

The conservation of the rhino has turned into a battlefield

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Fishing with electricity

Fishing with a pulse trawl saves energy
But is it also better for nature?

Mixed cropping works better

Growing several different crops
together leads to higher yields

Science as collective action

Increasingly, members of the public
are doing their bit for the sciences



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THE BATTLE FOR THE RHINO

The conservation of the rhinoceros has turned into a battlefield. Researchers place their hopes for the long term in new technologies and attention to the needs of local communities. 'Weapons are too simplistic a solution to a complex problem.'

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SCIENCE AS COLLECTIVE ACTION

Increasingly, members of the public are doing their bit for scientific research by sending in observations or carrying out small-scale studies. European policymakers see 'citizen science' as a way of making the sciences more open and democratic.



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MIXED CROPPING WORKS BETTER

Growing a variety of crops in strips or rows leads to fewer diseases and pests and a more attractive landscape. 'When I first heard that farmers were getting higher yields with mixed cropping, I didn't believe a word of it.'



COLOPHON Wageningen World is the quarterly magazine for associates and alumni of Wageningen University & Research and members of KLV, the Wageningen Alumni Network. A PDF version of the magazine can be found at www.wur.eu/wageningen-world **Publisher** Wageningen University & Research, Marc Lamers **Editorial Board** Yvonne Fernhout, Ben Geerlings, Bert Jansen, Jac Niessen, Irene Salverda, Antoinette Thijssen, Erik Toussaint, Delia de Vreeze **Editor-in-chief** Pauline Greuell (Corporate Communications Wageningen University & Research) and Edwin van Laar (Editor-in-chief Resource, Wageningen University & Research) **Magazine editor** Miranda Bettonville **Copy editor** Rik Nijland **Alumni news** Yvonne de Hilster **Translators** Clare McGregor, Clare Wilkinson **Art direction and design** Petra Siebelink (Communication Services, Wageningen University & Research) **Cover picture** Getty Images **Overall design** Hemels Publishers **Printer** Tuijtel Hardinxveld-Giessendam **ISSN** 2212-9928 **Address** Wageningen Campus, Droevendaalsesteeg 4, 6708 PB Wageningen, PO Box 409, 6700 HB, Wageningen, telephone +31 317 48 40 20, wageningen.world@wur.nl **Change of address alumni** alumni@wur.nl **Change of address associates** wageningen.world@wur.nl, mentioning code on address label **Change of career details** alumni@wur.nl

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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We actually need to carry on eating some animal protein, reckons researcher Hannah van Zanten, because it requires less land than a completely plant-based diet. As long as we feed our livestock on waste products.

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PHOTO SVEN MENCHEL

Admissions cap undesirable

‘Because government funding of the university is not keeping pace with the growth in student numbers, we’re having to restrict admissions in three degree programmes. There is already an admissions cap for Nutrition and Health, and from 2018 there will be one for Biotechnology and Molecular Life Sciences. That is very bad news. There are plenty of job opportunities for graduates but we are forced to take this step to keep up our standards. Together with the three technical universities, which are in the same boat, we are trying to get the message across in The Hague that we can cope no longer.

‘The government claims that the Netherlands is developing into a knowledge-intensive economy, but we cannot handle the increase in student numbers which that entails. Our budget in Wageningen goes up by a maximum of 2 percent per year, but the number of students has been going up by between 5 and 15 percent now for more than five years. That means overcrowded classrooms, a higher student-staff ratio, less supervision and overworked teachers. Close contact between students and teachers is still Wageningen’s trademark but we’re reaching the limits of what is possible now. The biggest bottleneck is the practicals, which are essential to technical degree programmes. You cannot just rustle up an extra laboratory or suitable supervisors at the drop of a hat.

‘We cannot go on like this. In Food Technology too, we have almost reached the limits: we’ve got our backs to the wall. And yet, to keep the knowledge economy going we ought to be providing every motivated student with a good education. Otherwise, there will be a shortage of qualified personnel before very long.’

*Tiny van Boekel, professor of Food Technology
He is retiring on 1 August after five years as director of the Education Institute at Wageningen University & Research.*

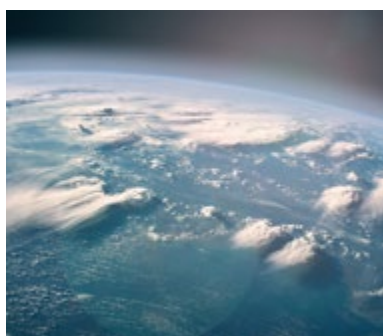


PHOTO SHUTTERSTOCK

EU grant for climate research

Maarten Krol, professor of Air Quality and Atmospheric Chemistry at Wageningen, has received an EU Advanced Grant of 2.5 million euros for research on carbonyl sulphide (COS). This sulphuric gas is a waste product of ocean life. More refined measuring methods can provide a better understanding of the variation in COS levels in the atmosphere. This facilitates a more accurate assessment of the amount of CO₂ absorbed by the earth and of the formation of sulphate aerosols in the stratosphere, which has a cooling effect. Info: maarten.krol@wur.nl

FOOD SECURITY

Climate bureau on campus

The international headquarters of the CGIAR Research Program on Climate Change (CCAFS) moved from Copenhagen to Wageningen Campus in March. The Netherlands has been a partner of CGIAR's since 2015, and finances collaboration between the climate bureau of this international partnership for research on food security and Dutch parties, including WUR. CCAFS aims to speed up the pace of positive change in the areas of climate-smart agriculture, food systems and landscapes.

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So what is bioplastic?

What is bioplastic, what can it be used for, how well can it be recycled and how sustainable is it? Wageningen Food & Biobased Research lined up the facts about biobased and biodegradable plastic in a report called *Biobased and biodegradable plastics, facts and figures*.

The term bioplastic is used for plastic that is not derived from fossil fuels. But it is not a very precise term, say researchers. Because bioplastic can refer both to biobased plastic, which is made out of biomass, and to plastic which is biodegradable, which only applies to a particular kind of biobased plastic. As for the difference in environmental impact between petroleum-based and biobased plastic, it is impossible to say anything about that, says Christiaan Bolck, programme manager for biobased materials. 'Conventional and biobased plastics have an impact on several fronts. What you can say is that smaller volumes of greenhouse gases are emitted in the production of most biobased plastics than that of conventional plastics.' Currently one percent of the plastic produced globally is biobased or biodegradable plastic. That proportion is expected to rise to 2.5 percent by 2020 – without necessarily requiring any more agricultural land.

Technically, there are more and more possibilities for extracting raw materials from garbage and waste flows from farming and food production.

The report, produced for the Netherlands Enterprise Agency (RVO), also contains important information about the separation of plastic packaging from other waste, for recycling. It has been demonstrated that most of the biobased and biodegradable plastics now on the market cannot be mechanically recycled as well as conventional plastics. How fast biodegradable plastics break down mainly depends on where they end up.

In practice, consumers still find it difficult to tell the different plastics apart, so there is some hesitation about urging people to put biodegradable plastic bags in the organic waste bins. Already now household organic waste bins contain one percent non-biodegradable plastic.

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PHOTO ANP

GREENHOUSE HORTICULTURE

RESEARCH

Best agricultural university

In the QS rankings of the best universities in the world, Wageningen has once again come top for agricultural sciences. For environmental sciences, WUR dropped two places to sixth position. QS bases the rankings on the reputation of the institute among academics and employers, the number of citations per academic article, and the H index, which is a measure of productivity and impact. Info: karin.hommen@wur.nl

EDUCATION

Top MSc programmes

Wageningen University & Research has once again been assessed as offering the best Master's programmes of the 13 universities in the Netherlands.

The Dutch higher education guide *Keuzegids Masters* 2017 describes 23 of Wageningen's 27 Master's programmes as top programmes. The highest scoring Wageningen Master's this time is Plant Sciences. The *Keuzegids* bases its rating on student evaluations (80 percent) and the verdict of education accreditation body NVAO (20 percent). Info: hermien.miltenburg@wur.nl



Chinese solar greenhouse

How can a Chinese solar-powered greenhouse be improved and made more environmentally friendly? Wageningen Plant Research and its partners in the sector are looking into this with the help of a demonstration greenhouse in Bleiswijk.

Many vegetable farmers in China use a solar greenhouse with a plastic dome and thick walls. During the day the walls store solar heat, which is released at night. This principle may well be of interest to the Dutch horticulture sector, which still depends on fossil fuels. But humidity levels in the Chinese greenhouses are too high, so market gardeners are hampered by diseases and pests, which they control with a lot of chemical products. This makes it difficult for the Chinese horticulture sector to meet the demand for good quality products and safe food.

The demo model built in Bleiswijk was fitted with ventilation to solve the humidity problem. Also, the vegetables are grown on substrate rather than soil, which prevents soil diseases and makes it possible to recycle water and nutrients. Experiments are also being done with a translucent insulating screen under the dome. 'One of the things we are curious about is how the vegetables will respond to the differences in temperature between day and night,' says Eric Poot of the Greenhouse Horticulture business unit. Info: eric.poot@wur.nl

WAGENINGEN ACADEMY

Executive education – transformational learning experiences

The growing complexity of the global Food & Agribusiness calls for outstanding leaders. Future sustainable scenarios, which tackle the supply-demand gap and cope with the ins and outs of the farm-to-consumer value chain, are key challenges for executives. Meeting these challenges and becoming a successful leader requires top-level education and a great deal of career experience. Executive Education programmes are transforma-

tional learning experiences for both professional and personal growth. That is what our Executive Education programmes are designed to do: support you in your development into an outstanding leader who commands with style and cutting-edge management thinking.

Interested in the Wageningen University & Research executive education programmes? www.wur.eu/academy.

Millions of kilos less phosphate in manure

In order to prevent health problems, livestock feed contains enough phosphorus for those cows that need it in the largest quantities. But individual cows' needs vary widely, so this system leads to an unnecessarily high phosphate output. Tailoring the amount of phosphorus in the feed to the individual needs of a dairy cow could cut phosphate levels in manure by millions of kilos per year. PhD candidate Ibrahim Jibrila of the Breeding & Genetics chair group developed a new and cheaper method of measuring cows' phosphorus requirements using an infrared analysis of milk. Infrared analyses have been used for years for the routine measurement of levels of fat, protein and lactose in milk. Info: henk.bovenhuis@wur.nl

HEALTH

Rehabilitation by gardening

Recovering cancer patients are often affected by side effects of the disease and of the treatment, such as depression, tiredness and raised risks of cardiovascular disease. A healthy diet and regular exercise aid recovery. To motivate people to adopt these habits and stick to them, Wageningen has started a study of the effects of a communal vegetable garden on cancer patients and ex-patients. 'Because research has shown that gardening is good for body and mind, and that people's diets improve when they grow vegetables themselves,' says researcher Iris Rijnaarts. Info: iris.rijnaarts@wur.nl



PHOTO SHUTTERSTOCK



PHOTO WUR

The digestion of nutrients is simulated using gut cells on a microscope slide which fluids flow over.

Gut on a chip

Wageningen University & Research and the University of Twente are working on the development of an innovative gut-on-a-chip with which the interaction between various substances in the human intestines can be studied.

The gut-on-a-chip replicates all the building blocks of a real intestine. Yet it looks deceptively simple: two glass slides with a layer of gut cells between them that are almost invisible to the naked eye. Attached to the chip are fittings to allow the simulated gut contents and bloodstream to flow in and out.

In vitro research on intestinal cells is not new in itself. What is new about the gut chip is that it is a dynamic model: the gut contents flow along the top of the gut cell, and the bloodstream along the underside. 'So that provides a much more realistic approximation of the gut,' says WUR toxicologist Hans Bouwmeester. A clump of cells like this does not work in the same way as a real gut, but that is no problem. 'It just depends on the question you want to answer. You can make the system as complex and realistic as you like. You can add mucus cells, for instance, which simulate the layer of slime on the gut wall, or you can add gut flora,' says Bouwmeester.

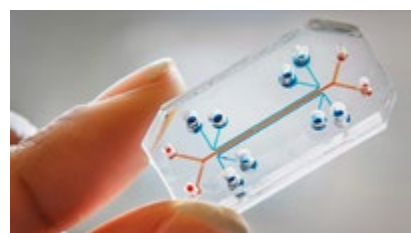


PHOTO RICHARD GROLEAU/WISS INSTITUUT

Chip with little fluid channels.

In the new gut-on-a-chip, scientists can study the interaction in the gut between various substances, food, micro-organisms and gut cells, and the effects they have on the immune system. This way, both the positive and negative effects of various substances which reach the gut via the mouth can be identified precisely. Currently lab animals are often used for this kind of research, so the synthetic gut-on-a-chip could contribute to a further reduction in animal testing.

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PLANT ECOLOGY

Brambles contribute to regional identity

There are 191 species of bramble in the Netherlands. Of these, 22 are common and 142 are rare to extremely rare, with very specific characteristics. This data comes from the study for which batologist – bramble expert – Rense Haveman received his PhD at Wageningen University & Research in April.

Every district has its own bramble flora, so that brambles contribute to the regional identity of the landscape, shows the study. Nature managers and policymakers often see brambles as weeds and an indicator of overfertilization. In fact, only a few species can really be considered fertilization indicators. Many species are specialists and grow in places such as the remnants of old forests or old hedgerows.

In the Netherlands, Haven distinguishes between ten different types of bramble

scrub, or bushy vegetation, rather than the five in the official taxonomy. Together with the great diversity of bramble species, these varied bramble scrubs are important for biodiversity too. With their different growth patterns and flowering times, they provide food for foraging insects and birds and shelter for nesting birds and bees. Haveman would like to see a new attitude to brambles, together with better conservation and more targeted management.

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PHOTO: SHUTTERSTOCK

FOOD PROCESS TECHNOLOGY

Boost for production of meat substitutes

Wageningen is working with partners in the chain on the large-scale production of meat substitutes using a new and cheaper technology. The research builds on the development of a plant-based beefsteak made of pulses, which was launched in 2015. Thanks to the shearcell technology used, plant proteins form fibrous structures. Ways of adding taste and nutritional value with flavourings, fats and other ingredients are now being studied. Five PhD candidates are going to research

topics including new plant-based materials as a basis for meat substitutes, a sustainability analysis and the improvement of soya, a basic ingredient. 'In four years' time we shall have the first version of a production line with which companies can make tasty meat substitutes in large volumes,' says professor of Food Process Technology Atze Jan van der Goot. The technology is also intended for butchers and restaurants.

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FISHERIES



PHOTO: ANP

Poor survival rates for discarded fish

The survival rate for undersized sole put back in the sea after the catch is 29 percent. For plaice it is 15 percent and for dab it is 16 percent. These figures come from research by Wageningen Marine Research on the chances of survival for undersized flatfish in pulse trawl fishing. The research is related to the gradual introduction of a ban on discarding undersized flatfish in pulse trawl fisheries. It is now compulsory for fishers to land all their catch. An exception can be made if a large proportion of the fish survive being returned to the sea. But it is not clear what constitutes a large proportion. The study was published in March in the *ICES Journal of Marine Science*. This year the researchers will be investigating what conditions on the ship make it possible for more fish to survive being returned to the sea.

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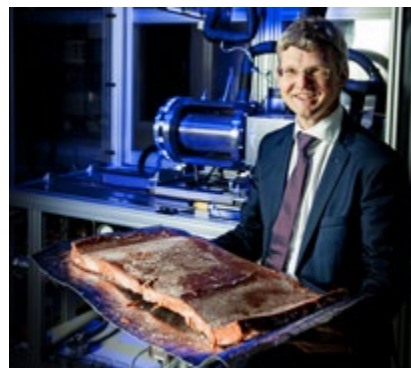


PHOTO: ACTION PRESS/REX SHUTTERSTOCK

Atze Jan van der Goot with a meat substitute.

Beetles and fungi love water hyacinths

Ethiopia can control the invasive water hyacinth with organic pest control using a combination of weevils and fungi, shows research by Firehun Yirefu Gebregiorgis, for which he gained his PhD in Wageningen in March, in the Farming Systems Ecology chair group.

Excessive growth of water hyacinths in lakes, rivers and canals obstructs electricity generation, irrigation, navigability and fisheries everywhere in tropical and subtropical zones. To date, Ethiopia has tried to control the thick layer of plants mechanically and with pesticides. Several East African countries have met with success in using weevils which feed off the plants. Because of its more changeable climate, South Africa is making use of fungi. Gebregorius discovered that in the Ethiopian climate a combination of two weevils (*Neochetina eichhorniae* and



PHOTO SHUTTERSTOCK

N. bruchi) and the fungus *Alternaria alternata* reduces the amount of water hyacinth by fresh weight by 85 percent.

Importantly, these weevils only like water hyacinth.

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BEHAVIOURAL BIOLOGY

Pigs communicate emotions

Pigs can pass on emotions to each other. Behavioural biologist Inonge Reimert of Wageningen University & Research discovered this by giving a pig from a group a nice experience (a chocolate raisin hunt) or an unpleasant one (isolation or a shock). When they returned to the group, both the happy pig and its companions became more active, playful and sociable. The mistreated animal, on the other hand, became more inactive, which infected the group too. The effect was still visible two weeks later. Reimert is the first person to have demonstrated this effect in pigs. The research can have implications for the wellbeing of pigs in a shed. Medical treatment currently takes place in the shed; the findings suggest it might be better to do it in a separate space, suggests Reimert.

