seaweed) and Digital Twins (models for understanding organisms better). ‘In the Digital Twins theme, we plan to build digi-



**‘We mustn’t
abandon our small-
group teaching’**

Arthur Mol

ference in the world'

tal copies of cells, plants, animals and ecosystems,' explains Mol. 'We won't be setting up our own big digital sciences group for that; instead we will look to link up with other universities that are strong in data sciences and sensors, such as Eindhoven University.'

The Connected Circularity theme includes the topic of circular agriculture. There has been a lot of talk about this but ideas still need to crystallize, says Mol. 'Agriculture minister Carola Schouten's circular economy vision is a picture of the future. If you listen carefully, you realize that we don't yet know how to put that circular agriculture into practice, or on what scale. Which cycles could you close and what does that mean for food safety, food waste, farmers' incomes and the Netherlands' position in the export market? We'll be assigning a group of people to set up a research programme in consultation with the ministry of Agriculture, the Dutch Federation of Agriculture and Horticulture and nature organizations.' 'We will work out the details of different options and scenarios, identifying the pros and cons,' adds Buchwaldt. 'Hopefully that will play a role in the public debate so that we end up with a feasible plan.'

LIMITING STUDENT INTAKES

The strategic plan also takes some big decisions on education. For example, it keeps the option open of enrolment restrictions for some degree programmes. Mol: 'We mustn't abandon our small-group teaching, with lots of contact between the teacher and



'We will be paying more attention to entrepreneurship'

Rens Buchwaldt

the students. That is difficult now that more and more students are coming. That's why we are looking into digital education and the "flipped classroom", innovations that let us use our teachers where they have most to offer. We also look every year at each degree programme to check whether the increase in student numbers is still manageable. We decided to set an upper limit again for

Nutrition and Biotechnology, but we scrapped the enrolment limit for Molecular Life Sciences.'

The ministry is unhappy with the limits on student intakes, says the rector magnificus, but more money is needed for science education if you want to keep up teaching standards. 'We want to maintain the quality of the education, come what may.'

BECOMING ENTREPRENEURS

More emphasis will be put on entrepreneurship over the next few years. That is a demand from below, emphasizes Buchwaldt. 'Students are showing an increasing interest in this. They are more likely to want to start a business or work for one.' Wilfred Dolfsma, the new professor of Business Management & Organization, is currently thinking up new educational paths that include entrepreneurship, for example in Master's degrees. There will also be courses for PhD candidates and a minor in Entrepreneurship in the BSc programmes. 'The second reason for doing more with entrepreneurship is that we want to make more of an impact,' explains Buchwaldt. Wageningen has relatively few spin-offs compared with the technical universities, although that has improved a lot in recent years and it now has more start-ups. 'We organize student challenges and we have investment funds that inject capital into new Wageningen companies. We've created an environment that attracts investors.' ■

www.wur.eu/strategic-plan

Crickets in the porridge

Several hundred people have started rearing crickets in Kenya and Uganda. This new phenomenon in Africa is providing the local population with additional protein and income. It is the result of a project called Flying Food, which now wants to spread cricket rearing to more African countries.

TEXT MARION DE BOO PHOTOGRAPHY SVEN TORFINN/HH

On the banks of Lake Victoria in Kenya stands an orphanage that houses nearly 100 children, mainly HIV orphans. For the past few years, Florence, the 72-year-old head of the orphanage, has been rearing crickets. The insects get dried, ground and stirred into the children's porridge. 'Thanks to this extra source of protein, the orphans are growing up healthier than they would on a menu of grain porridge alone,' says Phoebe Owuor. She heads the Flying Food project, a research programme about rearing crickets for human consumption. Owuor, a jolly lady of 56, is briefly in the Netherlands to raise new funding. 'Crickets convert green leaves into high-quality protein,' she explains. 'The insects contain valuable animal proteins that are important for babies and infants, as well as minerals such as iron, zinc and folic acid, which are indispensable for pregnant women. For poor women farmers in Africa, this project is a fantastic way of

feeding their own families better and making a bit of extra money. They can sell the surplus on the market and use their earnings to give their families eggs, fish or a little meat, and to pay school fees.'

IN THE WILD

In Africa, rearing insects as food is a new idea, but one or two generations ago, people in the project area used to catch and eat wild crickets and locusts. 'That makes acceptance easier,' says Erwin Beckers of Wageningen Food & Biobased Research. 'Around Africa there are about 1800 different species of insect on the menu, but they are all caught in the wild.' Since early 2013, Beckers has been involved in the project Flying Food, a public-private collaboration involving 12 partners, among them the Netherlands Organization for Applied Scientific Research, TNO. When TNO departments were merged with Wageningen University & Research recently, >





A cricket rearer in Kenya checks his crates of crickets.

45 TNO staff moved to Wageningen, including Beckers' entire research group. Beckers: 'Even before the merger, we had a lot of contact with Wageningen experts, because Wageningen has a lot of expertise on insects and livestock systems. Flying Food's first five-year plan was rounded off in June 2018, and we are now working jointly on a new masterplan to establish this new agro-food chain for the production, marketing and consumption of crickets in other African countries.'

PROTEIN DEFICIENCY

Flying Food's primary objective, according to Owuor, is to combat protein shortages and improve health among the local population. 'In rural Africa, people eat a lot of carbohydrates, such as cassava and millet. Children benefit especially from a diet containing more animal proteins, but these are scarce and expensive.' The project also aims to stimulate employment opportunities and economic activity in rural areas, so as to reduce migration to big cities and to Europe. It could also help to strengthen the economic position of



**'Thanks to cricket protein,
the children are growing
up much healthier'**

women: four out of five cricket farmers are women, most of them from extremely poor families numbering between five and fifteen people, with a family income of 200 dollars a year at the most. That income can be doubled with the earnings from crickets. 'In rural Africa you often see the land being worked by women, but it belongs to men, who take the harvest to market and pocket the profits,' says Owuor. 'Women do not own land, but you need very little space to rear crickets. Feeding and taking care of them takes no more than half an hour three times a day, and women can fit that in around their other tasks. The important thing is for

the women to get hold of the money themselves. Because rearing crickets is a relatively new phenomenon, men are not getting involved much at all. They don't see any business potential in it.'

COLD NIGHTS

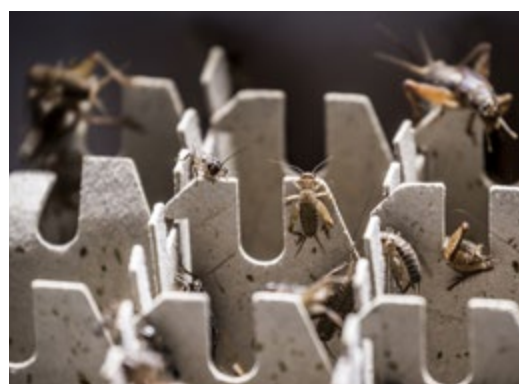
Meanwhile, in Kenya, over 400 people have taken courses run by trainers taught by Dutch experts. And about 100 of them have gone into business. In Uganda too, about 100 small businesses have started up, also along the shores of Lake Victoria. 'The crickets there are growing much slower than expected, however, probably because the nights are just a bit too cold there,' says Beckers.

The crickets are kept in crates, which must be well-ventilated, but hermetically sealed because there are so many predators at large: snakes, mice, rats, spiders and lizards are all crazy about crickets. Dutch companies such as Krecia EntoFood, Venik and NGN have a lot of experience of rearing insects. They produced the first cricket crates, which are now being copied locally.

No one knows exactly what African crickets eat in the wild, but a successful feed has been developed in the project. If the farmers have a bit of land, they can grow their own green fodder such as maize and leafy vegetables. Two kilos of cricket feed produces about a kilo of crickets, says Becker. 'That is a much higher conversion factor than you usually get in livestock farming. For beef you can easily need five to seven kilos of plant protein to produce one kilo of animal protein.'

THIRTY CRATES

The crickets turned out to grow slower in Africa than they did in controlled indoor conditions in the Netherlands. So farmers need to rear a lot of crickets if they are to establish a commercially viable business. Beckers: 'We have therefore developed a rearing set of 30 crates. You can get about 1500 crickets into one crate. Ten crates are used for the eggs from which the next generation of parent crickets is hatched, and the other 20 crates of crickets are harvested. When the last crate is empty, the first new one is ready for harvesting.' The mature insects are blanched in hot water. Sometimes they are eaten whole as a deep-fried snack.



The crickets are fed on vegetables and specially developed cricket feed.

But most of them get dried and ground up. The cricket meal can be used in doughnuts, pancakes, cakes, scones for schoolchildren and above all, as a protein-rich supplement for babies and infants.

A set of 30 crates produces four to five kilos of crickets per month, and one kilo of crickets raises about six dollars. A startup microloan of 600 dollars to purchase crates, feed and breeding pairs must first be paid back over three years. According to the business plan, that leaves 200 dollars a year. Beckers: 'We would also like to further develop the market, but at this stage of the project the supply is simply too small to be able to promote the consumption of crickets widely.'