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FOOD WASTE

‘Long life’ better than ‘Best before’

To prevent food waste, it can help to replace the warning ‘Best before’ on packaging with the term ‘Long life’. The change makes consumers throw out 31 percent less food, say Wageningen experts after a consumer study.

Too few consumers understand the difference between ‘Best before’, a guarantee of quality of long-life products, and ‘Use by’, which is a recommendation for the safe consumption of fresh foods. They play it safe and throw out even durable products such as coffee, tinned fish, syrup, rice and packets of juice as soon as the ‘Best before’ date has passed. The score was much lower even for other messages attempting to educate consumers, such as ‘after date X: look,

smell and taste’, or ‘quality guaranteed until date X’. In the Netherlands consumers are responsible for 800 million kilos of food waste per year, which amounts to 47 kilos per person. That is more than a quarter of the total food waste.

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FOTO GEA HOGEVEEN

REMOTE SENSING

BIOPROCESS TECHNOLOGY

Drones reveal soil legacy

Planten laten na hun groei een biologische en chemische erfenis achter in de bodem. Wageningse onderzoekers kunnen het effect daarvan met behulp van drones snel en op grote schaal zichtbaar maken.

Plants leave a biological and chemical legacy behind in the soil when they die. Wageningen researchers can measure the effects of this quickly and on a large scale using drones.

The researchers have proven that the effect of an earlier crop can be studied just as accurately using a drone, a hyperspectral camera and remote sensing as with an analysis of plant samples. The camera measures the visible reflection and the near-infrared reflection of the plants, from which the plant's condition can be deduced. The results of the study were published in *Biogeosciences* in February. In the experiment oats were grown after fodder radishes and vetches, or after English ryegrass. The oat crop grew 10 percent taller after a previous crop of fodder radishes and vetches, and after English ryegrass it was 10 percent smaller than after a fallow period. The previous crops also had an effect on the concentrations of chlorophyll and nitrogen in the oat leaves, which increased consider-

ably after the mixture of fodder radishes and vetches, and was a lot lower after the English ryegrass.

This plant-soil feedback is an important mechanism for explaining the dynamics in plant communities and the performance of plants in natural and farming systems. For practical reasons, studies on this biological and chemical legacy in the soil are usually short and small-scale. 'With these new technologies we can test the ecological principle on a spatial scale and a timescale that used to be out of reach,' says soil biologist Gerlinde de Deyn.

The technology gives farmers insight into relative differences within and between plots and shows where a crop lags behind, explains remote sensing expert Lammert Kooistra. 'It is a tool which gives you an indication of what to prioritize and which measures are needed.'

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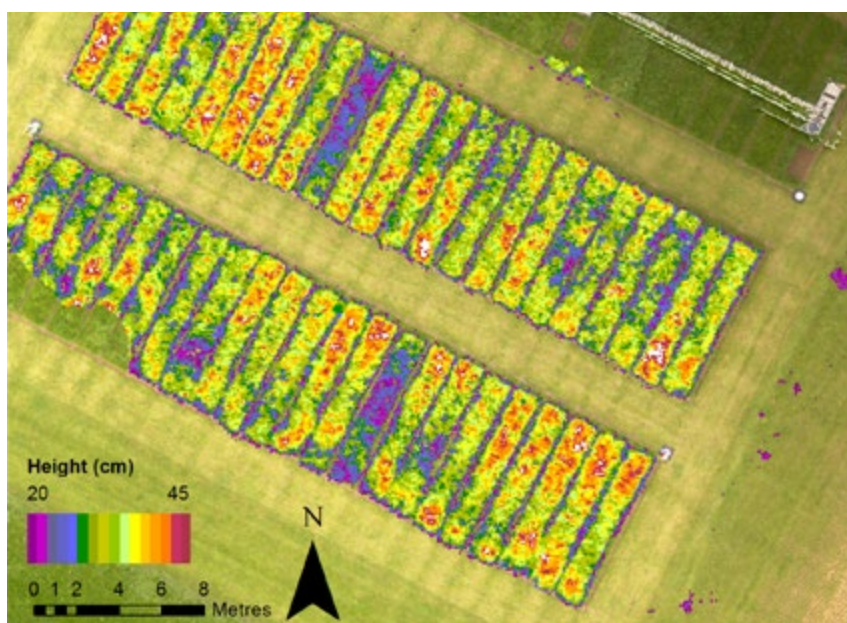
The fungus *Monascus ruber*

New production process for bioplastics

In collaboration with oil and gas company Total, Wageningen researchers have developed a new process for making organic acids out of biomass. The acids are used as building blocks for polymers such as polylactic acid (PLA), for use in bioplastics, for instance.

The micro-organisms which are currently used for the production have the disadvantage that they grow in an environment with low acidity. That makes the process expensive and generates waste products. In a comparison of several candidates, the fungus *Monascus ruber* performed best. The scientists could adapt the fungus so that it produces lactic acid and tolerates high concentrations of acids. The fungus is also registered as safe for human consumption, which is important for authorization to use the plastic for food packaging. Total is testing the results in a pilot in the US. The research and development work is protected by three patents.

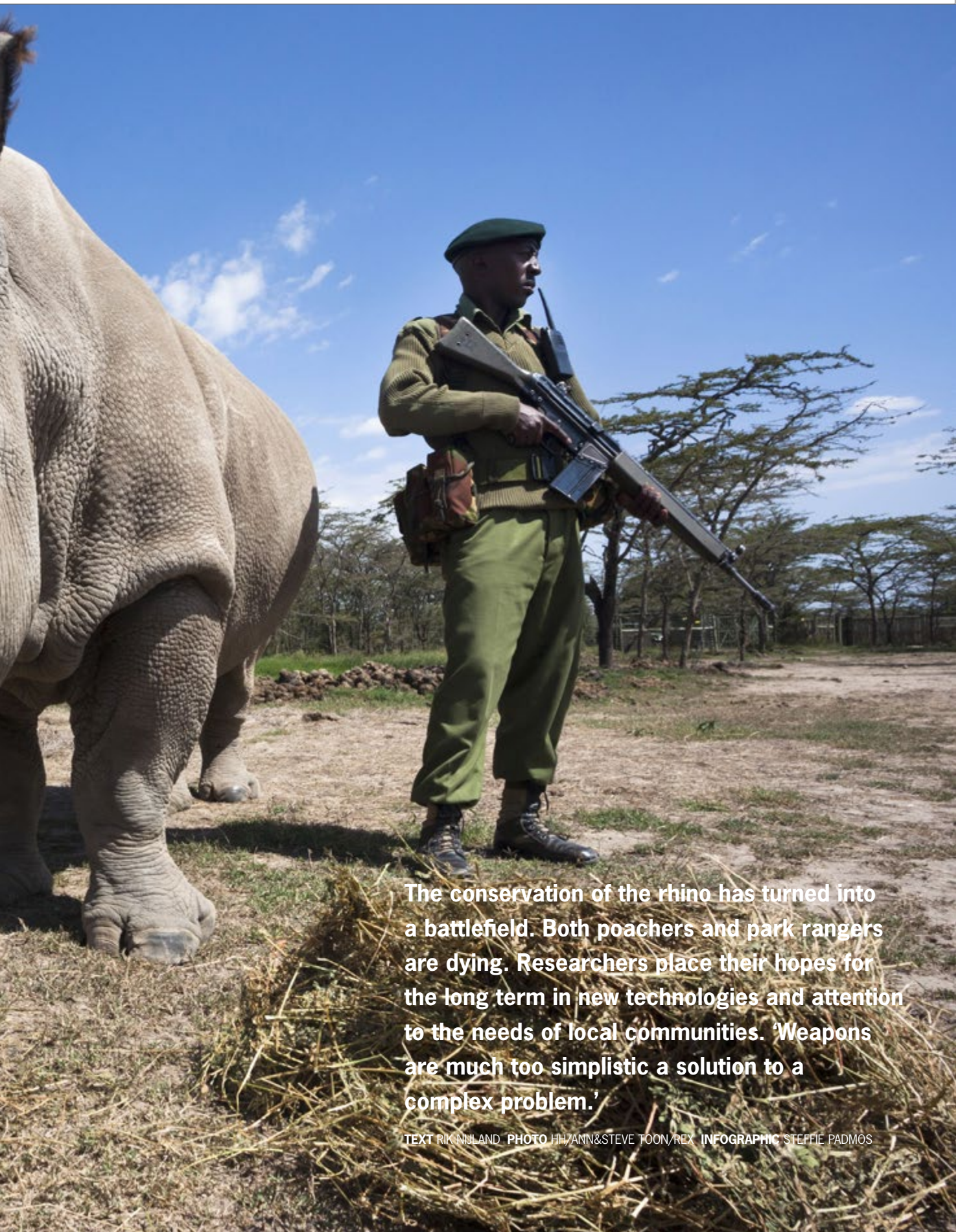
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Filming with drones provides precise images of the state of the grass.



The battle for the rhino



The conservation of the rhino has turned into a battlefield. Both poachers and park rangers are dying. Researchers place their hopes for the long term in new technologies and attention to the needs of local communities. 'Weapons are much too simplistic a solution to a complex problem.'

TEXT RIK NIJLAND **PHOTO** HH/ANN&STEVE TOON/REX **INFOGRAPHIC** STEFFIE PADMOS

‘Poaching is seen as doing something for the benefit of the family’

In early March this year, Europe got a taste of the consequences of the lucrative illegal trade in rhino horn when Vince was shot dead in a zoo near Paris. Vince was a young rhino with Dutch roots: he was born in Burger's Zoo in Arnhem in 2012. When Vince's French keepers found him, his horn had been sawn off with a chainsaw. In the wildlife reserves of South Africa, home to 80 percent of African rhinos, this kind of slaughter is the order of the day. The country forms the epicentre of international poaching: three rhinos die there every day, most of them in the Kruger Park, an extensive wildlife reserve half the size of the Netherlands, on the border with Mozambique. Every year more than a million visitors come to the park to enjoy its nature and see the big five. But another, depressing reality is lurking in the wings. In 2016 poachers killed 662 rhinos in this game park. And glib as it may sound, that represents a big improvement. In 2015, 826 mutilated carcasses were found.

To try and stop the poaching, for the past couple of years the park has been patrolled not only by armed rangers, but also by the South African army. But in spite of this display of force, there are always a couple of poaching gangs in action, says Bram Büscher, professor of the Sociology of Development and Change at Wageningen, and currently visiting professor in Cape Town. Since 2015 he has been doing research from Wageningen on poaching in South Africa, Indonesia and Brazil, using a Vidi grant for innovative research from the Netherlands Organization for Scientific Research (NWO).

‘I saw violence breaking out around the poaching in the Kruger Park six years,’ says Büscher. The huge demand for rhino horns and the sizeable earnings for anyone who can get hold of one are probably driven by

increasing wealth in Vietnam and China (see box). At that time Büscher was studying the relation between social media and nature conservation in cross-border nature reserves in southern Africa. ‘Poaching was such a key issue in that period that there was no way round it in my research.’

PEACE PARK

Together with the Limpopo National Park across the border in Mozambique, the Kruger forms what has been dubbed a ‘peace park’. Peace parks were the initiative of the NGO Peace Parks Foundation founded by the South African billionaire Anton Rupert, Nelson Mandela and Prince Bernhard, former Dutch Crown Prince and the founding president of the Worldwide Fund for Nature. Nelson Mandela saw peace parks as a conciliatory gesture towards neighbouring countries after the tensions during the years of the apartheid regime. But the peace park has not really brought peace: in the Kruger Park it is not just rhinos who are dying, there are human victims too. In 2015, The Guardian wrote that around 100 Mozambican poachers are shot in the park every year. Park rangers too are frequently victims of the armed struggle over the rhino. Büscher thinks the arms race between poachers and rangers has escalated further than it needed to. ‘Weapons are much too simplistic a solution to a complex problem.’ Racial divisions with roots in the apartheid era play a role in the background, he observes. ‘From our perspective all poaching is bad. White children grow up with soft toys and stories about lions, elephants and rhinos. But many of the mostly black poachers see poaching as a chance to do something for the benefit of their families or communities. Besides, not many of the local residents are particularly interested in the park; they are too busy struggling for

survival. If anything, they associate the park with past oppression: their forefathers had to get out of the area to make way for what is often described as a predominantly white hobby. Many of the nature organizations involved, including the Peace Parks Foundation, are frequently seen as white elite organizations which rarely take an interest in the local black community. In a context of unemployment and poverty, that leads to serious tensions. I don't think you can rule out the possibility of the bomb going off at some point. Of families and entire communities turning against the park.’ So perpetuating the current arms race is not a long-term solution to poaching, in Büscher's view. ‘The Kruger Park has focused too much on militarization in the war on poaching,’ he feels. ‘Communication channels between the park and the local community which had been developed since apartheid have been badly neglected. Of course you can't expect to reform violent poachers overnight just by talking to them, but it is nevertheless very important to show some understanding of people's needs, and to engage with them.’

USING FIREARMS

Associate professor Frank van Langevelde of the Resource Ecology chair group in Wageningen, who has done a lot of research in African nature reserves, sees no other option at the moment than taking action to protect the rhinos. Using firearms if that is what it takes. But he does acknowledge the risk that the more successful this is, the likelier the problem is simply to relocate. Since South Africa began to have some success in limiting the loss of rhinos, the numbers of poached animals in bordering Namibia and Zimbabwe have been going up – from around 25 in 2014 to 80 and 50 respectively in 2015. ➤

RHINOS

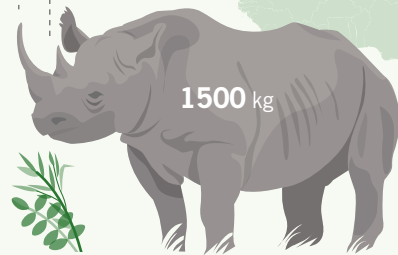
Worldwide, there are five species of rhino left. They are found in Africa and Asia and most are threatened to a greater or lesser extent, due to the rhino horn trade.

Black rhino

Numbers in the wild:
c. **5000**

- White rhino
- Black rhino

c. 100 cm
c. 50 cm

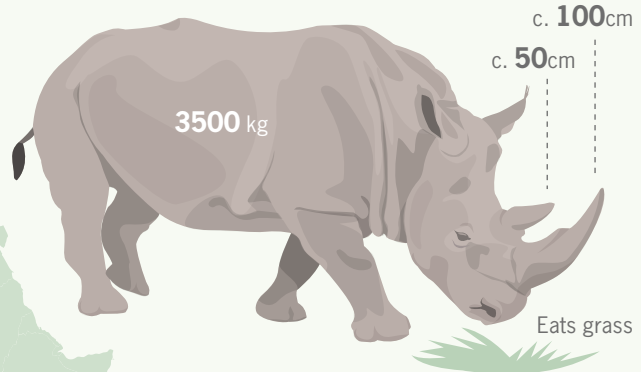


Eats green shoots and acacia leaves and twigs



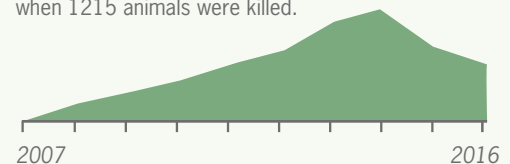
White rhino

Numbers in the wild: c. **20,000**. The species was considered extinct at the end of the 19th century until a surviving population of 100-200 animals was discovered in 1895.



Poaching

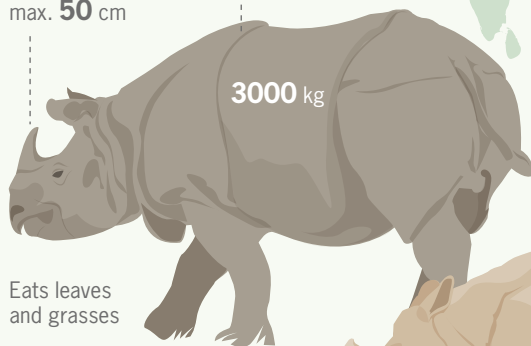
Far and away the most rhinos are found in South Africa, where poaching has therefore been concentrated for the past ten years. The peak was reached in 2014, when 1215 animals were killed.



Indian rhino

Numbers in the wild:
c. **3500**

A single horn max. 50 cm
Its thick folds of skin look like armour plating



Eats leaves and grasses



- Indian rhino
- Javanese rhino
- Sumatran rhino

Sumatran rhino

Numbers in the wild: c. **250**

Shy
Two small horns



Lives in forests and swamps

Very varied diet

Javanese rhino

Numbers in the wild: thought to be only **60** left in the rainforest of Ujung Kulon National Park



A single horn max. 20 cm

Very varied diet and habitat



PHOTO HOLLANDE HOOGTE

Vets and rangers in the Kruger Park in South Africa have anaesthetized a mother rhino in order to move her somewhere safer.

Van Langevelde thinks the battle will be fought not just with an arms race but also with modern technology. The Kruger Park is making use of drones and ‘smart’ fences which not only keep animals in but also register suspicious movements. The Wageningen researcher hopes to add another resource to the arsenal with SmartParks: a multidisciplinary project that uses an analysis of the movements of fleeing herbivores on the savannah – impalas, wildebeests and zebras – to pinpoint where poachers are active. A patrol can then go out and stop them before they kill a rhino. The idea came from astronomers at the Netherlands Institute for Radio Astronomy (Astron) and staff at NWO, who speculated at a conference in South Africa as to whether it might be possible to spot poachers from space. For a partner who knew about animals and poaching, they turned to Wageningen. With funding from the NWO, a Wageningen postdoc and a PhD candidate set to work in South Africa, collaborating with colleagues from the universities of Twente and Leiden and astronomers from Astron. Their task is to find out whether animals behave differently when fleeing different types of disturbance. The large herbivores of the savannah are constantly on the move, setting up a stampede at the approach of lions, a leopard or a pack of wild dogs – and when tourists get out of their bus or poachers make them uneasy.

‘We think it’s possible to differentiate between different disturbance patterns, if we can get hold of enough data,’ says Van Langevelde. ‘Lions, for instance, ambush their prey, while wild dogs rely on long chases at high speed. Different behaviour patterns are triggered by those predators than by poachers searching for prey without knowing where it is. The poachers usually walk in a straight line, causing a slow wave of disturbance among grazing game,’ says Van Langevelde. ‘Very occasionally poachers come by car or helicopter, but that is easy to spot. More often they come into the park in small groups, operating in the park on foot at night.’

REGISTERING ESCAPE BEHAVIOUR

The researchers started a trial in a small game park in South Africa in May. About 140 large herbivores were fitted with collars with GPS transmitters which were tracked with a telecommunication network (LoraWAN). Once it has been shown that movement patterns can be distinguished from each other, the collars will be removed. Eventually a satellite should be able to locate and register the movements of the game using the heat they give off, but that is still a way off at the moment, says Van Langevelde. In the trial period, the researchers are experimenting with tourist buses, walking safaris and poachers. ‘Rangers are going to imitate poachers, even down to really

shooting,’ the researcher explains. ‘That needs doing anyway to feed the lions which are being kept in quarantine in the park to inoculate them. We expect that impalas, zebras and wildebeests differentiate between the body language of hunters and that of tourists out on a walk.’

Van Langevelde has no illusions that the new method will provide the ultimate solution for discouraging poachers. The risk of being caught will increase but will not easily outweigh the lure of the income gained from poaching. ‘I think the best way is to reduce demand by educating and informing people in the Asian countries where rhino horns are popular. That is how the Netherlands managed to make smoking much less socially acceptable.’ He has higher hopes of this approach than of fighting the poaching trade. ‘Good that people work on that too, but in the light of the results with drugs and with human trafficking, I don’t have much faith in it.’

LIFTING THE BAN

The Wageningen animal ecologist is fiercely opposed to a free trade in rhino horns. Internationally, the import and export of horns is and will remain banned, but in March this year the South African high court decided to lift the ban on internal trade that had been in place since 2009. A handful of rhino farms in the country have been calling for this for years. They have large stocks of

‘Focussing on the animals and ignoring the people undermines nature conservation’

rhino horns – which grow back in two years if they are sawn off carefully. The farmers are keen to cash in this ‘capital’ on the home market. They claim that poaching only got out of hand after the introduction of the ban, and believe a legal trade would take the wind out of the poachers’ sails.

Opponents, such as Van Langevelde, are afraid that the legally marketed horns would be smuggled abroad, because export is still illegal. ‘In South Africa itself there isn’t a market for them but in Asia the demand is huge. There are so many people who want to get hold of one that I don’t think this will curb the poaching. It will still be lucrative. You might also start getting fraud with wild game, like what goes on in the caviar business in the Caucasus. There is a ban on fishing wild sturgeon but the fish farms are not producing enough caviar. All the caviar that is sold is labelled “farmed” but research reveals that much of it comes from wild sturgeon. A similar thing will happen with the horns.’

INCOME FROM TOURISM

According to Van Langevelde, for the time being the prevention of rhino poaching is a matter of combining technology, weapons, penalties and, where possible, local participation. In the sparsely populated country of Namibia, there has been some success with reducing poaching by giving local villages a share in the profits from tourism. ‘That won’t work in the Kruger Park, which lies in a densely populated area. A lot of poachers enter the park via Hoedspruit and Nelspruit, a region with a population of half a million.’ It would not be realistic to seek to share the profits of the Kruger Park with them. Last year 800 people were arrested for poaching, but there are many ready to take their place. In the short term, prevention – stopping those animals from being shot – is the only solution. Whatever Büscher may think of it, patrolling by the army is necessary, sadly.’ Professor of Sociology Büscher realizes his

plea for de-escalation and dialogue can only offer a solution to poaching in the long term. He nonetheless believes that restoring trust is essential. The local communities around the Kruger Park – millions of people – are experiencing far-reaching changes, he explains. ‘Small-scale farming still plays an important role but there is little land available. What is more, young people are turning their backs on the way of life of their parents and grandparents. They prefer a modern lifestyle. “Can’t those people start a farm instead of poaching rhinos?” people in the Netherlands sometimes ask. But this is to ignore the fast pace at which rural South Africa is changing. At the moment, some of the local population feel that they are being taken more seriously by the crime syndicates than by the Kruger Park or the government. In a context like this, if we concentrate solely on the animals and ignore the people, we undermine nature conservation and in the end we cuddle the rhino to death.’ ■

MARKET FOR HORNS

A rhino horn is worth more than its weight in gold. The end users are said to pay between 60,000 and 100,000 dollars a kilo.

The main constituent of rhino horn is keratin, the tough fibrous protein that nails and hair are made of too. In Asia, rhino horns are a traditional ingredient in medicines against cancer and other diseases, as well as being used to make little bowls or jewellery, or the handles of traditional Yemeni daggers.

The market for horns has peaked in different countries at different times,

shows research by Save the Rhino/TRAFFIC. Up until the 1970s, Japan was the biggest user, particularly for medicinal purposes. When the international trade was curbed, from 1977, the government instructed producers to use alternative ingredients. The trade then shifted to South Korea, but government legislation took effect there a few years later too. The turnover in Yemen has dropped just as dramatically, partly thanks to an information campaign and because of economic instability. At present the main markets for rhino horn are in China and Vietnam.

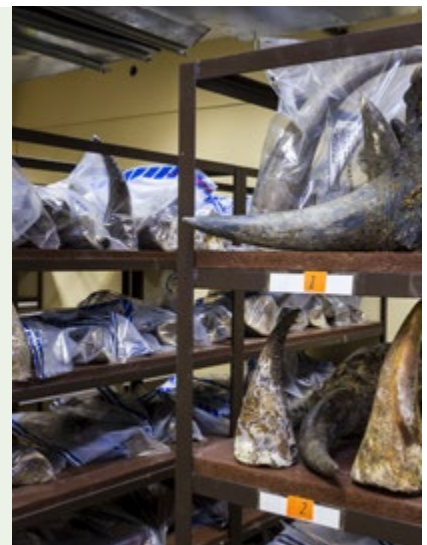


PHOTO GETTYIMAGES

Better genes for tricky plants

Plant breeders are increasing their understanding of the genetically most complex crops. Good news for chrysanthemum growers, for instance, whose flowers are being sold increasingly further afield. With the right genes, the chrysanthemums will still look fresh even after a long journey to far-off countries.

TEXT KORNE VERSLUIS PHOTO SHUTTERSTOCK

It was fortunate that Gregor Mendel, the 19th-century father of genetics, chose the pea as his preferred plant for his genetic experiments. If he had gone for a rose or chrysanthemum, he would never have discovered the laws of inheritance. For the pea, like mammals, has two copies of each chromosome in every cell (it is a diploid), one from the father and one from the mother. But other plants have more (they are polyploid). The rose, for example, has four copies of each chromosome, while six are standard in chrysanthemums.

That makes genetic research more complicated.

LEAVING TRACES

One of the methods that has been used for decades in genetic research in diploid crops is to establish the frequency with which genes are exchanged. By closely examining the results of a cross, geneticists can determine whether genes are located close together or not. But it is much more difficult to obtain that information when plants have more than two copies of each chromosome.



‘In Wageningen they
show us what the
software can do’

‘You therefore need much more complex calculation methods and more powerful computers to create gene maps,’ explains Chris Maliepaard, a Plant Breeding researcher at Wageningen University & Research. Early this year, Maliepaard and colleagues published a detailed genetic map of the rose. The modern cultivated rose is the result of crosses between various species of wild rose and that pedigree has left traces in how the chromosomes behave, he says. For instance, some chromosomes still want nothing to do with chromosomes that arrived via distant relatives in the past. That means they exchange genes less often when forming the female sex cells and the pollen. ‘We discovered that most chromosomes have no clear preference when forming sets, but one of the chromosomes does.’ To produce the genetic map of the rose, he used software that he and his colleagues de-

veloped in a project that is co-funded by 12 companies working on plant breeding for various polyploid crops.

COOPERATION

One of the users is Deliflor Chrysanten in Maasdijk, the largest chrysanthemum breeding company in the world. For a long time breeding ornamental flowers was a craft, says Aike Post, the company’s manager for Breeding. That is not just because of the complex genetics. ‘The most important aspect by far is the aesthetics: do you get an attractive flower?’ An expert eye and a feeling for the market were more important than genes and DNA tests. But that is changing. Post: ‘In the past Dutch growers sold their flowers in Germany and Britain but Eastern Europe is now becoming more and more important. As a result the flowers have to meet increasingly tough demands in terms of shelf life.’

Deliflor is working on a map of the chrysanthemum genome. The company is using the software developed by Maliepaard. Post: ‘We get a workshop once or twice a year on the

latest features in the software. The nice thing about this is that it lets us collaborate with companies working with completely different products. There are companies in the consortium for instance that breed potatoes or leeks. In Wageningen they show us what the software can do; here in Maasdijk we enter our own data and work on our own map.’

Ultimately, the improved understanding of the genome should make it possible to use selection methods that are already being used for diploid crops. Seedlings will then automatically be selected for their promising properties. Deliflor already does that to determine whether plants are resistant to the pathogen *Fusarium*. ‘That’s a simple property. One dominant gene is enough to make a plant resistant.’ In the future, Post also wants to be able to target more complex properties, such as colour, flower shape and post-harvest quality. The Wageningen PhD candidate Geert van Geest, for example, is doing research at Deliflor on the discoloration of the heart of the chrysanthemum flower. ‘We want our flowers still to look good even after they’ve been transported to Vladivostok,’ says Post. ■

wur.eu/plantbreeding

Fishing with electricity

Does fishing using electric pulses have advantages over beam trawling? It saves energy and is probably less damaging to the seabed, but is it also better for nature in the longer term? And is it animal friendly? 'The pulse makes beach crabs stiffen.'

TEXT TESSA LOUWERENS **PHOTO** HOLLANDSE HOOGTE

Two electrodes suspended in a bucket of water send electrical pulses through the water. It tingles a bit if you put your hand in, but there is no pain. 'Now it's at about half strength,' says Pim Boute, PhD candidate in the Experimental Zoology group at Wageningen University & Research.

Boute is researching the effect of electric pulse trawling on various sea creatures. Pulse trawling is a method that can be used to catch flatfish, for example. Flatfish such as sole and plaice bury themselves in the seabed so they first have to be flushed out

before they can be caught in a net. Traditionally, this is done with a beam trawl that drags heavy 'tickler chains' across the seabed. These chains plough up the seabed, injuring or ensnaring a lot of other creatures, including starfish, crabs and shellfish, in the process.

Scientists and fishing businesses are looking for more sustainable methods for catching flatfish and are therefore experimenting with pulse trawling. This method involves replacing the tickler chains by electrodes that emit electric pulses — the pulse trawl. Boute: 'The >





‘We are expecting this technique to be an improvement’

electrical pulses induce brief convulsions in the muscles of the fish, making them rise up from the seabed and get caught in the net.’

DAMAGE TO THE SEABED

Earlier studies showed that pulse trawling has several advantages compared to beam trawling. In the FP-7 BENTHIS project, for instance, research has been taking place since 2012 into the mechanical effects on the seabed of dragnets, including those used in pulse trawling and beam trawling. ‘The nets are dragged across the sea floor in

both cases, but the pulse trawl is lighter and the electric wires don’t dig so deep into the floor as the beam trawl’s tickler chains, which means they don’t cause so much damage,’ explains project manager Adriaan Rijnsdorp of Wageningen Marine Research. Fewer benthic creatures are caught in the net as well. It also depends on what part of the sea you are fishing in, says Rijnsdorp. ‘In shallower areas, the seabed is regularly churned up by strong tides or when a storm rages. The sea creatures that live there are better adapted to a turbulent sea floor, so the effect of fishing is less there than in the deep seas, where you can still see the tracks of the dragnets on the bed one year later.’ Another advantage of the pulse trawl is that boats can catch just as much sole as with the beam trawl while sailing at a slower pace, and therefore travelling less of a distance. ‘So the pulse trawl covers a smaller area to catch the same volume of sole.’

That, coupled with the fact that the pulse trawl is lighter and has less drag resistance, means the ships consume less fuel. This in turn means lower CO₂ emissions and lower costs for fishers. The fish that are caught are also better quality on average because they have suffered less damage. The initial impression is therefore that pulse trawling should be a good alternative to beam trawling. However, in principle the method is still not allowed in Europe. Since 2009, Member States have been able to grant an exemption for up to five percent of their fleet to use this new fishing method in the southern part of the North Sea. The Netherlands has granted 84 such exemptions.

To get a better picture of the long-term effects of pulse fishing in the North Sea, the Dutch Ministry of Economic Affairs commissioned the Pulse Trawl Impact

Assessment Project, which started in early 2016. ‘We want to use that research to predict the effects of pulse fishing on a large scale,’ says Rijnsdorp. ‘We are expecting this technique to be an improvement, but it’s important to investigate the possible downsides thoroughly so that we can make a well-considered decision.’ The research is a joint project with the Netherlands Institute for Sea Research (NIOZ) and the Institute for Agricultural and Fisheries Research (ILVO). The research results from the two projects will eventually form part of the scientific basis for a future decision by the EU on pulse fishing.

ANAESTHETIZED FISH

PhD candidate Pim Boute’s experiments in the Zodiac lab in Wageningen are part of the Pulse Trawl Impact Assessment Project. He has created a setup that will let him accurately measure the effects of exposing fish to electric pulses. ‘Some fish are affected by the pulse trawl but not caught in the net, for example, so we can’t examine them on board a fishing boat.’ By simulating the real-life situation in the lab, Boute can still see what the pulses do to the fish.

A tangle of cables connects an aquarium full of electrodes to the computer. The aquarium is about one and a half metres long and wrapped in a thick layer of polystyrene. ‘The fish we are investigating live in the North Sea and it’s colder there,’ explains Boute. ‘We keep the tank cold to stay as close as possible to the natural situation.’ The fish will be anaesthetized first to prevent any distress. Then Boute will measure their muscle activity under different settings for the electrical pulses. In the Zodiac basement, Boute shows us the X-ray room. X-rays are taken here of fish

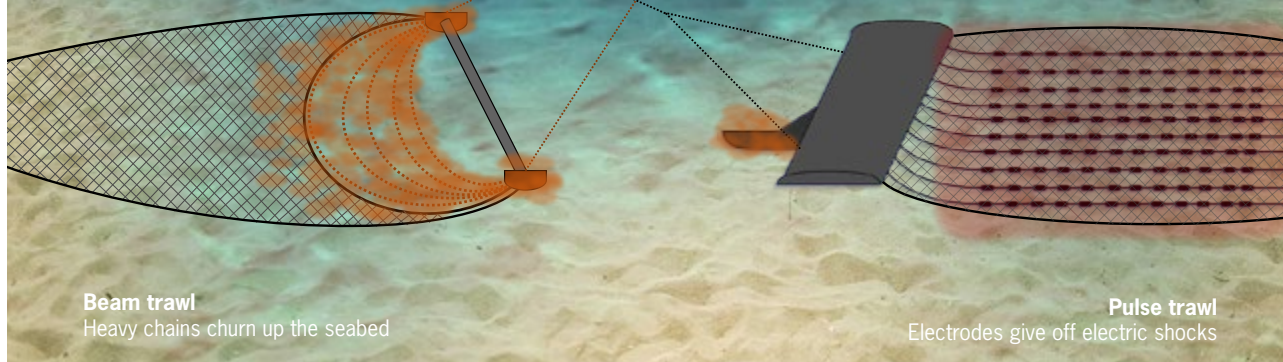
TENSION

The Netherlands has made use of the option of granting up to five percent of its fishers an exemption to the EU ban on pulse trawling. Many other EU Member States have not done so and have taken a critical stance. Earlier this year, the French Minister for the Environment called on the European Commissioner for Fisheries to maintain the ban on electrical stimulation in fishing and revoke the exemptions that have been granted. According to the minister, there are far too many ships taking part in pilot projects, not enough is known about the impact and risks, and there is insufficient monitoring. VisNed, the Dutch trawlers’ association, is working hard on getting pulse trawling accepted in Europe. The organization feels that the opposition is fuelled in part by other countries’ desire to bolster their competitive position.

BEAM TRAWLING

In beam trawl fishing, a dragnet hanging from a beam is pulled over the seabed. There are chains attached to the beam which churn up the ground to disturb the flatfish.

In pulse trawl fishing, the chains are replaced by strings of electrodes which give off little electric shocks.