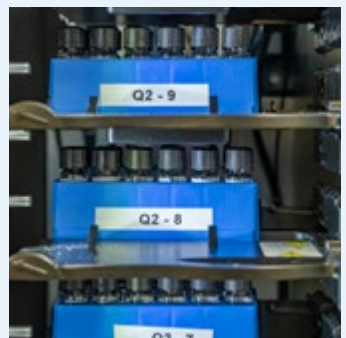
REARING BREEDING PAIRS

As the project progressed it became clear that for reasons of hygiene it was best to process the crickets for marketing at a central location. It also emerged that many farmers find it hard to hatch the eggs and rear the young crickets. So now a selected group of farmers concentrate on rearing the breeding pairs. To avoid in-breeding, as much breeding material as possible is exchanged between villages. One and a half years ago,

the project almost went under when disease suddenly broke out, killing many crickets. Beckers: 'Little is known about diseases among crickets, and nothing at all in Africa. But a Wageningen PhD graduate who has specialized in this happened to be in Kenya at the time and she identified it as a bacterial disease. The bacteria in question occurs in wild crickets and had probably got into the system at an earlier stage and caused the slower than expected growth in the crickets.' Research in Wageningen has shown that the bacteria is not transmitted from the mother to the eggs. Beckers: 'If you disinfect the eggs, you get a new generation of healthy crickets. We must develop a protocol for this.' All in all, it is obvious that hygiene in the production system poses a challenge. There are a lot of research questions here, which need to be answered before the system can be rolled out further, says Beckers. 'Besides, Kenya is one of Africa's frontrunners: from 2020, it will no longer count as a developing country, according to Dutch authorities. The impact of rearing insects might be even bigger in countries with even faster growing populations.' ■

www.flyingfoodproject.com

Testing shellfish without lab animals

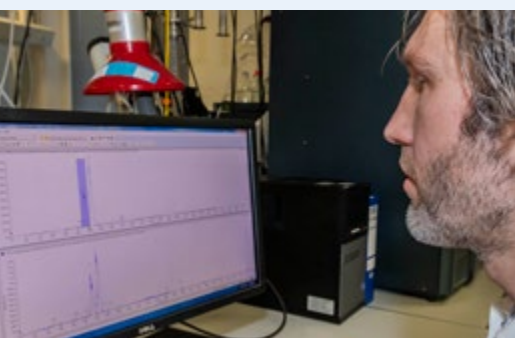


A method developed by the Wageningen institute RIKILT for identifying toxins in shellfish has prevented the use of hundreds of thousands of lab animals in recent years. What is more, the method is more reliable than the test on animals.

TEXT AND PHOTOGRAPHY HANS WOLKERS



‘The new method soon proved much more precise’



Food poisoning from eating shellfish is often caused by toxins produced by algae that can accumulate in shellfish. Within a few hours, the consumer gets stomach cramps, severe diarrhoea and fever: diarrhetic shellfish poisoning (DSP). Since 1970, a test using lab animals has been used to check for infected shellfish in production areas. Mice were given injections of a shellfish extract into their stomachs. If the mouse died, the production area was closed down. Hundreds of thousands of lab animals per year were needed for this testing.

MORE PRECISE

In 2005, RIKILT researcher Arjen Gerssen and his colleagues started developing a new method using chemical analysis and no lab animals. Gerssen's aim was to quantify the toxin in shellfish using liquid chromatography followed by mass spectrometry (LC-MS). ‘The breakthrough came when we decided to conduct the experiment with a slightly different LC-MS method than the usual one,’ explains Gerssen. ‘Instead of the standard acid mobile phase, we used an alkaline mobile phase. That new method soon proved to be much more sensitive and accurate.’

At first, only two of the 13 regulated toxins that cause DSP were available in their pure

form. These kinds of reference substances are essential for establishing new analytical methods. So at first, Gerssen could only develop the method for those two substances. But over the years, others gradually became available. Gerssen: ‘By now we can measure them all accurately.’

REFERENCE TEST

From 1 January 2011, the new method became part of the EU reference test for safeguarding the food safety of shellfish, and many laboratories adopted it. A major advantage of the new test is that it saves a lot on animals, as well as on related costs. ‘The LC-MS apparatus might be expensive – it costs about 300,000 euros – but so are lab animal facilities,’ says Gerssen. ‘The apparatus lasts 10 years, which makes the cost about 30,000 per year. If you have to do a lot of analyses, it works out cheaper than the mice test.’ What's more, the analytical chemical method is more reliable. The test on mice sometimes gave false-positive results. Gerssen: ‘Mice died during the test, but that was not always due to the toxins produced by algae; it could be caused by something else, like too many fatty acids. So a production area might be closed mistakenly. That had massive financial consequences for the sector. That is a thing of the past now. ■’

www.wur.eu/phycotoxins



ERNST VAN DEN ENDE:

‘The GMO directive needs to be amended’

Plant breeding using CRISPR-Cas constitutes genetic modification, according to a decision by Europe’s highest court last summer. The decision was met with disbelief by biotechnology experts and plant breeders. Ernst van den Ende, director of Wageningen’s Plant Sciences Group, on the consequences and possible solutions: ‘The European directive is no longer appropriate for modern-day technology.’

TEXT ARNO VAN 'T HOOG PHOTOGRAPHY MAURITS GIESEN ILLUSTRATIONS PASCAL TIEMAN



‘We are talking about changing just a single DNA letter in a billion’

In lectures, I often try to clarify things by using the tomato as an example,’ says Ernst van den Ende, director of the Plant Sciences Group at Wageningen University & Research. ‘That species has one billion DNA letters. If you compare the DNA of a commercial tomato with its wild forebear, then you see that an average of about 20 million DNA letters are different. Those differences arose in the past through classic plant breeding and mutation breeding, which are not subject to controls. Now we are talking about changing one or two letters in the DNA with CRISPR-Cas and this is supposed to need legal controls.’ The ruling by Europe’s highest court, which deemed CRISPR-Cas to be genetic modification, dates from July 2018. One consequence of this ruling is that European seed companies will have to compile a large dossier if they want to apply this technology in their plant breeding programmes. Market approval for crops that are officially genetically modified costs years and tens of millions of euros in safety tests, field trials and risk assessment. That is a major barrier to breeding crops with new properties, says Van den Ende.

STRICT RULES

‘It could have been so great,’ he says. ‘This technology is used in labs all over the world. We can keep on doing this, of course, but we can’t test plants outdoors that were developed using CRISPR because you need so many different licences for that. You have to work in greenhouses under strict GMO rules.’ Aurélie Jouanin, who recently obtained her doctorate in Wageningen, showed that you can use CRISPR-Cas to breed wheat in which the gluten has been modified in a way that lets people suffering from coeliac disease eat

it. There are other interesting applications of CRISPR-Cas, such as improving resistance to disease. The Dutch government aims to reduce the use of crop protection products to zero by 2030. But how are we going to do that? There is an urgent need to come up with better, more resistant varieties soon. CRISPR-Cas could play a major role in this.’

DEBATE

CRISPR-Cas is a technique that has attracted a great deal of interest among numerous researchers in Wageningen and far beyond, whether they are working on plants, bacteria or animals. Never before have scientists been able to make changes in genes so quickly, accurately and relatively simply. After the first publications on CRISPR-Cas appeared in 2013, it did not take long for a debate to arise about how this technology should be treated: exempt from controls, or included in the regimen of extensive tests for environmental risks that applies to genetically modified organisms such as transgenic maize?

CRISPR-Cas technology is based on elements of a bacterial immune system that recognizes viruses attacking the bacterium and renders them harmless by cutting the virus DNA. Scientists in labs have managed to reengineer CRISPR-Cas such that it can also make cuts in the genetic material of plants, for instance. A CRISPR-Cas cut results in a DNA letter being removed or added. Researchers can use these subtle changes in the DNA code – genome editing – to switch off genes or introduce different properties. This technique particularly appeals to plant breeding specialists as it lets them create new genetic variation. New mutations are the starting point in the quest for improved properties, such as firmer stalks in cereals,

higher yields or resistance to infections. In the past few decades, plant breeders have created mutations artificially by irradiating plants or treating them with chemicals; these are methods that produce large-scale changes in the DNA. The Institute of Radiation Breeding in Japan, for instance, has developed various new plant varieties by growing crops in fields around a strong cobalt-60 radiation source. That used to be done in Wageningen too, at the Institute for the Application of Nuclear Energy in Agriculture, which researched the irradiation of crop plants between 1964 and 1980. The institute introduced new chrysanthemum mutations to the market with unusual colours.

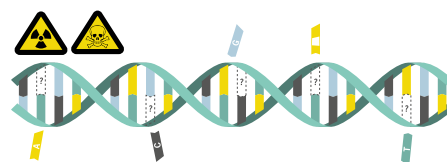
The application of radiation and chemicals in plant breeding is termed ‘classical mutagenesis’. Although these techniques involve changes to the genetic material, they are not regarded as a risk to the environment in the European legislation on genetically modified organisms. They are exempt from controls: no licence is required for the cultivation, introduction and processing of crops with mutations caused by classical methods, and there are no labelling requirements either. No such exemption applies for maize, for example, where genes from a different species have been inserted to make the plant resistant to herbicides or insects. Those are GMOs, which are only allowed in Europe under strict conditions.