Beam trawl
Heavy chains churn up the seabed

Pulse trawl
Electrodes give off electric shocks

ILLUSTRATION WUR / JUSTIN TIANO

that have been caught by a pulse trawl. Fish can break their backs when their muscles convulse powerfully. Boute: 'That is not animal friendly. Previous studies showed this happening to cod, for instance, but the results weren't consistent. That's why we want to investigate more broadly how often this occurs in commercial catches.' The aim of Boute's study is to determine the sensitivity of different sizes and species of fish to the pulses. That is because previous research has shown that the effect of the pulses depends on the size and species of fish. Boute: 'The landing obligation means that fishers now also have to bring back undersized fish and species that don't make much money. It might be possible to fish more selectively by choosing the right settings in a way that will let fishers mainly catch their target fish.' He also wants to look at the behavioural effects of pulses on sea creatures that are not being fished. 'Sharks and rays, for example, can sense electricity. In theory, the pulses could either attract them or repel them, so they could equally well end up in the net. Or not.' Invertebrates such as beach crabs also react to the electricity. 'The pulse makes them stiffen. Then they are unable to feed properly and run a

greater risk of being eaten. You don't always see them in the nets but what happens to these creatures could well affect the population and the ecosystem.'

EATING SAND

PhD candidate Justin Tiano at NIOZ is also investigating the effects of pulse fishing on the marine ecosystem, and in particular life in the sediment. That is because the electrical field from the pulse trawl permeates the top layers of the seabed. Tiano does his research in a lab at the other end of the country, in the coastal village of Yerseke in Zeeland. He has a row of 30-centimetre glass test tubes with sediment samples. He took those samples from the seabed using a hollow drill. A tiny tunnel runs through the sand in one of the test tubes. Tiano explains that it was made by a lugworm. 'It eats sand, then excretes it at the other end as the worm digs deeper. That process mixes up the sediment.' Lugworms and other creatures on the seabed play an important role in the exchange of nutrients and oxygen between the sea floor and the seawater, explains Tiano. They also help remove nitrogen and phosphate from the water. 'Too much nitrogen can lead to excessive algal growth, making oxygen levels in the water fall. This then affects the entire ecosystem.'

Tiano will be comparing the effects of beam trawl fishing and pulse trawl fishing on the seabed. First, he disturbed his sediment samples to simulate the effect of the chains on the beam trawl. Then he measured the impact this had on the biochemical processes in the sediment. He is currently working on the data analysis. He plans to carry out another test in which he exposes the sediment samples to electrical pulses to see what happens. That will let him determine which method of fishing is least disruptive for the marine ecosystem.

LIMITING THE DAMAGE

The WUR, NIOZ and ILVO research project is scheduled to run until 2019, and the researchers still have a lot of work to do. The results will be combined with the results from the FP7-BENTHIS project. Project manager Adriaan Rijnsdorp: 'To have sustainable fishing, it's important to find out what method and which settings should be used to catch the fish as efficiently as possible, with minimum damage to other creatures and the environment. Our research results will help us get a better estimate of the effect of a switch from beam trawling to pulse trawling.' ■

www.pulsefishing.eu

21
GRAM

PROTEIN CONSUMPTION

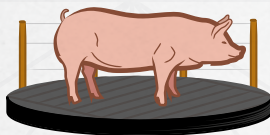
The consumer has access to 21 grams of protein a day, which comes from livestock that feeds on waste or grazes on marginal land.



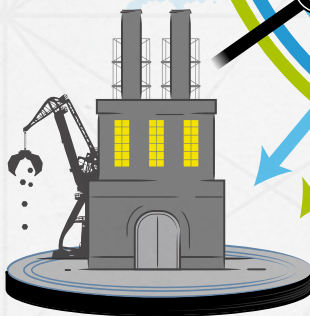
Unusable waste flows are converted into valuable protein.

PIG FARMING

Pigs are fed exclusively on waste flows sourced from consumers and the food industry.



Waste flows



FOOD INDUSTRY

Land that is unsuitable for farming is used to produce valuable protein.



CATTLE FARMING

Cows only graze on marginal land which is neither suitable nor needed for crop farming.

FARMLAND

Farmland is only used to produce crops for human consumption, not crops for livestock feed.



Plant-based food



USING FARMLAND EFFICIENTLY

‘We’ve got to start feeding our livestock waste products’

To be able to feed the growing world population, we actually need to carry on eating some animal protein, reckons researcher Hannah van Zanten, because it requires less land than a completely plant-based diet. As long as we feed the livestock on waste products and leftovers.

TEXT RIK NIJLAND ILLUSTRATION KAY COENEN

As a little girl, Hannah decided after a visit to a children’s farm never to eat animals again. And she still doesn’t, now aged 33 and a postdoc at the Animal Production Systems chair group in Wageningen. Her two children do get meat occasionally, though. And actually that makes them better world citizens than their mother, at least according to the thesis for which Hannah van Zanten was awarded her PhD with distinction last summer. She suggests in her thesis that for the sake of efficient land use and food security we should in fact consume a little bit of meat. ‘We don’t all have to become vegan to save the planet,’ says Van Zanten.

This message is music to the ears of diehard meat-eaters. Because even they sometimes feel their consciences nagging: a cow or a pig needs an awful lot of kilos of plant protein to produce just one kilo of animal protein.

So you can feed more people on a plant-based diet, making it a better choice for the world food supply: that is the assumption. And it is good for the planet too, since livestock farming takes up a lot of space and causes a lot of pollution, mainly because we grow tons of livestock feed and transport it around the world. This accounts for most of the environment damage done by livestock farming: half of the greenhouse gas emissions, 60 percent of the energy consumed and two thirds of the total land devoted to livestock. What is more, there is competition between ‘feed’ and ‘food’: feed largely destined for animals in the west supplants food crops for people in developing countries.

But in spite of the disadvantages associated with livestock farming, considerations of space and food security make it unwise to scrap animal protein from our diets completely, concludes Van Zanten in an opinion >



piece in her thesis. That is, at least, as long as we feed pigs and cows on waste products and leftovers we either cannot or do not want to eat ourselves, such as waste from the food industry, discarded food or grass from uncultivable land. This unusable food waste is then converted into protein-rich meat and milk.

VEGETARIAN

‘I am not say that you shouldn’t be vegetarian or vegan,’ says Van Zanten. ‘But if the whole world did so, then in nutritional terms you wouldn’t make use of waste products, leftovers and grass. That is bad news in terms of efficient land use or of food security. Because it means more plant protein is needed and therefore more farmland than would be used for a moderate intake of animal proteins based on waste flows.’

But what about the environment? Is it not better, for example, to use those waste products to generate bio-energy? ‘No,’ says Van Zanten. ‘Solar and wind energy are good options; we are better off using the waste products to feed cows and pigs. That is the most efficient way to use farmland.’ This is an important point, says the PhD graduate, in view of the fast-growing world population and to prevent the last wildernesses on earth from being tamed for food production.

In her opinion article Van Zanten calculates how much animal protein is available per person worldwide if the livestock is fed on waste products. She starts with a vegan diet which meets our basic needs. In producing this diet, the food industry ends up with waste products such as soya meal or wheat bran, products we do not eat but which animals can thrive on.

On top of that, a lot of food gets thrown out, sometimes because it is past its use-by date. ‘The FAO assumes that one third of our food ends up in the waste bin. That is an extremely large proportion and we are trying to reduce it, of course. So I based my calculations on 10 percent,’ says Van Zanten.

Van Zanten calculated how many pigs you can raise on that 10 percent as well as waste products in the industry, and it works out at two thirds of a pig per year per person, about 14 grams of protein per day. ‘Without using any farmland for livestock feed.’

There are a few hurdles to be cleared, however, before this vision becomes a reality. Leftover food will have to be collected, for instance. There is no system for that yet. What is more, feeding leftover food to pigs is currently prohibited in Europe for food safety reasons such as the danger of transmitting diseases.

On top of the 14 grams of protein in the form of pork, meat-eaters would be able to obtain three grams of protein from beef. This would be the protein produced by cows grazing on marginal grasslands: grasslands that are so wet, dry or remote that they are not commercially viable for arable farming. Such land can produce more animal protein per hectare than plant protein. An example in the Netherlands would be the soggy meadows in peaty areas.

‘At present cows also graze on land that is suitable for arable production,’ adds Van Zanten. ‘If you include that in the calculations, the three grams increase to seven grams of beef protein. At the moment we do not need those grasslands for food production, so why not let the cows enjoy grazing it? If land becomes really scarce and the world population grows, it might come under pressure. Then you might lose those four extra grams again because it would be more efficient to grow plant protein on that land. The important point is that by making optimal use of waste products, the livestock sector can produce a considerable amount of protein without creating any feed-food competition for land.’

FOLLOW-UP

The figures may sound very precise – 21 grams of animal protein, 14 from pigs and 7 from cows, per head of the human population – but they represent a provisional estimate. Van Zanten included two animal species in her calculation, the omnivorous pig and the cow, as a ruminant. In the follow-up study that is now running, she is going to go into more depth and include chickens, sheep, goats and fish, as well as zooming in on differences between livestock breeds in how they process feed. Moreover, explains Van Zanten, the results of the calculations are significantly influenced by choices made by the food industry. Her calculations were based, for instance, on soya meal, a by-product of soya oil produc-

‘We don’t all have to become vegan to save the planet’

tion which pigs thrive on. They don’t do so well, however, on the waste from the manufacture of sunflower oil or the ever more popular rape seed oil. ‘Those waste products are of low value. They are not much use to pigs. On the other hand, new technology – such as fungal treatments to make straw more digestible – can produce more animal protein.’

REACHING LIMITS

The provisional total yield, 21 grams of protein per person per day – the equivalent of a small meatball – is one third less than the current average worldwide intake of 32 grams per person. ‘In the Netherlands we’re on 71 grams of animal protein per person, so that needs to go down a lot.’

If we do indeed start eating far fewer animal products, will we then be able to cope with the growth in the world

population with the limited amount of farmland we’ll have at our disposal? ‘Estimates suggest that with 9.7 billion people on earth in 2050, there will be 0.16 hectares of farmland per person. The current heavily meat-based western diet requires about 0.20 hectares per person, while a healthy vegan diet requires 0.14 hectares per person.’ So there would seem to be enough farmland for either a vegan diet or the Van Zanten diet with its modest quantities of meat. ‘But we don’t use land for food alone; we also grow medicinal plants, cotton and energy crops. How much that amounts to, I don’t know. And how important are those crops to us? Will there be alternatives to them? It is not easy to say when we shall reach the limits to the available farmland. I would have liked to calculate that.’ ■

wur.eu/foodsecurity

MEAT UNDER PRESSURE

In January this year the Dutch National Institute for Public Health and the Environment (RIVM) made an insistent call for a reduction in the consumption of meat, cheese and milk. This is the only way we can achieve our climate targets, writes the institute in a report called *What’s on our plate*. ‘Meat has a healthy image in many people’s minds and the negative environmental impact is underestimated,’ says the report. Livestock farming is responsible for 15 percent of the emissions of greenhouse gases. RIVM suggested an extra levy on unhealthy and relatively unsustainable foods, including soft drinks and meat. This would reduce both chronic diseases and environmental costs. At the annual Agro debate hosted by Wageningen Economic Research, also in January, the Wageningen economist Hans van Meijl argued for similar measures. According to Van Meijl, the government needs to make people see and feel the ecological costs of

our current food production system. This can be done by means of a CO2 tax and meat and sugar levies.

Martin Scholten, director of the Animal Sciences Group in Wageningen, also argued for a change of course, in an opinion piece in the newspaper *Het Financieele Dagblad*. He predicts that greenhouse gas emissions can be halved by ‘dealing with the animals, their feed and their manure’ in smarter ways. He does not support the idea of a meat levy, he told the Dutch television news programme RTL Nieuws. Research in Denmark has shown that it doesn’t work, says Scholten. And a tax of that kind only swells the government’s coffers. The costs of making products more sustainable should be reflected in their prices. ‘That would make a meat tax superfluous and would ensure that the profits return to where they can be used for sustainable investments.’

A photograph of an older man wearing a grey bucket hat, glasses, and a light-colored striped button-down shirt. He is looking down and slightly to his left, with a serious expression. He is standing in a forest with many trees and green foliage in the background. A black strap is visible across his chest.

Science as colle

Increasingly, members of the public are doing their bit towards scientific research by sending in observations or carrying out small-scale studies. Fun to do, but for policymakers this 'citizen science' is also a way of democratizing research and gearing it more to society's problems. It is hard to get funding for it, though.

TEXT ARNO VAN 'T HOOG PHOTO HH/MARCEL VAN DEN BERGH

A group of people are standing in a grassy forest clearing. In the foreground, a white tarp is spread out on the ground. A person's hand is visible on the left, holding a string or rope. The text "ctive action" is overlaid in large white letters.

ctive action

‘We didn’t have the resources to send out researchers’

In the past few years webshops and supermarkets have started selling cheap camera traps equipped with a movement sensor so they automatically take a series of photos when something walks in front of the lens. These are simple variants of the instruments with which Patrick Jansen of the Wageningen Resource Ecology chair group does research, both in the tropics and in Europe, on populations of shy animals which are difficult to observe.

‘People buy one of those cameras for fun. They think it’s a nice gadget, but after a while it ends up in the cupboard,’ says Jansen. Imagine if you could get those people enthusiastic about setting up the camera in their gardens, or lending it to their neighbour, and sending in the pictures they get. ‘Then you could get a better idea of how mammals use the urban environment, ranging from big gardens on the edge of the city to tiny green patches in the city centre. All the evidence suggests that many woodland animals are gradually shifting towards the cities, but we don’t actually know exactly how that is progressing.’

Jansen has been able to try out a citizen science project of this kind together with the Mammal Association, in a project called Hopping Cameras. In this project, cameras are moved from garden to garden for a year in cities including Amersfoort, Deventer and Nijmegen. A volunteer installs them 20 centimetres above the ground, half a metre away from a tin of sardines with holes in it, from which fish oil leaks. The idea is that most mammals – mice, rats, hedgehogs, martens or cats – find this smell interesting enough to be worth checking out.

STANDARDIZATION

The setup with the tin of sardines solves a scientific problem: standardization. ‘Some people have a high-tech camera trap with high resolution, and others have a toy. In order to overcome that difference in sensitivity, you need to lure the animals as close to the lens as possible so that even the least sensitive camera picks them up,’ says Jansen. ‘The disadvantage of using bait is that we can’t then conclude anything about numbers, because the same animal might

come snuffling around three times in one night. Domestic cats are an exception because you can tell them apart by their markings.’

If you want to involve a broad segment of the public, you have to make compromises, says Jansen. ‘Above all, the system needs to be fool-proof. With professional researchers we would go for a different setup in a project using camera traps.’ But some degree of compromise on data quality is not disastrous, says Jansen, because there is something to be said for quantity too. Researchers are expensive and they cannot be everywhere at the same time, whereas you need a large number of observations to get a reliable picture of the distribution of mammals. Besides, there are other good reasons for doing a citizen science project. ‘The Mammal Association wants to get people enthusiastic and aware that their garden can be a little habitat for wild animals. For our students too, it is very handy that they can get some experience with citizen science.’

If a lot of people take part, thousands of



TICK RADAR

Purpose Up-to-date information about ticks and Lyme’s disease; offers a ten-day forecast on tick activity levels.

Name Arnold van Vliet
Year Since 2012



ALLERGY RADAR

Purpose Overview of symptoms being experienced by hay fever sufferers. The Pollen Planner provides info on the expected pollen count.

Name Arnold van Vliet
Year Since 2009



GROWAPP

Purpose See for yourself how nature reacts to a warmer climate. Makes it possible to compare photos from different seasons.

Name Arnold van Vliet
Year Since 2017

images come in. Jansen also wants to enable the public to help with identifying the animals in the photos through Agouti, a platform he built himself. This works in a similar way to the successful website Zoonoverse. There, thousands of volunteers receive a short training course and then help classify millions of photos from hundreds of camera traps on the Serengeti plains in Tanzania, for instance, or in the rain forest in Peru. To avoid mistakes, several people classify the same photo. Jansen hopes to launch his camera trap project before the summer. The only thing lacking is funding for the software development and supervision once the project has started. A lot of automatization will be needed for gathering and storing the research data: where and when was the photo taken, and what does the garden look like? 'Our photo processing system was made for researchers and I don't think it is user-friendly enough yet. Nor do we have a good helpdesk yet for questions and problems. Involving the public like this will only succeed if everything works properly from the start.'

INCREASINGLY EFFICIENT

Citizen science has the image of being casual and amateurish. Primarily, something you do for fun. But mobile technology and the internet are making communication between the general public and scientists increasingly efficient and international. Anyone can submit online observations or data, carry out research tasks or make their computers available for calculations. There are now too many projects, both large and small, to have an overview. They range from garden bird counts through air quality measurements and calculations of protein structures, to classifying galaxies or molecular structures of cells. For a few years now, citizen science has also been attracting serious attention from



WILDCAMERA

Purpose Doing research with camera traps to monitor how wild mammals use gardens.

Name Patrick Jansen

Year Since 2016

European policymakers. They see this approach as offering ways of drawing the wider community into the pursuit of science, spreading knowledge and making science more open and democratic. In this respect, citizen science is very relevant to the recent debate about open access to data and publications, and the influence of society on the scientific agenda.

In 2014, the European Commission published its *White Paper on Citizen Science*. The paper waxes lyrical about the opportunities and possibilities: 'In citizen science, a broad network of people collaborate. Participants provide experimental data and facilities for researchers, raise new questions and co-create a new scientific culture.' Seen like this, citizen science goes far beyond public assistance for the researcher. The document recommends targeted financing of citizen science projects, and proposes making this form of science a fixed component of large EU research projects, such as the 80-billion-euro Horizon 2020 programme for innovative projects. There are signs of growing enthusiasm for the concept elsewhere too. The United States has already taken it one step further: the National Science Foundation has recently started awarding

grants specifically for citizen science projects.

MINIMAL RESOURCES

The new appreciation and professionalization of citizen science would seem beneficial to researchers who have been working in this field for years now with minimal resources, as funding is still very hard to find, as Arnold van Vliet knows from experience. 'You have to be constantly asking yourself what your business models are,' says the Wageningen citizen science specialist. In 2001, Van Vliet started up *Natuurkalender.nl*: a phenological observation programme which registers recurring natural phenomena such as flowering, leaf fall, bird migration and the return of insects. Van Vliet knows how to make good use of this general knowledge. One example is the website *tekenradar.nl* which he started together with the National Institute for Public Health and Environment RIVM. Tick bites can be reported on this site, which provides researchers with information about the risk of Lyme's disease, as well as making it possible to warn people when ticks become active again. Van Vliet's ambitions go beyond involving the public as data providers. ➤

‘You know that you’ll get some unusable observations’

For him, citizen science is a combination of observation, analysis and the translation into applications, plus all the communication that entails. ‘Why get worked up about a plant that is flowering a month earlier because of climate change? Well, what about hay fever, for instance? If birches and grasses flower earlier, 10 to 15 percent of the human population are affected.’

The accumulated knowledge about weather conditions and flowering times and the reports of all sorts of allergy symptoms were used to build the ‘pollen planner’, which, with visuals like those used on weather forecasting websites, warns hay fever patients weeks ahead that they can expect symptoms. ‘Actually, we’d like to go a step further by informing the relevant people – patients, doctors and pharmacists – so that sufferers can start taking medicines before symptoms appear,’ says Van Vliet.

For Van Vliet, citizen science means making the best of the time and money available, because science funding bodies are dubious about this unconventional approach, which

does not focus exclusively on publications. Moreover, the monitoring of flowering times, allergy symptoms, tick bites and mosquito bites is geared to the long term. ‘That is very tricky for project financiers. So I am constantly wondering how we can generate a reliable income. How do we maintain the networks which collect data? Because it doesn’t all come free.’

COMMON ASSUMPTION

That is a common assumption about citizen science, says Van Vliet: it’s nice and cheap. ‘That is absolutely not the case. The technical development of apps and websites, the hours of analysis and interaction with the public cost money. Building up a community is time-consuming. You need to reach people and motivate them. Will you join in? Will you stay on board? One of the ways we do it is through the stories we tell on Nature Today, showing how data provided by the public are used. That goes on 365 days a year, literally.’

The media play a key role in citizen science.

Without attention you don’t get participants, as Bastiaan Meerburg can tell you. He is head of the Livestock & Environment department and an expert in rodent pests at Wageningen University & Research. In the summer of 2012, Meerburg created a bit of media hype around a project which asked people to send in rat droppings. The aim was to use DNA analysis to get the measure of resistance to rat poison.

‘We wanted observations from all over the country, but we didn’t have the resources to send researchers out to collect droppings. That makes this an interesting alternative, and we certainly got a good picture. Some of the droppings were not usable because they had crumbled, and some were mouse or hedgehog droppings. You get that with citizen science: you know that you’ll get some unusable observations.’

The results of the DNA analysis were remarkable, says Meerburg. ‘One quarter of the rats in the Netherlands were resistant to well-known types of poison. That is quite a lot.’ This knowledge has contributed to



PHOTO JEROEN JUMIELET

SPLASH COUNTER

Purpose Counting the number of insects splattered on number plates to get an idea of changes in insect density.

Name Arnold van Vliet
Year 2011



RAT DROPPINGS

Purpose Sending in droppings to find out where brown rats are resistant to rat poison

Name Bastiaan Meerburg
Year 2012/2013



EVOCA

Purpose Sharing information about diseases and pests in order to solve problems in Africa.

Name Cees Leeuwis
Year Since 2016

more targeted pest control methods, with pest controllers first checking which poison is effective.

An important lesson, says Meerburg, is that sharing results is good for the participation levels. 'It gives people the feeling that something really is done with what they send in. We asked participants to give their postcode; then they could look at the results on the website within a few days. Commitment increased tremendously, and neighbours started getting each other interested. Asking each other: what's living in your garden?' The researchers chose a strategic moment: around the time of the Olympic Games, in a period when there wasn't much other news. Meerburg: 'Because of that the subject really caught on. I was interviewed for endless radio shows and newspapers. That was good for the research and led to us getting a lot of material sent in. Somebody even sent in a dead rat; they are still talking about that in the post room.'

FIGHTING MALARIA

The digital revolution and the availability of telephones could mean citizen science could be used to address serious problems related to diseases and food security in Africa. Finding out whether that can work in practice is one of the aims of the EVOCA project run by Cees Leeuwis, professor of Knowledge, Technology and Innovation at Wageningen University & Research. In the next few years, 12 PhD candidates will be studying whether mobile information systems can be built using elements from citizen science for purposes such as setting up regional collaboration among farmers. Leeuwis: 'For us, citizen science is not an end in itself. The main priority is the problems, such as diseases and pests in potato farming, water shortages, or fighting malaria. Maybe we could use some citizen science-like elements in addressing these problems but we are nowhere near ready to develop

specific ways of using it, or apps. You shouldn't dream up solutions before the problem is totally clear at the local level. That is what the PhD candidates are researching in the field at the moment.' ICT and telecommunications offer new scope for connecting people, says Leeuwis. In countries such as Tanzania, Kenya and Ethiopia, most people have access to a mobile phone by now. 'That makes it possible to collect data in a decentralized fashion, and to link it to scientific models. Farmers might send in observations on their mobile phones, giving you a picture of the incidence of diseases and plagues in an area. In turn, that provides information about how farmers could respond to the situation.' It is not for nothing that the terms observation and action feature in the acronym EVOCA: Environmental Virtual Observatories for Connective Action.

IN TOUCH

For Leeuwis, citizen science is primarily a means of mobilizing people and stimulating collective decision-making. 'Diseases and pests are collective problems. A farmer cannot fight potato blight alone; you need a community of farmers for that. It is precisely new communication technology that can put people in touch with each other and pro-



MOSQUITO RADAR

Purpose National monitoring network for nuisance caused by mosquitoes. Offers a five-day forecast of mosquito activity, in collaboration with weather forecast site *Buienradar*.

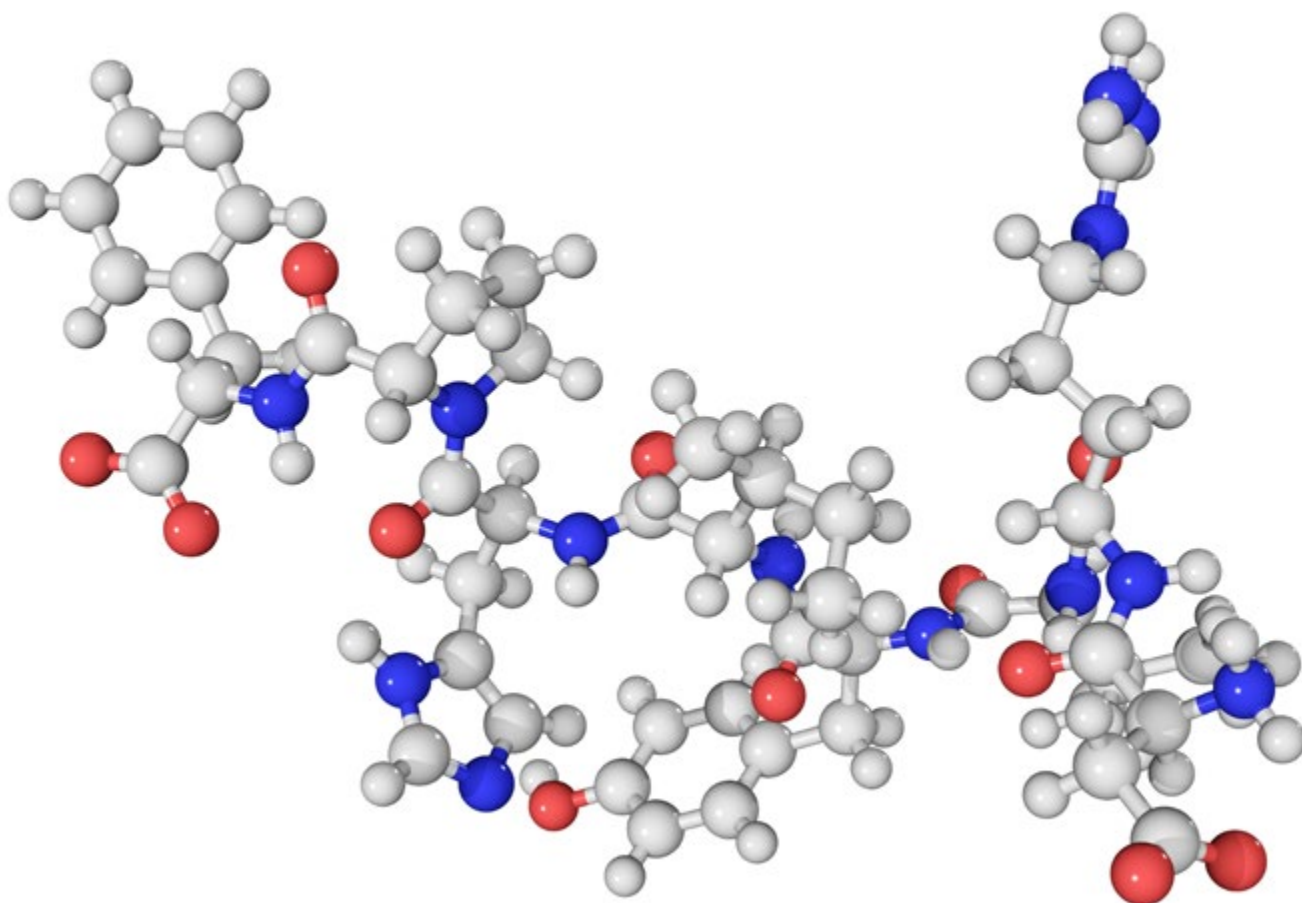
Name Arnold van Vliet

Year Since 2016

In 2017 *muggenradar.nl* joined the international Global Mosquito Alert

mote collective action. So we are not interested in citizen science as a matter of collecting data and giving individual advice; we want to see if it can help a community deal with diseases more effectively.' Citizen science originally grew out of the idea that citizens could help scientists collect data, says Leeuwis. 'Subsequently, projects have grown up in which the citizen becomes a bit of a scientist, with the focus still on the science. We take it a step further, by focussing on an actual problem. What we do is very action-oriented. Science plays a role, but the pursuit of science is no longer the main objective. That is a bit different to the idea with which citizen science was started.' ■

www.wur.eu/citizenscience



Protein to combat high blood pressure

Wageningen researchers have turned protein from eggs into a product that lowers blood pressure. That is an interesting option for people with health problems who would then not necessarily have to take medication. Researchers in Maastricht are currently looking at whether it is suitable as a nutritional supplement.

TEXT RENÉ RECTOR ILLUSTRATION ANP

Medical biologist Aart van Amerongen has been working for years on a product to reduce high blood pressure, one of the key risk factors in cardiovascular diseases. That would normally be something for university hospitals and pharmaceutical companies, but Van Amerongen, from Wageningen Food & Biobased Research, is focusing not on the development of conventional blood pressure control medication but on products based on the protein in chicken eggs.

Van Amerongen's quest is part of the research by the Bioactive Food & Feed Ingredients group into bioactive substances – natural substances that have an effect on processes in the body and could therefore potentially be used as nutritional supplements.

One such category of natural substances is peptides, the bonding units that form proteins. Peptides play a role in biochemical processes, for example when they block enzymes. The idea is that because of their natural origins, they are likely to be suitable as nutritional supplements to inhibit overactive enzymes and reduce health problems.

BLOOD PRESSURE TOO LOW

One of the key enzymes involved in controlling blood pressure is angiotensin converting enzyme (ACE). 'Some antihypertensive medicines target ACE. Your blood vessels then don't constrict so much and your blood pressure falls,' explains Van Amerongen. But antihypertensives can have side effects: if you take too many, your blood pressure can fall too much, causing dizziness and headaches. 'We knew from the literature that peptides don't have that problem. If you consume more peptides than needed to inhibit ACE, your body breaks them down into amino acids, building blocks for your body.' A mixture of peptides capable of reducing blood pressure could therefore be a good low-risk alternative to conventional high blood pressure medicines.

The researchers chose chicken eggs as the source for the peptides. Van Amerongen: 'You are looking for a basic material that is cheap and plentiful. We chose chicken eggs partly because these eggs contain proteins

that are suitable candidates, partly because chicken-egg proteins are available in pure form and partly because a friendly poultry farmer (who went on to found the biotech company Newtricious) was prepared to start up a joint project.'

EXPERIMENTING

The protein lysozyme, which can be extracted from chicken-egg protein and purified, turned out to be the ideal candidate to experiment with; it can be chopped up into peptides that are known to have an effect on ACE. Van Amerongen and his team experimented with all kinds of enzymes that break lysozyme down into peptides and looked to see whether the peptide mixtures had any effect in an ACE inhibition test. But that did not mean they were finished. Our digestive system is designed to break down peptides. If a pill or nutritional supplement is stuffed full of peptides, there is a big chance that they would be broken down before they could do their good work in the blood or vessel walls containing the enzymes that have to be inhibited. So Van Amerongen and his group exposed the peptide mixtures to models of the oral cavity, stomach and intestines until they found a mixture that was capable of

surviving the journey through the digestive organs.

ON THE MARKET

To demonstrate that NWT-03 (as the peptide mixture is known) works in humans, it is now being tested as a nutritional supplement at the university hospital in Maastricht in accordance with European Food and Safety Authority protocols. 'If that is successful, NWT-03 can probably be put on the market as a preventive product for people with mildly elevated blood pressure, probably mainly to improve the elasticity of the blood vessels,' says Van Amerongen. 'It has a mild effect, but its big advantage compared to conventional blood pressure medicines such as ACE inhibitors is that it has no side effects, according to the literature. That's why I expect NWT-03 to be available over the counter.'

NWT-03 also turns out to have an inhibiting effect on the enzyme DPP-4, which is involved in the delivery of insulin in the blood. That means NWT-03 could well help tackle type 2 diabetes. This is currently being investigated in collaboration with the university hospital in Groningen. ■

www.wur.eu/bioactive-ingredients

EGGS AND FISH

Eggs are a source of bioactive substances. In addition to the peptide mixture NWT-03, which is being investigated as a possible product for reducing blood pressure, Wageningen is also working on MacuView, a product based on lutein from egg yolks that was developed by Maastricht university hospital to help treat the eye disease macular degeneration. Other egg components are also being studied for their bioactivity. Van Amerongen: 'We also have a project to turn the egg protein ovomucin into a bioactive spray to deal with dry mouth syndrome. It could be used by Sjögren's syndrome patients, people taking multiple medicines or people in intensive care.'

Undersized fish are also being investigated as a possible source of bioactive substances. 'We have studied how we can increase revenues from the mandatory bycatch,' says Jeroen Kals, researcher at Wageningen Marine Research. Useful components can be extracted, explains Kals. 'Mackerel and herring for example are suitable sources of fats and peptides. Fish that live on the seabed such as sole and plaice contain many high-quality proteins that can be used for different purposes than peptides.' But it will take a while before the landing-obligation fish get used for anything other than animal feed. 'It's still a tricky issue politically: if you increase the market value of the bycatch, it will eventually no longer be bycatch – it will become the main catch,' explains Kals.

Mixed cropping works better

Large fields of one crop: the ideal in arable farming. But growing a variety of crops in strips or rows leads to fewer diseases and pests, as well as a more attractive landscape. 'When I first heard that farmers were getting higher yields with mixed cropping, I didn't believe a word of it.'