DIRECTIVE OUTDATED

Various new techniques have been introduced for modifying DNA since the GMO directive came into force in 2001. So there was already a debate about legislating for new technology, says Van den Ende. ‘In fact, science has rendered the directive outdated so

GMO REGULATION

European legislation does not see conventionally mutated crops as an environmental risk. Because the technique has been in use since 1930, there is a lot of knowledge about its safety. Techniques such as CRISPR-Cas do not have that kind of track record yet, and therefore come under the strict GMO regulation.



The DNA of a tomato has one billion DNA letters. If you compare a modern tomato with a wild ancestor, 20 million DNA letters differ. Those differences came about through breeding using radiation or chemical treatments: **classical mutagenesis** techniques which cause DNA changes on a large scale.



CRISPR-Cas is a new technology for creating genetic variety. This precise gene-editing technology is used to cut through a DNA letter at a particular location. The technology is developing very fast. There are now variants that not only cut through the DNA, but also change DNA letters, from a C to a T, for example. This makes the outcome more predictable.



that the text needs to be amended. It is simply no longer appropriate for modern-day technology. The European Parliament had already put off that debate because the subject matter is complex. And now another new technology has been added: CRISPR-Cas.'

In October 2016, the debate about new plant-breeding techniques moved to the courtroom after the French court of appeal asked the European Court of Justice for a ruling on the question of whether organisms with a CRISPR-Cas mutation are genetically modified. The issue had arisen in a case instigated by nine French civil society organizations. 'The strange thing was that the Advocate General at the European Court of Justice – who advises the court – had suggested quite a flexible approach to CRISPR-Cas. That is why it came as such a surprise when the Court jumped to considering CRISPR crops to be genetically modified organisms.' >

GENESPROUT INITIATIVE

Plant biotechnology student Damian Boer was disappointed when he read about the European ruling on plant breeding techniques such as CRISPR-Cas during his summer holiday in Georgia. 'I've spent five years learning about new techniques and their interesting and useful applications. You're on the verge of graduating and you hear: sorry guys, the techniques are being cancelled – we have to continue with the traditional methods, so we won't be able to use that new knowledge. I'm seriously considering a career in America or China where these technologies are subject to fewer rules.'

This was what prompted Boer to start GeneSprout, an initiative for young plant scientists at Wageningen who want to become involved in the debate about new plant-breeding techniques. 'We're focusing on providing accessible information about CRISPR-Cas. And we want to throw open the public debate about this new technique, including among students in Wageningen. There are a lot of different kinds of plant scientists, but they have little contact with one another, and each individual has their own assumptions and strong opinions. Students who focus on organic farming seldom talk to plant biotechnology specialists and vice versa. Whereas we are all pursuing the same goal – sustainable food production. We could reduce some of the polarization.'

The European Court of Justice argued that while the techniques of classical mutagenesis make comparable genetic interventions, there is much more knowledge about their safety because they have been applied since 1930. 'Techniques developed after 2001 don't have that history. And so they are covered by the strict GMO rules.'

SONNY PERDUE

This decision has created two worlds. In March 2018, the American government decided not to impose controls on plants that have been bred using CRISPR-Cas as long as the mutations that were introduced are indistinguishable from natural mutations or classical mutagenesis. According to US Secretary of Agriculture Sonny Perdue, this will let plant breeders work faster and more accurately. Canada and China have adopted a similar view. It is a simple and obvious argument, says Van den Ende. 'In the United States they look at the DNA in the final product. If that is no different from what could occur in nature, then they don't consider it to be a GMO product. In Europe they look mainly at the technological process and what exactly is involved in the intervention. If someone in the lab does something artificial to the DNA, something unnatural is happening and so we call it a GMO.'

If CRISPR-Cas is seen in Europe as a GMO technique, that will have quite a few consequences, for example for import controls, labelling and the approval of new varieties. There will be new issues for international trade too. In Canada, for example, CRISPR-Cas is permitted. Europe has a trade agreement with Canada (CETA), which has informally already come into effect although it has not yet been ratified by



'There is an urgent need to come up with better varieties soon'

all the EU countries. In principle, Canadian exporters will be able to sell new CRISPR products to the European market, says Van den Ende. 'We will have to accept that because no technology exists that can detect whether or not CRISPR-Cas has been used.' 'If these rules are kept, only the big companies will be able to afford the European approval process. The larger companies in Europe don't see this as a positive development either but at the same time it does protect their position of power because little companies won't stand a chance any more. Whereas CRISPR-Cas is a fairly cheap and simple technology that smaller plant breeding companies and start-ups could use too. That would help do

something about the concentration of power in the agro-industry that a lot of people have been concerned about in recent years. But that innovation is now being nipped in the bud.'

The Netherlands is one of the biggest players globally in the breeding and production of seed for vegetables, and the market leader in breeding and exporting seed potatoes. Van den Ende has noticed that project proposals for plant breeding with CRISPR-Cas are being withdrawn because it will not be easy to market any resulting product in Europe. 'Some breeding companies are stopping their work on CRISPR; that's simply a choice in what to spend their R&D money on. Companies breeding tomatoes and cucumbers, for instance, are however using CRISPR-Cas in the laboratory to track down genes. CRISPR lets them switch genes on and off, and thereby figure out what the promising genes are for growth, yields or disease resistance. They then look for interesting gene variants in their collection of wild relatives and cultivars. Then they use those plants in a targeted manner in cross-breeding.'

RELOCATING POTATO BREEDING

The potato breeding sector was loudest in its protests at the decision by the Court. Potato breeding company HZPC in Joure has already said that it is thinking of relocating part of its plant-breeding programme to the United States. The potato has a complex genome map with eight copies of each gene, compared with two copies in a cucumber for instance. As a result, potato cross-breeding is a particularly lengthy process and CRISPR-Cas could speed that process up. Van den Ende says that people are only now starting to realize the consequences of the

‘Smaller companies in particular could use CRISPR-Cas’

ruling for research and international trade. Because of this, attempts are being made to find new solutions. Various meetings are being planned over the next few months in Brussels with MEPs and representatives of NGOs. One solution would be to rewrite the European directive to make it fit better with the current state of science. But that process can take five to ten years in the European Parliament. A faster route would be to draw up an annex to the directive, comparable to

the annex for classic mutagenesis. Van den Ende: ‘We are seeing a majority emerge – including in the Netherlands – for such an annex that exempts CRISPR-Cas technology when it introduces minor mutations.’ At the annual international conference CRISPRcon, started a few years ago, participants discuss the science, technology and public debate relating to gene editing. In June the conference will be held in Wageningen, and Van den Ende is

responsible for the local organization. CRISPRcon is expected to bring 500 to 700 participants to Wageningen. ‘Proponents and opponents will have their say. Not to trade insults but to inform people comprehensively of all the arguments that the different groups have. Hopefully we will have enough understanding of one another to find a golden mean.’ ■

www.wur.eu/crispr-cas



CRISPR-CAS IN PLANT BREEDING

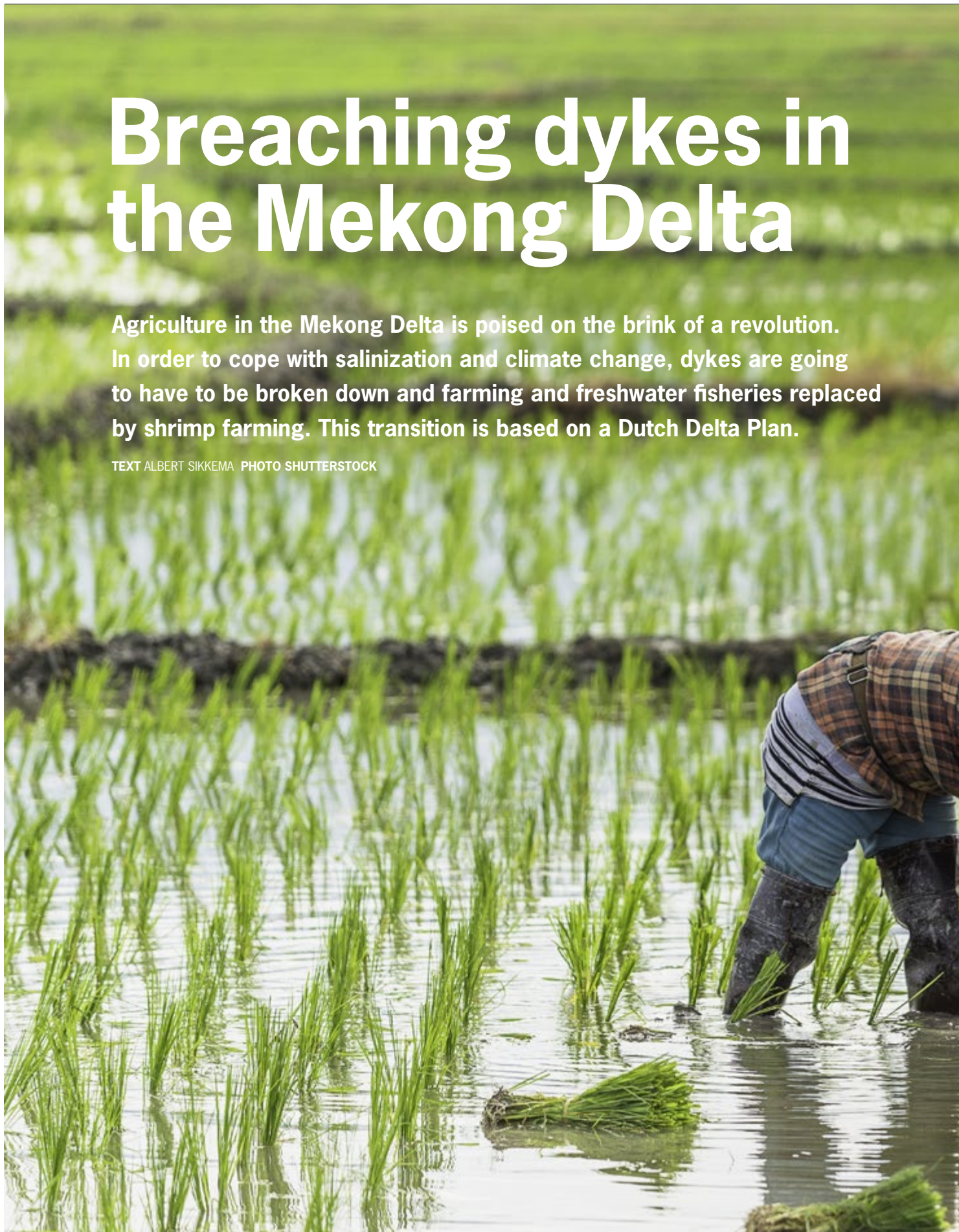
In the past few years, researchers have used CRISPR-Cas to edit various food crops in search of improved properties. In January, Aurélie Jouanin received her doctorate in Wageningen for genome editing using CRISPR-Cas with the aim of changing the immunological properties of gluten so that wheat flour could become suitable for people who are gluten-intolerant (who have coeliac disease). The approach works but more mutations are needed to produce wheat that does not spark off any immune response at all. Chinese scientists have switched off a gene in tropical

indica rice in order to get the plant to develop shorter stalks, a property associated with improved yields. Yield-improving mutations have also been made in soybeans. And an American laboratory has mutated a gene in tomatoes so that the plant's growth is more compact and it flowers (and consequently bears fruit) earlier in the season. Furthermore, mushrooms have been developed with CRISPR-Cas that have less of a tendency to turn brown thanks to mutations in an enzyme. It also turns out to be possible to modify the composition of fatty acids in oil-bearing crops.

Breaching dykes in the Mekong Delta

Agriculture in the Mekong Delta is poised on the brink of a revolution. In order to cope with salinization and climate change, dykes are going to have to be broken down and farming and freshwater fisheries replaced by shrimp farming. This transition is based on a Dutch Delta Plan.

TEXT ALBERT SIKKEMA PHOTO SHUTTERSTOCK







After 1975, Vietnam became the world's second biggest exporter of rice. Shrimp farming grew up a few decades later, in response to salinization.

On the top floor of the education building at Can Tho University, 10 small groups of provincial civil servants and students are bent over a map with stickers. Players throw a dice and confer eagerly about how best to develop shrimp farming. I am a guest at the first trial of a new game called Good Shrimp Farming. The aim of the game is to raise players' awareness of the options and the dilemmas involved in developing the delta. Shrimp farming here in the south of Vietnam has grown rapidly in recent decades, but is now coming up against environmental limits. The purpose of the game, developed by Can Tho University and Wageningen University & Research, is to help provincial governments and farmers develop new policy.

ALWAYS FLOODED

The Mekong Delta is just as big and just as flat as the Netherlands, and its population is about the same. But the 4900 kilometre-long Mekong, which rises on the Tibetan plateau, brings a lot more water down with it than the Rhine does to the Netherlands. In the rainy season, the upper reaches of the delta, near the border

with Cambodia, are always flooded. Just like the Netherlands, the Mekong Delta has seen a spectacular development of its agriculture. From 1975, after the Vietnam War, the region was developed with help from Wageningen (see inset). Soil improvement and irrigation meant farmers could go from one harvest a year to three. Vietnam also started importing improved high-yield rice varieties. This enabled farmers to earn more, put an end to famine and made Vietnam the biggest rice exporter after Thailand, explains Dang Kieu Nhan, director of the Mekong Delta Development Research Institute in Can Tho. A Wageningen PhD holder, he is joining in the shrimp-farming game today. By 2000, Vietnam enjoyed food security but two problems were looming, explains Nhan. Export prices for rice were low, so farmers were not earning much in spite of farming more and more intensively. And salt water was infiltrating the coastal region of the Mekong. This salinization was affecting the rice crop, so the Vietnam government opted for diversification. Shrimp farming was established along the coast, while farmers further inland started combining rice farming with freshwater

aquaculture, mostly farming tilapia. Thanks to this development, which WUR researcher Roel Bosma assisted with, Vietnam has grown into a significant exporter of shrimps and tilapia. Bosma helped develop the Good Shrimp Farming game, and he too is present at its trial run in Can Tho.

ENVIRONMENTAL LIMITS

There is every reason to play this game, says Nhan, as the agricultural sector in Vietnam faces another transition. Intensive export agriculture is coming up against environmental limits such as pollution with pesticides, and falling biodiversity and soil fertility. It has got to give way to a more environmentally friendly way of farming that keeps an eye on food quality and consumer demand while addressing the issue of climate change.

The blueprint for this transition is outlined in the Mekong Delta Plan, drawn up at the end of 2013 by a Dutch consortium of WUR, Deltares and consultancy firm RoyalHaskoning DHV. One of the main authors in this consortium, which was led by ex-minister Cees Veerman, was WUR researcher Gerardo van Halsema.



‘The high dykes block the deposition of sediment on the rice fields’

Remarkably, this commission from the land of polders and dykes is not recommending raising the dykes. Instead, the proposal is that Vietnam should adapt its use of land and water so that delta residents can cope flexibly with the impact of climate change. This means that Vietnam should flood polders in the upper reaches of the Mekong to create more space for the overflowing river. The country should also adapt to the salinization in the coastal region by substituting shrimp farming and mangrove forests for agriculture and freshwater fish farming. The mangroves will help absorb the expected rise in seawater levels.

RAIN CAPES

During my travels through the humid Mekong Delta, temperatures reached 32 degrees Celsius every day. Actually it is supposed to be dry in December, as the rainy season is from June to November, but the innumerable scooter riders on the streets kept having to put on their rain capes. Climate change is already under way. The rainy season is shifting and it is raining more heavily, says Chau Nguyen Xuan Quang, director of the climate centre in Saigon. On the other hand, it rains less

these days during the dry season in the spring. This means the delta is facing both flooding and water shortages, explains Quang.

Life is becoming more dangerous for delta dwellers too. The Mekong Delta suffered extensive flooding in 2000 and 2011, but the damage in 2011 was much greater and more residents had to be evacuated, says Andrew Wyatt. He is delta manager of the International Union for Conservation of Nature, an international NGO which invests in nature management. That damage, Wyatt says, was a direct consequence of the construction of large dykes upstream over the past 15 years.

He shows me two satellite images. On the older image, the upper Mekong Delta plain is totally inundated at the end of the rainy season because the floodwaters have washed over all the one-metre dykes around the rice fields. On the newer satellite image, half of the plain is dry, protected by three-metre-high dykes. Because of those polders, there is no more room for the floodwaters and the mass of water moves faster towards the coastal delta, resulting in floods and much damage.

Wyatt, an American who has been living in

Vietnam for 18 years and monitors water policy there closely, is very positive about the Dutch Delta Plan. ‘This is a turning point. Before this plan, the Vietnamese government was not working on sustainability at all.’ The serious flooding of 2011 helped bring about a change of heart. The dykes broke, over 100,000 homes were flooded and 49 people died. Wyatt: ‘Then came the Delta Plan and now we are seeing environmental initiatives. The Vietnamese government adopted a resolution in 2017: we are going to adapt to the changing environmental conditions and flooding.’ Adaptation is the key word in the new policy.

BREACHING DYKES

The first steps are now being taken in the upper reaches of the Mekong Delta, says Wyatt. Proposals are being drafted to breach the high dykes. ‘Those high dykes enable farmers to get three rice harvests instead of two, but that third rice harvest brings down prices, doesn’t make the farmers much money, and has several downsides. The dykes block the deposition of sediment on the rice fields, causing soil fertility to drop. They also hamper the >

FROM POOR AREA TO RICE BOWL

Thirty years ago, Wageningen made a big contribution to the development of the Mekong Delta by tackling the problem of acid sulphate soils in which very little grows. In the mid-1970s, the Wageningen soil scientist Nico van Breemen brought to light the complex soil-chemistry process that causes the formation of acid sulphate soils. That knowledge led to new approaches to combatting soil acidification in polders and delta regions. The Wageningen soil scientist Tini van Mensvoort went to Vietnam, where he ran acid sulphate soil projects between 1980 and 1992. In the Mekong Delta, the ground was also becoming acidic because bacteria convert sulphate in seawater into sulphide, which in dry soil oxidizes into sulphuric acid. Working with Vietnamese researchers, he tested different treatment plans. His remedy: rinse the sulphides out of the soil with fresh water. This intervention changed the Mekong Delta from an impoverished region to the rice bowl of Vietnam.

Van Mensvoort has retired and is now a city guide in Düsseldorf. He puts his work in perspective: 'The Vietnamese did it themselves; Wageningen's main contribution was in transferring knowledge and boosting the confidence of the researchers in Can Tho.'