TEXT MARION DE BOO **PHOTOS** GUY AKKERMANS **INFOGRAPHIC** JORRIS VERBOON

In the crop farming of the future, noisy, heavy tractors will make way for light, clean driverless transporters with which you can position all sorts of little field robots to do the harrowing, sowing, planting or harvesting. They run on solar power or local biofuel, propelling themselves on four swivelling castors along rows between the beds, guided in part by GPS signals. In the spring you can use them to transport sowing seed, fertilizer or plant material, and in the autumn to transport the harvest. The little carts the robots are on are transported from the shed to the field and back on a carrier on rails. Storage, loading and unloading, sowing, harvesting and other jobs are all done completely autonomously. 'These little machines have time on their

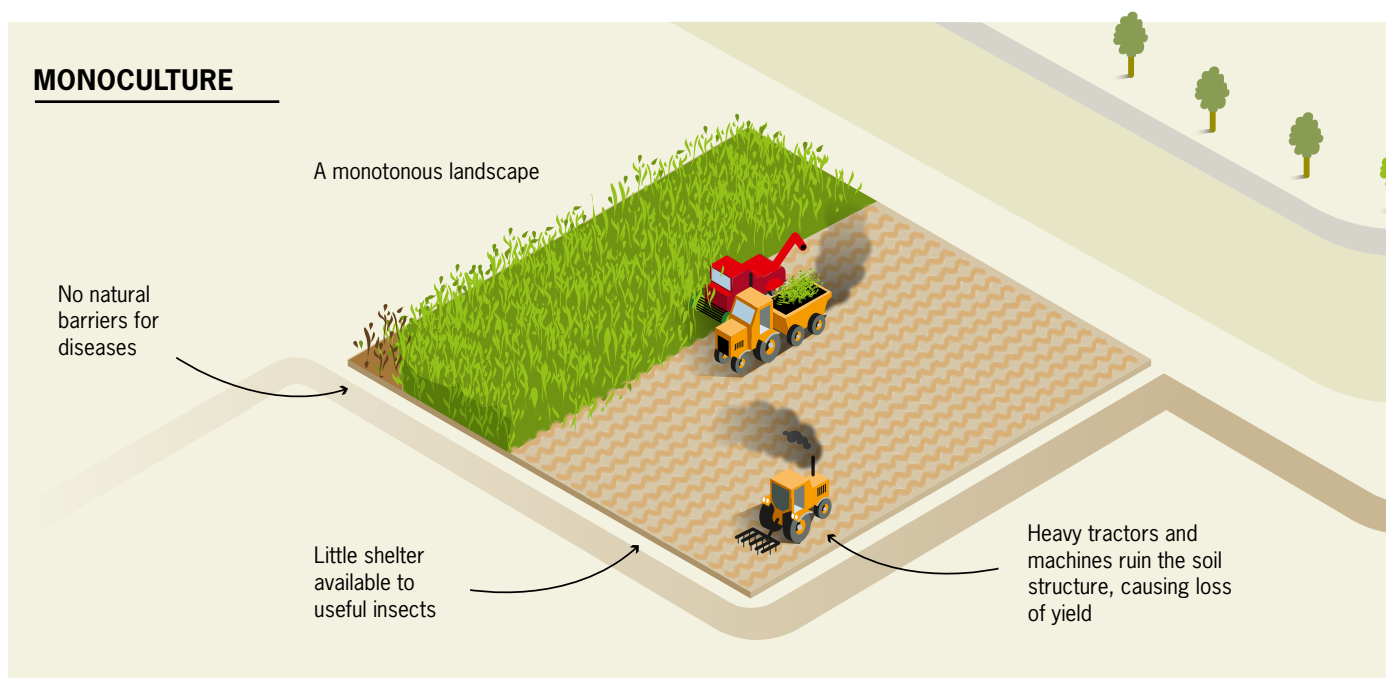
side,' says mechanical engineer Wim Steverink from Tollebeek in the Flevo polder. 'They work day and night, so they can get a lot of work done in 24 hours, small as they are.'

But things are not that far yet. So far on Steverink's website, this Lasting Fields concept only appears in an animation film, but he has already registered his design as a brand name. Last year Lasting Fields came in for an encouragement prize from the Innovation Fund. Steverink sees all sorts of advantages. 'Instead of large fields of monocultures you will soon be able to grow crops in narrower strips. Mixed cropping leads to a reduction in diseases and pests, higher yields and a more attractive landscape. What is more, there is >



‘In strips we find 16 natural enemies per 5 square metres; in a monoculture, 4’

MONOCULTURE



less pressure on the soil with light machinery, causing less damage to the structure. And it is energy-saving. On average it saves 200 litres of diesel oil per hectare per year.'

Most of the machinery parts in Lasting Fields are components Steverink has previous experience of building. 'The technology is no problem, I reckon. The main issue will be to organize the automatization properly and take lots of safety precautions. There could be children playing, or a dog could get into the field, for instance. But if we can drive on the motorway in driverless cars in 10 or 15 years' time, we can do this too!'

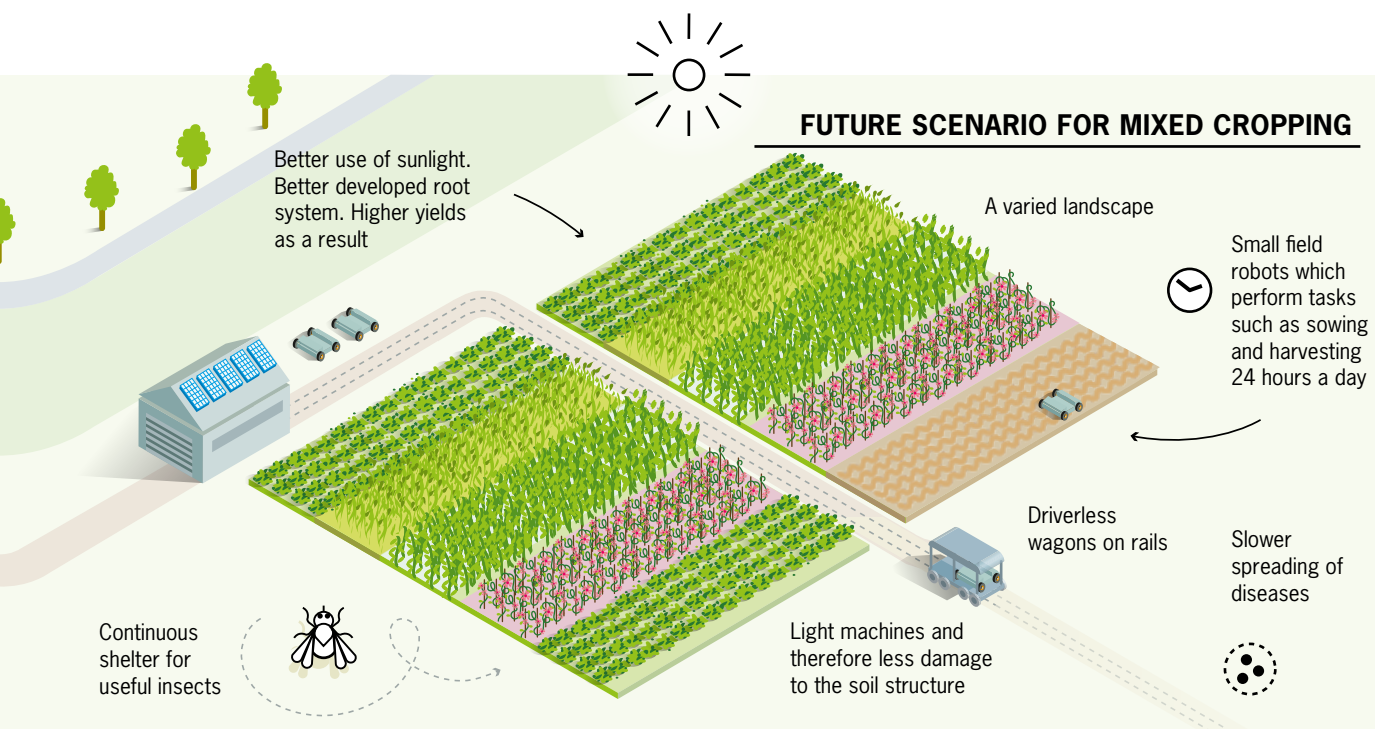
As a first step, Steverink is now working on a special plough, which follows set tracks through the fields. He is doing this within the SMARAGD research programme for smart and sustainable technology and robotization in crop farming. In this public-private collaborative project in the Agrifood top sector, Wageningen Plant Research is working with agriculture and horticulture organization LTO Noord and about 15 private partners, including Bayer, SuikerUnie and Rabobank.

BUZZING BEES

With small-scale autonomous machines, the crop farming of the future will look quite different. Monotonous monocultures will make way for colourful mixed cropping. Dirk van Apeldoorn of the Farming Systems Ecology chair group is experimenting with this on the Droevendaal organic experimental and teaching

farm in Wageningen. Thanks to the lovely warm spring the winter oilseed rape is in full bloom and the bees and hoverflies are buzzing around us cheerfully. 'This place is full of partridges and pheasants,' says Van Apeldoorn with satisfaction. He crouches down among the plants. Little spiders with big black jaws run over his hands. 'It is crawling with soil life here. Beetles, woodlice, you name it... the more biodiversity, the more stable the ecosystem and the fewer diseases and pests you get. In winter the soil fauna all hide in the ground, in the winter oilseed rape, the clover or in strips planted with 'green manure' (crops grown to be ploughed in). In the growing season a specially developed strip of flowers provides food and shelter for ichneumon wasps, hoverflies and other useful natural enemies. In wheat grown in strips we find 16 natural enemies per five square metres; in a monoculture of wheat, only four.' One of Van Apeldoorn's findings was that there are always fewer cases of the potato blight *Phytophthora* in strip cropping than in a large field. 'Year in, year out, for six whole years. Healthy plants can go on growing longer and produce more tubers.'

This spring, the organic farm ERF and several Wageningen research groups started an experiment on 45 hectares. You can see it along the A6 motorway near the Almere Buiten junction. There are no vast fields of potatoes or beets stretching to the horizon here, but a colourful variety of many different crops next to each other. Van Apeldoorn: 'The company wants to get away from the old-fashioned idea of organic farming with



your hands tied – with any spraying or intervention no go – to an active approach geared to working with nature in an efficient way. And strip cropping is an interesting option.’

Besides ERF, the organic crop farm De Graanrepubliek in North Groningen is trying strip cropping this season. Four more organic farms will follow suit next year. Van Apeldoorn: ‘We have got the go-ahead for an EU project (DiverImpact) in which we are going to set up and monitor a practice group. We are starting with 60 farmers who expressed interest in working with this at the organic farming fair Biobeurs in February.’

INTERMINGLED PLANTING

For thousands of years, farmers intermingled different crops in one field. And small farmers still do so in Africa, India and China, where labour is cheap. In western agriculture, however, widespread use of mechanization, artificial fertilizer and pesticides since the Second World War has led to upscaling and monoculture. ‘So we are coming up against our limits,’

says Wijnand Sukkel, a researcher in sustainable agriculture at Wageningen Plant Research. ‘In a monoculture, diseases and pests spread at lightning speed. If you grow five hectares of potatoes all together, a potato blight such as *Phytophthora* goes through the field like wildfire, with nothing to stop it. And once the potatoes are harvested, all you are left with is a bare desert. All the useful insects such as spiders and beetles, which live on the ground and eat destructive aphids, die because they cannot find food or shelter on the bare field.’

In mixed cropping, when one crop is harvested, useful soil dwellers can take refuge in the other crop and then in strips with green manure crops, so there is always somewhere to take refuge. ‘They very soon find their way to them. A ground beetle easily covers 10 metres a day and if it’s hungry, 15,’ says Sukkel. ‘Mixed cropping makes crops more resilient. For organic farmers, who have far fewer options for combatting diseases and pests, the need is greater. But even in conventional agriculture, the need to grow healthy crops is increasing, because half of all the pesticides currently in use are due to be taken out of circulation. What is more, everyone agrees that the trend to use ever heavier machinery has gone quite far enough. The machines of the future will be lighter, smaller, and do less damage to the soil structure.’

Smart combinations of crops are important. The carrot fly can’t stand the smell of onions, and the onion fly doesn’t like the smell of carrots. The pea aphid stops ➤

‘A lot of young farmers are open to innovation’

in its tracks as soon as it encounters a wheat plant, while the wheat aphid is not at all interested in peas. Finding the best combinations of crops is a science in itself.

SET TRACKS

The most practical option for the time being, Sukkel argues, is strips three to six metres wide, so that the farmer can work with a standard tractor with a 'working width' of three metres. 'Nowadays every farmer has a tractor with GPS, with which some farmers already follow set trajectories. That makes it less of a step to sow and tend the crop in strips. Heavy machinery spoils the soil structure. Years of soil compaction on sandy soils in the Netherlands is already causing harvest losses of 10 percent. With strip cropping and a system of fixed tracks, at least the soil on the strips between the tracks will not be further compacted.'

The ground is not completely ploughed over but lightly tilled to a shallow depth, to minimize disturbance to the soil life. A healthy soil life helps make it possible to nip a lot of diseases and pests in the bud. Sukkel: 'If you turn over the soil to a depth of 30 centimetres every year, you bury the soil life.'

Instead of planting in strips you could also alternate crops in each single row, or even intermingle them at random. 'Many small farmers in developing countries grow their crops in rows,' explains researcher Tjeerd-Jan Stomph of the Centre for Crop Systems Analysis at Wageningen University & Research. 'They still weed and harvest everything by hand. In the mechanized agriculture of the west you only see mixed cropping with crops that are harvested mechanically at the same time, such as a mix of clover and grass, grown as fodder for cows.'

This kind of mix has several advantages. When different species of plant grow together, they influence each other. 'Interactions come about in the capturing of light and the uptake of water and nutrients,' says Stomph's colleague Wopke van der Werf. He supervises five Chinese PhD candidates. Mixed cropping is very common in north-western China. Van der Werf: 'When I first heard people saying that farmers got higher yields than with monocultures, I didn't believe a word of it. But it turns out to be true.'

Recent PhD graduate Fang Gou was the first to conduct a field experiment under Dutch conditions. For two years in Wageningen, she grew a crop combination of six rows of summer wheat interspersed with two rows of

'In a monoculture a disease spreads through a field like wildfire'

maize. The wheat was sown in March and harvested in June or July. The maize was only planted in April or May and was harvested in September or October. The wheat plants around the edges of the field get off to a particularly flying start because they get more sunlight and can take root better. The young maize plants are somewhat overshadowed by the wheat at first but they catch up once the wheat has been harvested. 'The sunlight doesn't just reach them from above but from the sides as well,' says Van der Werf. 'And they also form a much better root system, with which they take up more water and nutrients. The roots develop fast underneath the wheat. And the wheat plants, which sense this competition, start forming better roots of their own in turn.' In a year with a nice warm late summer with plenty of rain, 100 hectares of maize and wheat can produce as much as 120 hectares with monocultures of the crops grown separately.

VIALE

The biggest hindrance to introducing intensive mixed cropping, in which crops might be alternated every second row, is the current mechanization system, which is geared to monocultures. Low labour costs are crucial in arable farming and robots will therefore need to provide a way of making mixed cropping profitable. And that robotization is now getting off the ground. There is a four-armed robot which looks at individual plants through a small camera and sprays a tiny amount of herbicide on them if it spots a weed. This spray robot costs about 50,000 euros, whereas a conventional driverless spraying machine costs at least five times that much – to say nothing of the big savings in pesticides and labour costs. The second difficulty in introducing intensive mixed cropping concerns the varieties available. For the past 100 years, modern varieties have been developed to thrive in monocultures, with heavy

nitrogen fertilization and ploughed soil, and they only perform well under those conditions. For mixed cropping, the question arises of which root types are most compatible. Do you need deep root systems or shallow ones? Combinations that include fruit trees or other trees might be of interest too.

Experiments with strip cultivation have been going on at Wageningen Plant Research in Lelystad since 2012. No robots are needed for this. You can work a three metre-wide strip with an ordinary tractor. In the first instance, they cultivated six strips with six different crops, but it has now become clear that a less complicated scheme can work just as well. The study is looking at the best order to grow the crops in. 'We don't want crops getting infected with pests and diseases coming from harvest waste left behind on the land,' says Sukkel.

According to Sukkel, there is a lot of interest among farmers. 'A few years ago the farming population was aging but now a new generation of highly educated, ambitious young farmers has appeared on the scene. They are open to innovation. Needless to say, we first want to see whether it works and how it works. So as a first step we are trying to promote strip cultivation. It makes the landscape more attractive. It increases biodiversity and it will attract more birds. In hilly areas, strip cultivation has the added advantage that you get less erosion.'

TURNING A TRUCK

On the organic arable farm NZ27 near Zeewolde, the Monsma family is experimenting with strip cultivation for the third year running. 'We have a large farm of 275 hectares, two of which we have sown in strips,' says Douwe Monsma. 'In the first year we had strips of six metres wide, in the second year we made them 12 metres wide, and this year we are going for 24 metres. We grow the same crops as we have on the rest of the farm: potatoes, onions, sweetcorn, grass with clover, and carrots. The biggest issue was the mechanization. We have very large, wide tractors and that makes those narrow strips very impractical. You have to work on different crops at different times. And you've got to be able to turn around that heavy tractor, your potato harvester or your tipper truck. Inadvertently, you do a lot of damage when you do that. You have no room for manoeuvre, so you have to drive over the same bit over and over again. And that is exactly how you damage the soil.' The appropriate length and breadth of the tracks



Researchers in a trial field in Wageningen with a mixed crop of wheat and maize.

and crop strips is the subject of further research within the SMARAGD project.

The incidence of disease in Monsma's crops was not as good as hoped. This was probably because of the alder hedge surrounding the field, from which a lot of destructive insects crawled into the crops. Monsma; 'Our cabbage was really decimated by caterpillars and aphids; they descended on it from all directions.' But Monsma still stands by the principle. 'It is good to provide shelter for useful insects. A ground beetle is a real predator and cleans up caterpillars, thrips and aphids. You benefit a lot from that.' He expects that it will be more worthwhile to invest in advanced, smart, small machines for more intensively farmed crops such as outdoor vegetables than for cereal crops. 'I would quite like to have a few robots working autonomously here, instead of those heavy harvesters. But then you do have to be able to rely on them. In the US and Australia, driverless tractors are already in use which can do the harrowing and sowing autonomously. Who knows, that may come here too. Then we can all go off to the theatre and have fun.' ■

wur.eu/intercropping

UN YOUTH REPRESENTATIVES

Tackling climate change and raising awareness

Liset Meddens and Martijn Visser see climate change as the biggest threat to the planet and to humanity. Both went to Wageningen University in order to help change the world. Meddens was UN Youth Representative for Sustainable Development five years ago; Visser is in that role now.