**'Vietnamese
agriculture is
enormously
dynamic'**

development of aquaculture and cause flooding elsewhere. If you go back to lower dykes, you can manage the water better, without much loss of income.'

The Vietnamese researchers I talk to do not share Wyatt's optimism, however. 'My biggest concern is how to involve farmers in the plans,' says director Quang, of the Saigon climate centre. 'You might think we don't need those high dykes anymore, but a lot of farmers won't agree with you. Their houses and land will be under water. And as long as food prices go on fluctuating wildly, it is hard for them to invest in alternatives. In the policy, we must draw on their knowledge and experience, but I don't know how yet.'

GAMING WITH FARMERS

The Good Shrimp Farming game might offer a solution. The meeting with the provincial civil servants on the campus of Can Tho University was a success, says game designer Tran Thi Phang Ha afterwards. The civil servants were enthusiastic and they are thinking of playing the game with farmers as a way of formulating their policy. She explains how the game works. 'There

is a map on the table, with farm plots on it. A player throws the dice, lands on a particular plot and then has to deal with the situation described on that plot. The shrimp farmer learns about farming options, ecological constraints and market developments. This opens up several perspectives on ways of improving your local environment. You might want to produce more fish, for example, but you could also combine aquaculture with vegetable growing and with tourism.' Ha thinks this game has something to offer rice and tilapia farmers, too, by shedding light on their business strategy.

RAKING

Around Can Tho, at the heart of the delta, thousands of canals connect the three main estuaries of the Mekong. Travelling through the area, you still see countless rice fields, in which the farmers are raking the wet soil after the last harvest, or ploughing it using a tractor or a buffalo. It is difficult to imagine that this region faces water shortages and even salinization in the spring. But that salinization is already coming close to Can Tho, which is 60 kilometres away from the sea.

At first, Vietnam tried to keep the salt water out. Fifteen years ago, with World Bank funding, the government constructed large dykes in the coastal zone to protect rice and tilapia farms. But in spite of these efforts, the water became brackish and rice harvests declined. Fish farmers switched from freshwater tilapia to saltwater shrimps and asked for the dykes to be holed. And that happened.

In the new policy, prompted by the Dutch Delta Plan, Vietnam accepts the salinization. Freshwater farming has to disappear from the coastal zone, partly in order to stop the fall in groundwater levels and secure the supply of drinking water. Vietnam also needs to keep hold of more of the fresh river water and arm itself by natural means against rising sea levels by reintroducing mangroves along the coast. Mangrove forests, which have been cut down for decades to make way for shrimp farming, provide natural coastal defences. A Wageningen-Vietnam project has researched how you can combine mangroves with shrimps.

The margins for change are not very big. Game designer Ha points out that many of the small farmers in the Mekong Delta are



PHOTO ANP



PHOTO SHUTTERSTOCK

Sustainable shrimp farming in a mangrove forest that protects the coast.

still poor. They have less than one hectare of land for rice and fish farming, and they earn no more than 15 million Vietnamese dong (600 euros) a year. That is barely enough to support a family, says Tran, especially with the rising price of fertilizer and pesticides in recent years, and low prices on the export market. For this reason, the Delta Plan includes a chapter on agriculture. Farmers should focus less on bulk crops and more on quality food for the growing Vietnamese middle class. Various interesting options are emerging in this area. Vietnam National University in Saigon is doing research on floating rice: rice plants that float on water and can therefore move with the changing height of the river. One problem is that this variety of rice is not yet very profitable. The university in Can Tho is doing research on farming traditional local fish species for the Vietnamese market. There is also a new demand among well-off Vietnamese for more expensive, organic food. Most producers are not benefitting from this new market yet. Small farmers sell their wares at traditional markets in the Mekong, such as the floating market on

the Cai Rang River, which I reach from Can Tho in half an hour by boat. Hundreds of boats come and go with food products which are traded on the water. Nice for tourists but not the way for farmers to reach wealthy urbanites. Part of Vietnam's delta management challenge is to find new ways of linking farmers to consumers.

HANOI IS FAR AWAY

The big question will be: how will the Vietnamese government organize the transition to sustainability? The formerly communist government implemented economic reforms in 1986 in a shift towards a market economy, but is used to a top-down approach to policy. Now the ministries of infrastructure (the dam-builders), agriculture and environment need to work together. But the capital, Hanoi, is far away, say the people I talked to in the Mekong Delta. It is at the regional level that the various different interests need to be balanced in an integral plan. And that is not an area in which Vietnam has much experience.

The World Bank wants to implement the Dutch Delta Plan for the Mekong and

has allocated 300 million dollars to investments. Forty million of this is earmarked for getting rid of the polders. WUR researcher Gerardo van Halsema, one of the authors of the Delta Plan, is advising the World Bank on this. 'The first step has been taken at the political level,' he says. 'Now regional and local government must be brought into the decision-making process to work out the plan. That is time-consuming and for the Vietnamese it takes some getting used to.' Van Halsema is not afraid that the delta farmers will get a poor deal. 'Vietnamese agriculture is enormously dynamic. We have done research on land use in the delta, and that showed that there are changes in how 14 per cent of the land is used every year. That shows that the farmers are constantly adapting to the circumstances. The World Bank finances projects in the field of sustainable shrimp cultivation, but I am also seeing new environmentally friendly farming systems that we hadn't thought of. The great thing is: there is new scope for the farmers to innovate.' ■

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LOES MOOR-HULSHOF, OPERATIONAL DIRECTOR
AT THE VEGETARIAN BUTCHER:

'I want to make sure factory farming is soon superfluous'

Loes Moor-Hulshof is the woman behind The Vegetarian Butcher. Together with frontman Jaap Korteweg and marketing man Nico Koffeman, she has built up the company step by step over the past eight years. It was taken over by Unilever at the beginning of this year. Hulshof is delighted. 'This is the moment we were waiting for.'

TEXT ASTRID SMIT PHOTOGRAPHY MARIJE KUIPER

In a factory in Breda, a machine is pushing out long, fat ribbons of soya dough.

Nearby, people are sorting the subsequent product: rough chunks made from these ribbons. These are the vegetarian chicken pieces sold in the supermarkets. Along with other meat substitutes, they have entered the fray to compete with real chicken. The factory floor is spacious and could easily accommodate a few more machines and workers. And that is exactly the idea, says operational director Loes Hulshof of The Vegetarian Butcher, the Dutch company that makes meat

substitutes such as vegetarian hamburgers, chicken, steak tartare and the recently launched smoked sausage. All of which have to look and taste like real meat. 'At the beginning of this year we were taken over by Unilever. Now we can upscale considerably. In the next few years we want to conquer the German and British supermarkets, then the ones in Scandinavia, southern Europe and other western countries. After that we hope to set our sights on the east. We want the whole world to start enjoying our vegetarian meat, making factory farming superfluous.'

This is the kind of language you would expect from the Dutch animal rights party (Partij van de Dieren) rather than a commercial company. But those two worlds meet at The Vegetarian Butcher: Jaap Korteweg, the company's creator and head, was once married to party leader Marianne Thieme, and his business partner Nico Koffeman represents the animal rights party in the Upper House of the Dutch parliament. Hulshof is a party member too, and a fervent vegetarian like Korteweg and Koffeman. 'It makes no sense that we kill and eat animals. It's just so wrong. Seeing livestock being >

transported on the motorway brings tears to my eyes.'

Hulshof, who grew up in Lievelede, first studied Food Technology at Van Hall Larenstein University of Applied Sciences in Leeuwarden. 'I had been cooking entire dinners since I was 14, so that choice of degree programme was logical.' She finished off her applied sciences degree at 20 and, not ready for the job market yet, enrolled to do Food Technology in Wageningen, majoring in Food Process Engineering. Atze Jan van der Goot, now professor of Protein Structuring and Sustainability, was her supervisor. She found out, though, that she was not really a born technologist; her minor about integral food logistics manage-

ment appealed to her more. Hulshof:

'Thinking in terms of supply chains felt like a homecoming. The links between the seed and the pork chop. Later I realized it is better to make that chop out of the seed more directly, rather than via a pig.'

TROUT FISHING

When Hulshof was studying Food Technology in Wageningen, she was still a carnivore. Until one day, when she went trout fishing with her family. 'I didn't mind catching the fish. But I couldn't kill it. It seemed to be asking me, what are you doing? Soon after that I stopped eating meat.' And this was someone who had grown up on a farm: Hulshof's father was a dairy farmer. Her brother, who studied in Wageningen too, took over the farm from his father. 'My brother loves meat and can't stand the animal rights party. I come from a real CDA (Christian Democrat) family. That can be tricky sometimes, although I have stayed on good terms with my family. My brother was a witness at my wedding.' After graduating, Hulshof worked for Unilever as a trainee, and went on from there to a job with Mars in Oud Beijerland, near Rotterdam. One of her main projects was to create a light version of a satay sauce. But she didn't get much satisfaction out of this work. At some point, she asked herself: when I'm 80 and looking back on my career, will this have been the peak? She tried to introduce one meat-free day in the Mars canteen, but it met with too much resistance. One day she read an article in the paper about her former supervisor, Atze Jan van der Goot. In it, he spoke of his latest project: developing new meat substitutes. Hulshof got in touch with him and went to see what he was doing. 'I wanted to get involved. It didn't matter much to me what I would be doing, as long as I could contribute something to that plant protein transition.'