TEXT ALEXANDRA BRANDERHORST PHOTOS HARMEN DE JONG

It's an incredibly impressive experience to be at the UN in New York. Just the famous building itself, to start with. And it is a world in itself: a big, complicated circus of meetings large and small,' says Liset Meddens. After graduating with an MSc in Development Studies in Wageningen, she was elected UN Youth Representative for Sustainable Development (see box) in April 2011. 'Attending the UN climate summits, on the other hand, was disillusioning. You come together to solve the climate problems, but you can't make yourself useful. Every word in a document is the subject of extensive lobbying,' says Meddens. At the climate summit in Durban at the end of 2011, the youth representatives got precisely one word into a text, and in 2012 in Rio de Janeiro they achieved a whole paragraph. 'When we managed that, the young people in the room went crazy.' Once the texts have been ratified, the ministers and state secretaries put in a brief appearance, says

Meddens. 'In that period I gained a great respect for civil servants. They do the real work.'

NOT MUCH DRIVE

In the Netherlands Meddens led the 'Rutte to Rio' campaign, in which young people wrote postcards explaining why they felt Premier Mark Rutte should attend the sustainability summit in Rio. 'We wanted to pass on the opinions of young people and at the same time make them more aware of sustainability issues and of the UN.'

Meddens had the chance to visit Rutte in his tower office in The Hague. 'He didn't know much about climate change. The government should do as little as possible, he said, and leave sustainability to the market. I was shocked. There is not enough drive at the UN and we needn't expect much from the Dutch government either.'

Meddens sees the position of Youth Representative as a nice springboard for ex-

ploring the world. 'You have lots of freedom to express your opinion. Many doors open for you and you have an enormous platform. I now have a big network in the sustainability world in the Netherlands.'

GUEST LECTURES

Martijn Visser had the same experience. Due to graduate soon from the Wageningen MSc programme in Forest and Nature Conservation, Visser started in October 2016 on the job Meddens did five years ago. Visser regularly speaks at organizations and events related to sustainability. He goes to ministries, holds conference calls with the UN's sustainable development department, and gives guest lectures at secondary schools on topics such as the circular economy, nutrition and sustainability. 'Some young people have very little confidence in science or politics. Sometimes I get pupils thinking. They take the discussion seriously and come up to talk to me after the class, or email me later



LISET MEDDENS

Age: 31

Studied: MSc Development Studies, 2008-2010

Works: UN Youth Representative for Sustainable Development, 2011-2013
National coordinator and director of *Stichting Fossielvrij NL*, the Dutch branch of the climate movement 350.org, since November 2013

about their final school project.' The way the Dutch youth representatives teach in schools is unique, says Visser. 'That doesn't happen in other countries. You can easily just stay inside the policy bubble and help write resolutions. But we have a lot of contact with other young people.'

Just after being elected, Visser was allowed to attend the climate summit in Marrakesh in November 2016. 'An Indian negotiator there said young people didn't belong at a climate summit. But half the world population is under 30 years of age and will face the consequences of climate change. Young

people have a fresh perspective and can broaden the UN's field of vision.'

After her term as youth representative, Meddens became a trainee at *Stichting Urgenda*, a foundation which promotes sustainability in the Netherlands. While she was growing up in the Limburg village of Haelen, she didn't take much interest in the environment and the world. She wanted to take a broad degree and opted for Environmental and Social Sciences at Utrecht. 'I was under the impression that all was well with the world. When I opened my first textbook I got the shock of my life at all the environ- ➤

'There is not enough drive at the UN'



MARTIJN VISSER

Age: 23

Studied: MSc Forest and Nature Conservation, 2011- present

Works: UN Youth Representative for Sustainable Development, since October 2016

‘Young people can broaden the UN’s field of vision’

mental problems and the gap between rich and poor. Some 80 percent of the earth’s resources are used by 20 percent of the world population.’ After her Bachelor’s and a stint of voluntary work on Madagascar, where she helped build a school and planted trees, Meddens embarked on the MSc in Development Studies at Wageningen in 2008. Both her father and her brother had studied in Wageningen before her. ‘I wanted to focus on the social and international aspects of sustainable development. Wageningen has a good reputation and the programme was far more relevant to the cur-

rent situation than the one at Utrecht.’ For her Master’s thesis, Meddens studied the influence of the nature organization Conservation International in the Central Suriname Nature Reserve. ‘Conservation International wanted to collaborate with a village near a tourist resort. I was afraid that such a big NGO would dominate the local people but the villagers were very happy with the cooperation. They were disappointed in the government, which they never saw in the interior.’ Back in the Netherlands, Meddens saw the vacancy for a UN Youth Representative on

YOUTH REPRESENTATIVES

UN youth representatives for three aspects of the organization's work: the General Assembly of the UN, UNESCO and Sustainable Development. They get young people in their own countries involved in the UN and bridge the gap between political organizations and youth. Every country has two youth representatives for each of these three areas. In the Netherlands, young people elect one new representative aged between 18 and 25 every year. In their first year the newcomers get an induction from the sitting representative. The position is voluntary and requires a minimum of 20 hours a week for two years.

www.facebook.com/unyouthdelegates

Facebook. 'I was terribly worried about climate change and poverty. I hoped to be able to address that at the global level.' One letter and a few assignments later, Meddens gave a presentation and was elected by members of the boards of youth organizations. The election is done differently nowadays. Martijn Visser and the candidate competing with him campaigned for ten days. Thanks to a Facebook page, posters and his canvassing at his old secondary school in Utrecht, on high streets and at a demonstration in Amsterdam, Visser got 76 percent of the votes. His campaign team was made up of ten housemates and friends. 'We really went all out.'

FOND OF NATURE

Towards the end of primary school, Visser wanted to be a marine biologist. He was born and bred in Bunnik, near Utrecht, in a family that is fond of nature and foreign travel. Visser came to Wageningen to do a degree in Biology in 2011. He lived in a Ceres student house in the high street and was an active member of Ceres, serving on a fulltime committee for the yearbook and playing a lot of hockey. He enjoyed his studies. 'Biology is a hobby degree, with all those practicals and field trips. What I learned about deforestation, pollution and overfishing gripped me. I wanted to do something about that.' Through a European student exchange programme he spent six months studying marine ecology at the University of Uppsala in Sweden. He then opted for the Wageningen Master's in Forest and Nature Conservation. 'That programme includes attention to the social aspects of nature

conservation, such as collaboration with the local population,' he says. He did the research for his thesis on Curacao in 2016, looking at the marine ecosystem after the oil disaster in the Gulf of Mexico. He went down to a depth of 30 metres in a submarine and used its robotic arms to collect sediment so as to study the creatures in it. 'It really is pitch dark and you have to lie in the submarine for four hours. The glass dome you look through distorts the picture. Big fish look a lot smaller. You feel a very long way from everything.'

Previously, Visser and some fellow students had thought up a project for restoring coral reefs in Thailand, and had raised 10,000 euros for it through crowdfunding. He is also a co-founder and board member of the REEFolution Foundation, which focuses on coral restoration along the Kenyan coast. Visser aims to graduate in the autumn; his UN work counts as an internship.

OPTIMISTIC

In future he would probably like to continue in marine ecology. 'Everyone plunders the sea and nobody sees what anyone else is doing. And yet I'm optimistic. At some point people no longer have any choice and then they go into action.' Visser wants to pass on his passion for nature and make people aware of the ways it is under threat. 'When biodiversity is lost, ecosystems become less stable. Climate change and the destruction of nature and the environment also cause greater inequality and more poverty. People in poor areas cannot prepare as well for the consequences of extreme weather conditions and flooding.'

Meddens still works intensively on climate

change issues. During her time at Urgenda, a report came out about the carbon bubble. Researchers calculated how much gas, coal and oil can still be burned if we are to stop global warming going above two degrees Celsius. The calculations show that the fossil fuel industry cannot exploit 80 percent of the reserves still in the ground. 'So investments in these fossil fuel companies will largely go to waste. That is a strong argument for persuading investors to withdraw their money from the fossil fuel industry,' explains Meddens.

DIRECTOR

In 2013 she became national coordinator, and now she is director of Fossielvrij NL, an offshoot of the international climate organization 350.org. Fossielvrij NL is building a broad civil society movement that calls on public bodies such as pension funds, universities and municipalities to stop investing in the fossil fuel industry. At first Meddens had the feeling she wasn't being taken seriously. That changed after her appearances on the television programmes *Tegenlicht* and *Nieuwsuur* in 2015. After talks with Fossielvrij NL and a petition, the ABP pension fund decided to reduce the CO₂ footprint of the 380 billion euros in assets it manages by 25 percent by 2020.

Meddens recently became director of Fossielvrij NL. 'If people get organized and put pressure on public institutions, they have more impact than they can have by taking fewer showers and car journeys,' says Meddens. 'Lobbying goes too slowly, and we mustn't rely on the UN and the government. Only with pressure from the general public can we make the transition to sustainable and renewable energy fast enough.' ■

‘DON’T FORGET TO GO BACK TO TANZANIA’

University changed her life

It was nearly 25 years ago that Rose Mongi met Wageningen academic Anne van den Ban in Tanzania. This encounter would prove to be life-changing. ‘I couldn’t believe my ears when he offered me financial support.’

TEXT YVONNE DE HILSTER PHOTOS SAM VOX

The conversation in which Professor Anne van den Ban offered to sponsor her for a Bachelor’s degree lasted no longer than five minutes, recounts Dr Rose Mongi on the phone from Tanzania. ‘I asked his advice on how to further develop my skills. Out of the blue he asked, “Do you need to study? I can support you.” He said it just like that.’

Van den Ban, the founder of Rural Extension Science in Wageningen, sponsored Mongi for her Bachelor’s degree in the early 1990s. The two friends and Wageningen alumni Van den Ban and tropical agronomist Gerard Kerkhoven subsequently established a fund to support students from developing countries, now known as the Anne van den Ban Fund. Mongi is currently the leading scientist in Tanzania’s national wheat and barley programme. Last year she obtained a PhD in plant breeding in South Africa. ‘I met Professor Van den Ban in 1990 when I was working as a technician at the Uyole Agricultural Research Institute, which is part of the Ministry of Agriculture, Livestock and Fisheries,’ Mongi says. ‘It was my first job and I had to work hard: setting up plant trials, conducting field assessments and harvesting. I had attended a two-year course

at an agricultural college after secondary school, as I wanted to improve the situation of smallholder farmers. Van den Ban worked as an extension consultant and would always come out into the field and talk to us about the trials and harvests.’

‘One day, I talked to some European friends (volunteers at the research institute) about getting into higher education, as I could not

afford the fees for a Bachelor’s degree in Tanzania at that time. They encouraged me to seek Van den Ban’s advice. I was scared to do so, him being a foreigner, and so senior and knowledgeable. But I mustered up courage and talked to him. It only took five minutes. To my great surprise he offered his full financial support. I rushed out to my colleagues, wondering if this had really hap-



pened. But we all knew this straightforward answer was typical of him.'

Mongi believes that Van den Ban made the offer because he always saw her working so hard. 'Van den Ban believed in working hard and delivering good results to the farmers.' Mongi ending up getting herself enrolled at the University of Missouri, Columbia (USA) in 1991. She worked hard and finished her Bachelor's degree in two and a half years, a year and a half ahead of schedule. 'Then my study advisor recommended me to a colleague at the University of Idaho, who had a position for a Master's student of Plant Sciences in his project. The university accepted me because of my good grades and the project covered my tuition fees and living expenses.' Upon graduation Mongi was offered a PhD position at another university. But she decided to return home. 'Every single day I would hear Professor Van den Ban saying: remember to go back and work for your people.'

WHEAT AND BEAN VARIETIES

She is still very happy with her decision and she sees the impact of her work. In her work in Tanzania she brings together plant breeders, agriculturalists and extensionists to collaborate with farmers on agricultural development, and she has developed four wheat and three bean varieties. 'For example, last year I worked with 500 wheat farmers who were able to raise their yields from one 100-kilogram bag to fifteen per hectare, thanks to a combination of high-yield varieties and knowledge about fertilizer and different farming methods. I'm passing on my knowledge now like Van den Ban used to do.' She also takes care of the school fees of others, not just her own three children. 'Van den Ban did not know me, he was not even from my tribe. But he nevertheless supported and encouraged me. Supporting someone's education has more impact in the long term than any other gift. It enables people to stand on their own two feet.'

Van den Ban and Kerkhoven formalized their support to students in 1992 by establishing the foundation Sharing Responsibilities for Students (SRS). At first they were the sole donors, but others soon joined them. In 2005 the foundation was renamed the Anne van den Ban Fund, for promotional reasons. Nowadays it helps 20 to 30 talent-



Rose Mongi in a wheat trial field at Uyole Agricultural Research Institute in Mbeya, Tanzania.

'Van den Ban wasn't from my tribe, and yet he was there for me'

ed foreign students with a contribution to the costs of studying at Wageningen University.

Mongi found out about the foundation in 1993, on her first and only visit to Wageningen. 'Professor Van den Ban picked me up at Schiphol airport when I stopped over on my way home to Tanzania, and we had dinner with the board. "Keep working

hard," he told me, and that is what I did. Sadly, that was the last time I would see him. But we stayed in touch by email. He was so nice. He offered something from his heart, without expecting anything in return.'

Rose Mongi's full story and her recent letter to the Anne van den Ban Fund donors is to be found on www.universityfundwageningen.eu/rosemongi

ANNE VAN DEN BAN FUND

The Anne van den Ban Fund celebrates its 25th anniversary this year. Before the foundation was established, Dr Rose Mongi from Tanzania was the first to be sponsored by Professor Anne van den Ban. So far, over 250 Master's degree students from developing countries have received a scholarship. www.wur.eu/annevandenbanfund

When I think of Wageningen...

In 2018, Wageningen will have been an academic institution for 100 years. To celebrate, WUR is asking former students to send memories or requests to Wageningen under the slogan 'share a memory, support a project'. The responses received so far include one from Marc Bouwman: Wageningen always makes him think of the chalk smudges on the trousers of his lecturer Jack Peerlings. Kees van der Does writes about the still topical Hoogstraat song from 1960. And Denise Eurlings-van der Made hopes many other students will experience such internship adventures as she did when she had a night-time encounter with a large baboon in Uganda.

To find out more or share something yourself:
100x100.wur.nl



PHOTO GUY ACKERMANS



Learning from top athletes

Wageningen is getting a top sports network with students and alumni who are or have been active at a high level in sport, competing or as a trainer or coach. The aim is to give a boost to Wageningen's sport and health research.

The people behind this Wageningen Elite Sports Performers Network are the businessman Koen Beelen (Forestry 1991), WUR researcher Christiaan Bolck (Environmental Economics 1998) and Henri ten Klooster, head of De Bongerd Sports Centre. Beelen spent years coaching the national men's youth hockey squads, while Bolck is a former rower.

'Top sportspeople and coaches have unique expertise, experience and energy that don't get used,' says Beelen. 'Wageningen does a lot of sport-related research, from sports in local neighbourhoods, diet and anti-doping to sustainable pitches, but it isn't showcasing this as a cohesive whole. There are gains to be made in this market.'

With the support of University Fund Wageningen, students and alumni in a range of sports were tracked down and invited to an introductory meeting. The elite athletes

had various ideas for sports-related research and new collaborative opportunities. They also talked about how Wageningen can present itself as an attractive university for top athletes, being located close to the Papendal national sports centre. They also see opportunities for mentoring top sportspeople doing a degree. Archer Carrie Wegh (Nutrition & Health 2015): 'Many athletes at Papendal would love to study. The university should facilitate this. I was lucky because I had a fantastic student counsellor who arranged all the peripheral stuff for me so that I could concentrate on my modules. Students can also learn a lot from top athletes, such as planning, setting priorities and selling yourself.' It will become clear over the next few months what form the network will take. If you are or have been involved in sport at a national or international level and would like to know more, send an email to alumni@wur.nl.

NETWORK

'Because you recognize something in one another'

In April, Marion Bloemendal (Management, Economics & Consumer Studies 2008) and Iris Vendel (Food Technology 2014) organized the first meeting of the new Brussels alumni network together with University Fund Wageningen (UFW). 'I've always organized social events alongside my study and I thought it would be nice to meet other people from Wageningen here,' explains

Vendel, 'because getting to know new people is interesting and you recognize something in one another. A critical attitude and curiosity about the world and other disciplines, for example.' The event was attended by a good 15 alumni – Dutch, Flemish and Greek, from different generations.

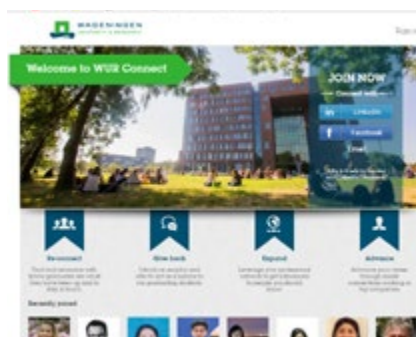
If you too would like to start an alumni network, please contact UFW via alumni@wur.nl.