SETTING UP

Van der Goot put her in touch with the

entrepreneurs Korteweg and Koffeman, who had big plans but not much experience of finding their way to the market. 'I talked to them, was taken on, and we started setting up the organization.' Friends said she was crazy to give up a good, permanent job at Mars. 'They've gone quiet about that now,' says a proud Hulshof, who got shares in the company when she started there.

They have formed an effective triangle over the years since they started in 2010, says Hulshof. Korteweg is the public face of The Vegetarian Butcher, Koffeman is the marketing and communication brain, and Hulshof is the organizer. 'Setting up all the company operations that facilitate the growth of the brand: that is what I've been doing for the past eight years.' Communication, the production of artificial meat, supplying supermarkets, recruitment, packaging, internal controls: Hulshof did whatever was needed at any given moment. 'We built it up like that, step by step.'

Collaboration with partners was a very deliberate strategy for the company. 'Until two years ago, we didn't have a factory of our own but had all our products made in meat factories. Now we produce some of them ourselves here in Breda, but most of them are still made at Unox and Mora. Those companies will keep their links with us. We want to become the biggest butcher in the world; we don't have to make everything ourselves.'

PLANT MEAT MATTERS

The Vegetarian Butcher also sought collaboration with Wageningen University & Research, and invested in Van der Goot's research on the structuring of plant proteins using something known as shear cell technology. This provides a gentle way of processing plant proteins from soya or wheat to create a structure like that of beef steak. Since 2017, this project has been transformed into a large public-private consortium called Plant Meat Matters. Several companies, including Unilever, are



LOES MOOR-HULSHOF (1979)

1996-2000: Food Technology, Van Hall Larenstein

2000-2004: Food Technology, WUR

2004-2006: Unilever Unox, process and product development

2006-2007: Unilever Knorr, management trainee

2008-2010: Mars, innovation project leader for Suzi Wan and Seeds of Change

2010-2012: The Vegetarian Butcher, innovation and production manager

2012- present: The Vegetarian Butcher, operations director



Loes Moor-Hulshof on the production line for vegetarian hamburgers.

participating with the aim of readying shear-cell technology for industrial application. The partners can use the knowledge obtained along the way in their day-to-day product development. As soon as Van der Goot's vegetarian beef steak is ready, The Vegetarian Butcher will get it on the market. 'We believe in the power of innovation. We need each other,' says Hulshof. Since the company started, it has doubled its workforce every year. 'Now there are 85 people working here, and we've got

is run by a very strong management team. I don't do it alone. That might be my strength: being able to build up a team that carries the organization. I actually feel a bigger responsibility to get the human race into vegetarianism. That pressure is much stronger. The Vegetarian Butcher is just a means to that end.'

VAST SALES POTENTIAL

So the Unilever takeover is very welcome, says Hulshof. 'Now we can really conquer

has not been greeted with such enthusiasm in all quarters. Some people are afraid The Vegetarian Butcher has sold its soul. 'I understand that. But I'm not worried about that. Our ideas about the future are quite similar, and the higher goal – the growth of plant-based meat on the market – is more important. And we've had good discussions about that. We are only 0.04 per cent of Unilever, a really tiny little plant. They want to keep that plant intact and nourish it. We get to say which other parts of Unilever we want to make use of in order to grow big.'

Hulshof has her hands full with the takeover. 'From being an organization with 85 people, we are now part of a company with 160,000 people. That is a gigantic leap of course. How do you organize that well?' Her own career will always be driven by the higher goal. 'I'm not out to become the director,' says Hulshof. 'I want to make sure factory farming is soon superfluous. More and more people are buying vegetarian products as a matter of course. That is the start of a major change, and it's really great to be doing it.' ■

'Seeing livestock being transported brings tears to my eyes'

another 10 vacancies again, from product developer to project leader,' says Hulshof. Isn't that a massive responsibility? Hulshof seems relaxed: 'No, not at all. The company

the world and at a blow, we get vast sales potential, with access to supermarkets in 190 countries. That is fantastic. This was the moment we were waiting for.' The takeover

Blossoming business network helps East Africa

With philanthropic donations from the Wageningen Food for Thought campaign, East-African SME business owners have built up a network in the agri-food sector. This is proving good for both the entrepreneurs and for rural communities. 'The income of more than one million small farmers has gone up by a third.'

TEXT ANJA JANSSEN PHOTOGRAPHY AA-ACADEMY

You could hardly find a finer example of what the African Agribusiness Academy (AAA) makes possible in East Africa: early in October 2018, 150 local agribusiness entrepreneurs came together at their own expense for a week in the Ugandan capital of Kampala. They shared knowledge and experience, and made trade deals worth over 1.2 million dollars.

The AAA is a network of small and medium-sized companies in the agri-food sector in East Africa. It was set up in 2010 on the initiative of the Wageningen Ambassadors and WUR. Thanks to the Food for Thought campaign (2013-2017), a University Fund Wageningen fundraising campaign, the initial business club was expanded into an autonomous member organization led by an African team. Philanthropic partners (private donors, foundations and companies) invested two million euros in the new organization, the Dutch government doubled that amount and AAA members themselves contributed in money and in kind.

Jan Kat of the DEKA Foundation was one of the philanthropic partners. 'My eldest brother and I studied in Wageningen. Contributing to this project struck us as a nice way to give something back. The AAA

'You can't go any faster than the local momentum'

project appealed to us because it's about entrepreneurship and in our foundation we were looking for something at the intersection of education and development.'

The money was used to help AAA members with business plans, to provide training, and to engage Wageningen experts to support the establishment and expansion of the network. At the end of the project, the organization, which has been completely autonomous since the end of 2017, received a further one million euros from the Dutch government (the Directorate-General for International Cooperation).

FIFTEEN BUSINESS CLUBS

The AAA is now active in six countries – Kenya, Uganda, Tanzania, Ethiopia, Malawi and Rwanda. A secretariat in Kampala led by director Farid Karama leads the organization and supports the country branches. Fifteen

business clubs are up and running in the six countries, where members get together and training and workshops take place. Karama, a Ugandan, has been a member of the AAA since 2011, and he was enthusiastic about the entrepreneurs' network from the start. 'You can help each other grow.'

The AAA has changed the lives of many entrepreneurs, says Karama. 'They got access to financing through better business plans. Between 2013 and now, companies have grown by an average of 30 per cent thanks to deals among them, improved marketing, branding, and support they got in financing and management. Strong mutual trust has grown up too, which makes it possible to share knowledge, do joint marketing or, for example, buy packaging together.'

The AAA may be a business association, but the ultimate goal of the organization is 'to contribute to economic growth and improving farmers' incomes and food security in Africa,' says Karama. One condition for membership is that the entrepreneur works with small, local farmers. That approach, stimulating rural development by supporting SMEs in the agri-food sector, appears to work. 'In the period from 2013 to now, the income of more than a million small farm-



ers who supply AAA members has gone up by 35 per cent,' says Karama.

IMPACT ON FARMERS

'Large sums have been invested in the AAA project, but if you look at the impact it's already had on farmers, that is certainly justified,' says Bram Huijsman, former director of Wageningen International at WUR. He came up with the idea of the business club in 2010, and has been involved in the AAA since then, together with former Wageningen Ambassador Piet Heemskerk. 'We wanted to stimulate entrepreneurship in Africa in the supply chain between the farmer and the market. The SMEs form a crucial link in that chain,' states Huijsman. 'We thought beforehand: this is such a good idea, it is bound to take off. But that's not how things work. Building up a member organization is a long-term process. You can't go faster than the local momentum. The entrepreneurs have to build it up themselves. We coach, but they've got to do it. So they largely dictate the pace.'

Jan Kat could see that the AAA programme was 'outside Wageningen's comfort zone'. 'But the commitment of the researchers was tremendous. They contributed to laying foundations that the organization can now go on building on.'

The development of AAA has gained momentum now. As of 2019, the AAA has 260 paid-up members. Karama's ambition is to grow to 500 members in 2020. Initially in the current six countries, but Ghana, Zambia and Nigeria have shown an interest as well. AAA recently started offering funding for loans of between 2000 and 20,000 dollars as well, without requiring any security. The money for this comes from a number of philanthropic partners who contributed to the Food for Thought project too. Another sign that the AAA has reached maturity is its growing influence. The organization is recognized by the government of the six East African countries as a representative of SMEs in the agri-food sector. Karama: 'We join the conversation about agribusiness policy, entrepreneurship and trade issues. Many people and organizations follow us and appreciate what we do. Our visibility is growing.' ■



Network activities run by the Africa Agribusiness Academy in East Africa.

www.aa-academy.org

Calum Revfem's Wageningen connection

Twenty years on, alumnus Calum Revfem from New Zealand still feels a bond with Wageningen. He helped set up an alumni network in his country. 'I find it valuable to be part of that'.

Calum (Environmental Systems Analyses, 1998) still cherishes warm memories of his university days in Wageningen. 'I thought it was fantastic. Both the university's academic approach and teaching style, and the social life in Wageningen. I really enjoyed living in Dijkgraaf and socializing in the Bunker,' he says in a Skype chat from his home in Ohakune.

Calum had tried to build a network with Wageningen alumni in New Zealand before, but it was only in Wageningen University & Research's centennial year that his plan really took off. December saw the first gathering at the Dutch embassy in Wellington, which was attended by about 80 alumni.

They drank a toast to the formal establishment of the Wageningen Alumni Network New Zealand. 'What I didn't manage eight years ago with Facebook was now really easy with LinkedIn,' says Calum. 'It helped too that the Dutch



Alumnus Calum Revfem

embassy made such an effort and that the Executive Board president Louise Fresco

came to New Zealand for the centennial celebrations. All the pieces fell into place.'

More than 20 years after graduating, Calum still feels connected to the Netherlands, and especially Wageningen, through his field of work as well. 'The Netherlands and Wageningen are big on sustainability. I specialize in measuring and reporting on sustainability,' says the co-founder and managing director of Proxima. 'Our customers include major agri-food companies such as the dairy producer Fronterra.'

Last year, Proxima had its first intern from Wageningen, a German MSc student of International Land & Water Management. Calum found him via WUR Connect. 'It turned out to be very valuable having someone with a strong scientific background take a fresh look at sustainability among our customers,' says Calum. 'My reason for offering internships in general is that I want to give something back and help increase knowledge among young people.'

Info: www.wur.nl/alumni

PHOTO CALUM REVFEM

LECTURE

'The Netherlands should become a testing ground for climate innovation'

Over 300 people attended the World Lecture on Wageningen Campus at the end of November. The subject – combating climate change (mitigation) versus adaptation – is a hot topic among alumni and students.

'Both climate adaptation and climate mitigation are needed urgently,' argued the speaker Tim van Hattum (Environmental Science, 1998) from Wageningen Environmental Research. His key message: it would be good to treat the Netherlands as a testing ground for climate innovation, a sustainable delta where we come up with and try out smart solutions. We can then scale up those innovations for use elsewhere in the world. After the introductions by Gerben Mol (Amsterdam Institute for Advanced Metropoli-

tan Solutions) and Paul Vertegaal (nature conservation society Natuurmonumenten), there was plenty of opportunity for debate chaired by Wageningen Ambassador and meteorologist Gerrit Hiemstra (Meteorology 1986). Van Hattum: 'Most of those present were concerned about the climate problem. The audience suggested a variety of solutions, from curbing population growth to the use of nuclear power. Someone also had the original idea of a personal CO₂ budget.' The World Lectures are organized by KLV



PHOTO GUY ACKERMANS

and Wageningen Academy and sponsored by the Wageningen Ambassadors.

Info: www.wur.nl/alumni

DONATIONS

Alumnus donates valuable 18th-century book of insects

Alumnus Jan Lindenberg has donated an unusual book of prints by Maria Sibylla Merian to the Wageningen university library. On 5 February 2019, he came along to hand the book to Executive Board President Louise Fresco.

The book *Dissertation sur la Generation et les Transformations des Insects de Surinam* contains 72 black-and-white prints showing tropical insects, their metamorphoses and their host plants. The first edition was published



PHOTO'S GUY ACKERMANS

in Amsterdam in 1705. Lindenberg's edition is from 1726 and is in both Latin and French. Special Collections curator Liesbeth Missel is pleased with the book. 'We already had a later edition but that one didn't have any text. This book contains Merian's original texts. That makes it special.' 'I want this book preserved for posterity in secure surroundings. It's in good hands in Wageningen,' said Lindenberg in explaining his donation. The 94-year-old alumnus studied both Arable & Grassland Farming and Land Development from 1945 to 1951. Info: www.wur.nl/alumni

UNIVERSITREE

South African alumni mark centenary



PHOTO WUR

South African alumni gather for centenary On 11 December 2018, an alumni gathering was held in the Dutch embassy in Pretoria, South Africa, to mark Wageningen's centenary. President of the Executive Board Louise Fresco and Cheryl de la Rey, vice-chancellor of the University of Pretoria, signed an agreement that will strengthen relations between the two institutions. They also planted a UniversiTREE, a wild mango, to celebrate 100 years of WUR. Info: www.wur.nl/alumni

WUR CONNECT

Dare to ask

Environmental Sciences student Niu Shu posted a question on WUR Connect about what kind of job she could apply for when she graduates. She received a prompt reply from senior recruitment consultant Dotty Aalmans at Toyota Motor Europe. Niu can think in terms of jobs in waste or environmental technology in the car industry.



PHOTO NIU SHU

Event

1 April: Hannover Messe, Germany. Alumni are welcome at the Holland High Tech pavilion from 15:15 to 17:30.

Members

Who is on WUR Connect? Most of the members are alumni (82%) and the rest are students (12%) or in the category 'other users' (6%). The main suppliers of alumni are the Nutrition and Health degree programmes.

Photos

You can see and upload photos on WUR Connect too. You'll find photos of the alumni meeting in New Zealand, for instance.

Upgrade

The WUR Connect platform is due for an upgrade, which will open up more ways for alumni to get in touch with each other.

Let us know

Have you found an internship, a job or a long-lost friend thanks to WUR Connect? Let us know through alumni@wur.nl

More events and vacancies on wurconnect.nl

Prof. Annet Aris, WUR Land Development 1984, Wageningen Ambassador, has been appointed member of the supervisory board of the Rabobank for a period of four years. Aris teaches at INSEAD Business School. 12 December 2018.

Remco Bosma MSc, WUR Environmental Protection 1997, has been sworn in as mayor of Bladel. He was previously working at the ministry of Infrastructure and Water Management. 16 January 2019.

Jeanet Brandsma MSc, WUR Zootechnics 1995, has been appointed member of the supervisory board of Rabobank Meppel-Staphorst-Steenwijkerland. Brandsma is co-owner of the Batenburg dairy farm in Giethoorn. October 2018.

Rian van Dam MSc, WUR Domestic Science 1986, has been inaugurated as mayor of Hollands Kroon. She used to be programme director of Greenport Noord-Holland Noord. 12 February 2019.

Francine van Dierendonck MSc, WUR Bioprocess Technology 1999, has been appointed member of the executive board of the pension administrator APG Group. She has previously been managing director of Xenos. 1 November 2018.



PHOTO WUR

Prof. Gert Jan Hofstede

WUR Biology 1983, has been appointed extraordinary professor until 30 September 2021 at the School of Economic Sciences, North-West University in South Africa. Hofstede will be working at the Centre for Applied Risk Management on agent-based modelling of socio-technical systems, especially ‘artificial sociality’, as he did in Wageningen. 1 October 2018.

Geerke Duijzer PhD, WUR Nutrition & Health 2009, has won the 2018 NAV publication prize for her article ‘Effect and maintenance of the SLIMMER diabetes prevention lifestyle intervention in Dutch primary healthcare: a randomized controlled trial’. 1 November 2018.

Prof. Thijs Ettema, WUR Biology 2000, has been appointed professor of Microbiology. Ettema has spent the past 12 years working at Uppsala University in Sweden. 1 January 2019.

Martijn van Galen BSc, WUR Molecular Life Sciences, Master’s student, has won one of the 13 Unilever Research Prizes worth 2500 euros. 27 November 2018.

Karin Horsman PhD, WUR Plant Breeding 1991, has started as director of Strategy and Academic Affairs at Leiden University. Horsman was previously manager of National Accounts and assistant director of Corporate Strategy & Accounts at WUR. 1 January 2019.

Prof. Ruud Huirne, WUR Agrarian Economics 1986, has resigned as director of Netherlands Food & Agri at the Rabobank and is now working part-time as a special consultant on Food & Agri for the Rabobank. He and a number of partners are also setting up a company in sustainable energy and green raw materials. 1 January 2019.

Bart Knols PhD, WUR Biology 1989, has received the 2018 Marc Cornelissen Brightlands Award. The medical entomologist

‘I hope the film will help in the conservation of the Wadden’

Ruben Smit PhD, WUR Forestry 1996, received the Golden Film award from the Netherlands Film Festival and the Film Fund for his nature documentary *Wad* about surviving on the boundary between land and water. The award is given when a film attracts 100,000 paying visitors.



The director and ecologist Smit, whose company is based on Wageningen Campus, had already received this award for his documentary *The New Wilderness*. Smit is mainly pleased that he and his team was able to make the film about the Wadden Sea’s nature. ‘There is so much going on with the nature in the Netherlands, partly because of climate change. The Wadden Sea is the most fragile nature area our country has. I hope the film will help improve conservation of this area.’

The Golden Film award and associated plaque were handed over on 20 December 2018 in the Heerenstraattheater cinema in Wageningen.



PHOTO WOUTER LE DUC

Directors Ruben Smit (left) and Melchert Meijer zu Schlochtern

and malaria expert (Radboud University) received the prize of 35,000 euros for the way he inspires businesspeople, researchers and students in the field of sustainability. 10 December 2018.

Rien Komen PhD, WUR Economics of Agriculture and the Environment 1995, has been appointed to the executive board of the Aeres group. He had been director of Windesheim Flevoland. 1 January 2019.

Gijs Kuneman MSc, WUR Horticulture 1988, is the new director of Bosgroep Mid-den Nederland, a cooperative of forest and countryside landowners. 1 March 2019.

Jan Karel Mak MSc, WUR Environmental Protection 1983, has become chair of the Europe supervisory board of Solidaridad. Mak is chair of the board of the engineering consultancy Deerns Group and he is the chair of University Fund Wageningen. June 2018.