WUR-CONNECT

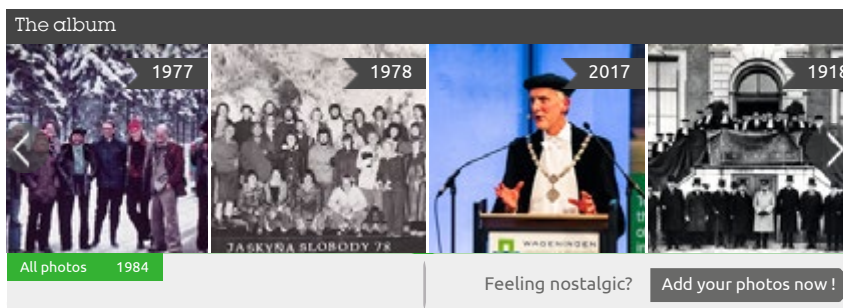
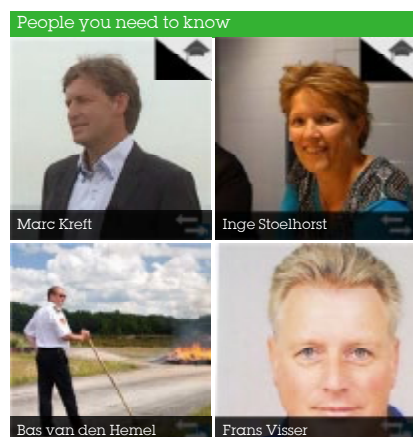
Staying in touch with the 'WUR family'

Curious about people in your year? Looking for a mentor or an event in your field of work? You can find all this on the new alumni platform WUR Connect.



At the start of this year, University Fund Wageningen (UFW) launched the online platform WUR Connect. With its slogan 'You will always be a Wageningener', WUR Connect is targeting alumni, KLV members and students. You can look up old friends or make new contacts, offer your services as a mentor or intermediary for internships, or discover new career opportunities.

Responses have been appearing on the platform from all over the world, often along the lines of 'it's great to be able to stay connected to Wageningen like this'. Riccardo Manieri (MSc Animal Sciences 2010) at the Form-Action business school



in Pesaro, Italy, says that he finds WUR Connect a good initiative because it is exclusively for the WUR community. 'That gives this digital WUR platform added value. It offers more specific learning and career opportunities than other social media, you get to know people who can be

682
New members
joined in the past month

useful to you, and it gives you that feeling of belonging to the WUR family.' 'The idea for the platform started when we were thinking of a digital alternative to the list of KLV members, which is issued in book form,' says UFW staff member Tom van der Schaaf. 'We eventually opted for a platform that offers many more ways of staying in contact with Wageningen.' There are numerous different options for searching the list of members: by name, country or town of residence, degree subject, graduation year, sector or willingness to do something for alumni or Wageningen University & Research. You can also upload or view Wageningen-related photos and job vacancies, offer your services as a volunteer for alumni activities, or offer to donate money or take part in research. The easiest way to register is via a LinkedIn account. The navigation menu is in both English and Dutch.

The university has over 45,000 alumni but it does not have contact details for everyone. At the start of May, the database already contained 5600 people. Van der Schaaf: 'The interest has exceeded our expectations.' The first job has already been arranged via the platform and various people have tracked down someone they had lost contact with. There may well be more successful matches. 'We only hear about them when someone places an update,' says Van der Schaaf.

Info: wurconnect.nl

Cartoon: www.bit.ly/wurconnect-animation

54 New Jobs

- Coördinator Hygiëne & Pest Control (starter) at KLV Professional Match Netherlands
- regelingsdeskundige at klv professional match Netherlands
- (trainee) Keurmeesters at KLV Professional Match Netherlands

[More on the job board](#)

Get involved

PERSONALIA

Martin Baptist PhD, WUR Environmental Protection (water purification) 1996, senior researcher at Wageningen Marine Research, has won the public prize in the Prince Friso Engineering Awards given by the Royal Netherlands Society of Engineers (KIVI). 19 April 2017.

Prof. Tiny van Boekel, WUR Food Technology 1977, WUR professor of Product Design and Quality Management, dean of Education and director of the WUR Education Institute, has retired. 24 March 2017.

Prof. Erwin Bulte, WUR Forestry 1992, WUR professor of Development Economics, has been appointed a member of the Royal Netherlands Academy of Arts and Sciences (KNAW). May 2017.

Nico Claassens PhD, WUR Biotechnology 2012, microbiologist, has been given a Rubicon grant by the Netherlands Organisation for Scientific Research (NWO), a funding instrument that lets researchers acquire experience abroad. Claassens will be going to the Max Planck Institute of Molecular Plant Physiology in Potsdam, Germany. 25 April 2017.

Aalt Dijkhuizen PhD, WUR Agrarian Economics 1977, former chair of WUR, chair of the Agri & Food Top Sector, has been appointed chair of the associated Top Consortium for Knowledge and Innovation (TKI) and chair of the International Advisory Board of Hendrix Genetics. 1 April 2017.

Jessica Duncan PhD, Bishop's University, Sherbrooke, Quebec, Canada, Sociology 2004, WUR assistant professor of Rural Sociology, has been voted WUR Teacher of the Year 2017. 6 April 2017.

Maria Fernandéz de Bobadilla MSc, WUR Plant Sciences 2016, received the East-West Seed graduation award for Plant Sciences for her research on stress in plants. 11 April 2017.



Maria Fernandéz de Bobadilla

Marian Geluk MSc, WU Molecular Sciences 1989, director of the Food & Nutrition Top Institute (TIFN) in Wageningen, has been appointed director of the Federation of the Dutch Food Industry (FNLI). 1 May 2017.

Prof. Martien Groenen, Radboud University Nijmegen Chemistry 1982, WUR professor holding a personal chair in Animal Breeding and Genetics, has been appointed professor of Animal Breeding and Genetics. 1 April 2017.

Aalt den Herder MSc, WUR Zootechnics 1992, independent consultant, has been appointed secretary of the Dutch Poultry Farmers' Union (NVP). 25 April 2017.

Rianne Jacobs PhD, University of Pretoria Mathematical Statistics 2011, WUR PhD 2016, researcher at the National Institute for Public Health and the Environment (RIVM), has won the SETAC Journals Best Paper Award for her paper on the risk assessment of nanoparticles that she wrote for her doctoral research at WUR. 8 May 2017.

Jos Malda PhD, WUR Bioprocess Technology 1999, head of research at the Orthopaedics department at UMC Utrecht (university hospital), has been appointed professor of Biofabrication for Translational Regenerative Medicine in Utrecht. 1 April 2017.

Kris van Malderen MSc, WUR Environmental Protection (water purification) 1986, has been appointed formal director of the GD Animal Health Service in Deventer. 1 January 2017.

Albert Markusse MSc, WUR Farming Technology 1983, director of SuikerUnie, has been appointed CEO of Royal Cosun. 1 June 2017.

Bas Rüter MSc, WUR Biology 1994, director of Sustainability at Rabobank, has been appointed chair of Bionext, an organic supply chain organization. 4 May 2017.

Willem van Schaik PhD, WUR Food Technology 1998, associate professor in the department of Medical Microbiology at UMC Utrecht, has been appointed professor of Microbiology and Infection at the University of Birmingham, UK. He has also received a Wolfson Research Merit Award from the Royal Society (London). 1 April 2017.

BEST ARTICLE

Thomas Lans PhD, WUR Plant Breeding and Crop Protection 2001, **Frans Verhees PhD**, WUR Economics of Agriculture and the Environment 1996, and **Jos Verstegen PhD**, WUR Zootechnics 1991, have received the Richard A. Swanson Research Excellence Award for the best article in *Human Resource Development Quarterly* (HRDQ). 23 March 2017.

DECORATIONS

Hans Brons PhD, WUR Environmental Protection (water purification) 1981, senior researcher at Aqua Resins Technologies BV, has been appointed Knight of the Order of Orange-Nassau for his work on behalf of sustainability and policies that spare the environment. 26 April 2017.

Jan Dommerholt PhD, WUR Zootechnics 1971, has been appointed Knight of the Order of Orange-Nassau for his services to beekeeping, cattle improvements and Stichting Lochems Steunfonds. 22 April 2017.

Leo Eppink MSc, WUR Tropical Land Development 1966, has been appointed Member in the Order of Orange-Nassau for his work for Het Gilde and the story-telling group Eva Luna. 26 April 2017.

Henri Goverde PhD, former part-time professor of Politics at WUR and guest professor at Utrecht University, has been appointed Knight of the Order of Orange-Nassau for his exceptional achievements in science and society. 26 April 2017.

Prof. Edith Lammerts van Bueren, WUR Horticulture 1978, WUR professor of Organic Plant Breeding, has been appointed Officer in the Order of Orange-Nassau for her achievements in making agriculture more sustainable. 27 April 2017.

Prof. Gerhard Zielhuis, WUR Human Nutrition 1979, has been appointed Officer in the Order of Orange-Nassau for his contribution to the development of epidemiology in the Netherlands and Europe. 26 April 2017.

Jochem Zuiderveen Borgesius MSc, WUR Forestry 1974, former alderman of the municipality of Wageningen, has been appointed Knight of the Order of Orange-Nassau for his services to the Wageningen community and to forestry in the Netherlands. 26 April 2017.

UFW RESEARCH AWARD

Martin Mwangi receives prize for his research

This year, the University Fund Wageningen Research Award was given to Dr Martin Mwangi (Nutrition & Health 2009). He received the three-yearly award for ground-breaking research that resulted in a pub-

lication in 2015 in JAMA on the safety and effectiveness of iron supplements for pregnant women in Kenya. In his speech, Mwangi, who is now a postdoc in the Cell Biology and Immunology chair group at Wageningen, thanked the 470 pregnant Kenyan women who took part in his study. 'They even allowed me into their rooms while they were giving birth.' Babies were also named after him.

Over half the pregnant women in Africa have anaemia due to iron deficiency. However, iron supplements were thought to be associated with more malarial infections. Mwangi showed that the supplements do not increase the risk of malaria. Just as important was his finding that iron supplements reduce the risk of a low birthweight by more than half. The prize consists of an artwork and a cheque for 2500 euros.

Video: universityfundwageningen.eu/researchaward



Martin Mwangi

PHOTO WUR/JONNE SEIDEL

TEACHING AWARD

Marc van Mil national Teacher of the Year

Biochemist Marc van Mil MSc (Biotechnology 2005) was chosen Teacher of the Year in April by the Dutch National Students' Association (ISO). Van Mil is a lecturer and educational innovator in Biomedical Sciences at Utrecht University.

The jury praised Van Mil for his interactive teaching, his interpretation of his role as a lecturer and the multi-disciplinary content. 'I expect my students to prepare for lectures online; otherwise they might as well stay at home,' says Van Mil. 'In exchange, I offer them a challenge and get the students thinking. Learning is an active process. Furthermore, as a lecturer in molecular genetics, I want students to be aware of the ethical and societal aspects of new technologies. As an academic, you have to be willing and able to talk to society at large about this. The debates about genetic modification that I experienced as a student had a formative influence on me.'

The prize consists of 15,000 euros and



Marc van Mil

PHOTO ANGELEKDE JONGE

membership of the Docentenkamer, a new national advisory body set up by the Ministry of Education. Van Mil wants to use the prize money to develop a computer game in which doctors and patients engage in a dialogue about DNA.

Van Mil will give a WUR Talk in the autumn.

Video: wur.nl/wurtalk.

IN MEMORIAM

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

Mr J. Bekendam PhD, WU Tropical Plant Breeding 1954. 11 January 2017.

Mr A.B. Brader MSc, WUR Forestry 1988. 28 April 2017.

Mr J.M.M. van der Broek MSc, WUR Tropical Plant Breeding 1953. 12 March 2017.

Mr H.D. Disson MSc, WUR Forestry 1972. 5 August 2016.

Mr D.A. Ehlhardt MSc, WUR Zootechnics 1962. 1 February 2017.

Mr R.K. Elema MSc, WUR Farming Technology 1962. 16 November 2016.

Mr J.M.P. Geerts MSc, WUR Forestry 1980.

Ms M.J. van Harn MSc, WUR Domestic Science 1983. 11 March 2017.

Ms A. Hartmans-van der Ende MSc, WUR Domestic Science 1961. 8 March 2017.

Mr E.P.L. Hessels MSc, WUR Tropical Forestry 1967. 30 June 2016.

Mr F. ter Hofstede PhD, WUR PhD 1999. 10 October 2016.

Prof. L. Lyklema, honorary member of University Fund Wageningen. 21 January 2017.

Mr H.A. van der Meiden MSc, WUR Forestry 1953. 2 February 2017.

Mr R. Reuderink MSc, WUR Tropical Rural Economics 1951. 24 March 2017.

Mr G. Salentijn MSc, WUR Tropical Plant Breeding 1946. 3 August 2015.

Mr W.M. Samsom MSc, WUR Rural Economics 1971. 20 January 2017.

Mr H.W. Schut MSc, WUR Forestry 1948. 23 March 2017.

Mr L. Touwen MSc, WUR Tropical Plant Breeding 1958. 3 February 2017.

Mr K.G. Varela MSc, WUR Soil and Water 1983. 3 May 2013.

Mr H. Veenland MSc, WUR Agricultural Plant Breeding 1954. 31 October 2016.

Mr J.A.P. Vermue MSc, WUR Farming Technology 1988. 7 November 2016.

Mr G.H.L. Weijers MSc, WUR Land Development A 1987. 7 February 2017.

Mr J.C. Wilms MSc, WUR Tropical Rural Economics 1956. 30 March 2017.

Mr J. Zander PhD, WU Forestry 1963. 15 March 2016.

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



KLW

WAGENINGEN
ALUMNI NETWORK

Science Café attracts capacity crowds



On 30 September 2016, a jam-packed Orion listened to Professor Jennifer Doudna talk about CRISPR-Cas. This was no ordinary lecture in front of an exceptionally captivated audience; this was a special Science Café.

CRISPR-Cas is causing a great deal of controversy. Bacteria use the repetitive DNA sequence in their immune systems and scientists have shown they are able to use the tool to quickly and precisely modify DNA in plants, animals and even humans. The possibilities are obvious - improving crops, tackling diseases - but also give rise to ethical questions: do we have a clear

enough idea of the risks, and where will it all end?

Bringing science to a wider audience
CRISPR-Cas and the dilemmas that accompany it are perfectly compatible with the Science Café concept, according to Karin Schroën, who is involved on behalf of KLV. At each Science Café, two scientists who represent different sides of an argument debate a hot scientific topic with participation from the audience. Doudna is a well-known name in the world of genetics and attracts capacity crowds, as she did on 30 September; reason enough to move the Science Café to the campus for that occasion. But Loburg will remain our favourite venue as a place you can walk into (and out of) at any time because the aim of the Science Café is to be easily accessible: to bring science to a wider audience. 'Anyone interested in science is welcome.' Interested members of the public do come too, although the majority of the audience is made up of students and PhD candidates. Schroën is happy with the turnout: a Science Café usually attracts between 70 and 100 interested persons. 'And if there are fewer people, then those are always the most interested and the post-Café drink and chat sessions last the longest!'

Special guests deserve something special

The Science Cafés are sponsored by KLV and organised - with great pleasure - by a group of scientists, PhD candidates and students. 'Everyone has a broad interest in a wide range of scientific themes. It is really driven by curiosity and we've no lack of ideas.'

The big Science Café about CRISPR-Cas was a chance we couldn't let pass, says Schroën. 'But we want to seize the opportunity to arrange specials like this more often. When a special guest comes to Wageningen, you can sometimes create a fantastic Science Café at short notice.'

Additional information is available at:
sciencecafewageningen.nl and
facebook.com/sciencecafe.wageningen



Photo: Guy Ackermans

INVITATION

If you check our KLV Facebook page on a regularly base, you will be informed what KLV has been up to and what we are working on. This way you will keep in touch with the alumni association of your Wageningen University. Of course you are welcome to post your own interesting status updates too.

Join KLVNetwork! 

www.facebook.com/klvnetwork

ACTIVITIES

Info: klv.nl/en (unless indicated otherwise)

18-23 August
Annual Introduction Days (AID)

14 October
Reunion 50th-years alumni,
starting year 1967

4 November
Reunion 25th-years alumni,
starting year 1992

KLV-CONFERENCE 'INSPIRED BY UNCERTAINTY'



The KLV conference of 2017 will now be held - in a different form - on a new date somewhere in the autumn.

Further information can be found on the conference page of the KLV website:
www.klv.nl/events/klvconferentie-2017

WANT TO BECOME A MEMBER?
Go to klv.nl/membership



PHOTO HOLLANDE HOOGTE

Raising the water table to prevent peat fires in Indonesia

Simple dams can sometimes suffice to raise the groundwater table in dried-up peatlands in Indonesia, says soil scientist Henk Wösten, from Wageningen Environmental Research. The rewetting that then takes place is a key weapon against peat fires. 'In dry El Niño years, Indonesia now suffers from uncontrollable underground fires, especially on Sumatra and Kalimantan,' says Wösten. The smoke from these fires pollutes the air as far away as Kuala Lumpur and Singapore, and is a

serious nuisance in the region. Many peatlands have been drained for oil palm and acacia plantations. But drainage takes place even in unexploited peatlands. 'Often canals several kilometres long are dug into the peat from the river, to enable transportation of timber,' says Wösten. Both the drainage and the peat fires cause emissions of large quantities of CO₂ in Indonesia. With funding from the World Wildlife Fund (WWF), Wösten is working on restoring peatlands together with

local partners in the Londerang project on Sumatra.

'I use a hydrological model to decide where dams are needed, and how many, to raise the groundwater table by so many of centimetres, and I calculate how much difference that makes to CO₂ emissions.' Nature benefits from these measures too. 'The forests in the peatlands are the last natural habitat of the Orang Utan.'

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