Prof. Rudy Rabbinge, WUR Phytopathology 1971, emeritus professor at WUR, has been honoured with the International Leadership Award. He received the award for his 'huge contribution to food security and rural development'. 25 October 2018.

Sascha van Rooijen MSc, WUR Economics of Agriculture and the Environment 1995, has started as the director of the Netherlands Wind Energy Association (NWEA). November 2018.

Wendy Sanders PhD, WUR PhD 2001, has received the 2018 Royal Netherlands Chemical Society Education prize. Sanders works as a specialist in teaching methods for chemistry at Eindhoven University of Technology and as a chemistry teacher at Heer-



PHOTO DOLPH CANTRIJN

Prof. Jantine Schuit

WUR Domestic and Consumer Studies 1989, has been inaugurated as professor of Health, Behaviour and Society at Tilburg University. Schuit was head of the Centre for Nutrition, Prevention and Health Services at the National Institute for Public Health and the Environment (RIVM) and held the chair in Health Promotion and Policy at VU University Amsterdam. 30 November 2018.

beeck College in Best. 3 November 2018.

Catharien Terwisscha van Scheltinga PhD, WUR Tropical Land Development 1993, has become chair of the Land and Water Network (NLW), which is affiliated with KLV. 1 September 2018.

Prof. Lonneke Vervelde, WUR Biology 1984, has been appointed professor of Veterinary Immunology and Infectious Diseases at the University of Edinburgh. 1 August 2018.

Haiko Zuidhof MSc, WUR Food Technology 1994, has become vice-president for APAC (Asia-Pacific) at IMCD, a supplier of specialist chemicals and food additives. 1 December 2018.

Prof. Peter Twumasi

WUR Biotechnology 2003, has been appointed director-general of the National Sports Authority (NSA) of Ghana. Twumasi is head of the department of Biochemistry & Biotechnology at the Kwame Nkrumah University of Science and Technology (KNUST) in Ghana. 6 December 2018.

IN MEMORIAM

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

Prof. K.J. Beek, WUR Tropical Rural Economics 1962. Former chair of WUF. 13 January 2019.

Mr G.H. de Bruijn PhD, WU Tropical Plant Breeding 1964.

Mr W. van Donselaar MSc, WUR Farming Technology 1977. 20 September 2018.

Mr H.J. Doude van Troostwijk MSc, WUR Rural Economics 1959. 22 November 2018.

Emeritus Prof. W.J. Feenstra, WUR Horticulture 1954. 2 November 2018.

Mr C. Geerling PhD, WUR Forestry 1970. 24 November 2018.

Mr P.A.M. Jansen MSc, WUR Forestry 1957. 20 November 2018.

Ms W.A. Jongbloed MSc, WUR Horticulture 1959. 8 October 2018.

Mr P.P. Koks MSc, WUR Agricultural Plant Breeding 1956. 18 November 2018.

Mr G. Londo, former member of staff at WUR. 18 December 2018.

Mr G.J. Mocking MSc, WUR Food Technology 1975. 7 November 2018.

Mr F.G. van Ogtrop MSc, WUR Forestry 1989. 9 November 2018.

Mr S.F. Postma MSc, WUR Rural Sociology of the Non-Western Regions 1964.

Mr A.C.M. Schimmel MSc, WUR Land Development A 1987. 21 December 2018.

Mr S. Schukking MSc, WUR Dairy Production 1957. 6 January 2019.

Ms N.J. Schukking-Vos MSc, WUR Horticulture 1957. 26 April 2018.

Mr J. Smelt MSc, WUR Biology 1983. 25 May 2018.

Mr P. Tilma MSc, WUR Agricultural Plant Breeding 1957. 5 September 2018.

Emeritus Prof. A.J.W.G. Visser, 28 October 2018.



IN MEMORIAM (CONTD)

Mr B.W.L. Vlaanderen MSc,
WUR Landscape Architecture 1990.
29 November 2018.

Mr C.A. de Vries MSc,
WUR Tropical Rural Economics 1967.
24 October 2018.

Prof. H.W. de Vries,
former director at WUR.
8 February 2019.

Mr C.J.M. Wijnen MSc,
WUR Rural Economics 1967.
30 April 2018.

Prof. W.J. Wolff,
former part-time professor in Aquatic
Ecology. 27 November 2018.

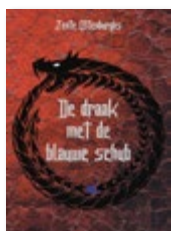
Mr G. Zijlstra MSc,
WUR Land Development 1953.
6 December 2018.

Mr J.J. Zuidberg MSc,
WUR Forestry 1958. 17 July 2018.

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

'Amazing what the pioneers are doing'

Jelleke de Nooy-Van Tol MSc, WUR Landscape Architecture 1977, has written the book *Niet Normaal, onze landbouw, en hoe die anders kan!* ('Our agriculture's not normal, and how it could be different'). In 140 pages, she shows how we can make the transition to sustainable farming methods and how pioneering farmers are already doing this. 'The use of "not normal" in the title means both "not customary" and "amazing what the pioneers are doing",' says De Nooy, who is an independent consultant. The book gives tips on switching to sustainable agriculture. 'I hope it will inspire people on what can be a difficult path of change.' The book costs 17.50 euros and is published by Eburon Academic Publishers.



Jente Ottenburghs PhD, WUR PhD 2016, wrote the fantasy novel *De draak met de blauwe schub* ('The dragon with the blue scale'), to be published by Beefcake Publishing in spring 2019. 'I used to play with Lego and action figures a lot. The book is based on one of the adventures I made up back then.' Ottenburghs is at Uppsala University (Sweden) where he investigates the evolution of birds. 'Sometimes when I got home I didn't feel like opening up the laptop again. But I made a habit of spending at least quarter of an hour on my book every evening.'

Paul Mentink MSc, WUR Biology 1983, draws on nearly 50 years of bird-watching in the book *Mijn vogels, belevenissen van een vogelaar* ('My birds, experiences of a birdwatcher'). There are chapters on his behavioural studies of the house sparrow and his work for the protection of the barn owl. The hardback (32.85 euros, 132 pages) is illustrated with pen and ink drawings by Harm Echten and is published by Brave New Books.



KLW



KLW is for everyone at Wageningen. It aims to foster contacts with other KLW members, alumni, students and the university. You can network in your own subject area through the study groups and sub-networks. KLW also offers career support services such as a CV check and relevant workshops. Members often get discounts too on admission charges for lectures and debates.

Come along to one of our events and get to know us! A selection is shown here – go to www.klv.nl for a complete overview.

VWI members' meeting

6 April 2019. General meeting of the members of the Network for Wageningen University Alumni Women (VWI). vwi-network.nl

Young KLW LinkedIn workshop

10 April 2019. Workshop in English for experienced LinkedIn users. klv.nl

Dairy scientists' reunion

17 May 2019. Reunion focusing on sustainability, standards and certification in the dairy sector. klv.nl/zuivelaars/

KLW members' meeting

2 July 2019. KLW Annual General Meeting for all members. klv.nl

KLW Wageningen Alumni Network is Wageningen University & Research's active, thriving alumni society with around 7000 members.

Want to become a member?
www.klv.nl

KLV

Ben Schut

KLV member since 1972

A PASSION FOR

Birdwatching

Retired plant breeder Ben Schut (who graduated in 1972) enjoys the spectacle of the birds in his garden. 'A blackbird on top of the roof when its young on down in the garden are in danger from a passing cat. You see the beak frantically opening and shutting, and its whole body joins in,' says Ben, illustrating. Or there was the spring of 2017, when five long-eared owl chicks hatched out. 'They stayed in our garden for a few months. Three evenings a week, my wife and I sat out on the garden chairs to watch the show – the fledglings being fed and practising flying.' Ben's wife was born deaf. 'Without her, I would never have taken up birdwatching in this way or with this passion.' Since Ben became hard of hearing himself, his passion has only grown. 'You are not distracted by sounds. You watch and enjoy.'

Are you a KLV member with a passion, or do you know someone who is? Send an email to secretariaat.klv@wur.nl

WANT TO BECOME A MEMBER?

Visit our website www.klv.nl

PHOTO GUY ACKERMANS



PHOTO: VEG-ON-WHEELS

Selling ready-to-eat vegetables by bike in Nigeria

In the Nigerian city of Akure, students on bicycles or with handcarts fitted with cool boxes sold ready-to-eat leafy vegetables for a period of one month. 'The aim of Veg-on-wheels was to boost vegetable consumption in the city,' says Harriëtte Snoek of Wageningen Economic Research. 'Oluranti Lawal of the Federal University of Technology in Nigeria came up with the idea; we helped with setting

up the research, training interviewers and processing the data.' This project complements the CGIAR-A4NH research programme on a healthy diet for city dwellers in non-western countries, which Wageningen is involved in. In that programme, it was found that, for Nigerians, health is a key motive for eating vegetables. But consumers are put off by certain obstacles. Both

the availability and the freshness of greens at the markets go down as the day goes on. And then there is the time-consuming task of ridding the vegetables of sand, weeds, yellow leaves and insects, says Snoek. 'Veg-on-wheels addresses these drawbacks by offering the vegetables washed, cut and cooled in the vicinity of workplaces.'

Info: harriette.snoek@wur.nl