

WAGENINGEN WORLD

MAGAZINE OF WAGENINGEN UR ABOUT CONTRIBUTING TO THE QUALITY OF LIFE

no.3 2015



THEME ISSUE
STRATEGIC
PLAN

'We must share our
scientific insights with
the general public'

Louise Fresco, page 10

Keeping the **shelves filled** | Organisms on the **drawing board** | Learning to live with **bird flu**
Monitor your city with a smartphone | **Teaching** to the camera | **Sugar beet** has more to offer



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DIALOGUE WITH SOCIETY

Wageningen UR is opening its doors to the outside world: the campus will be livelier and there will be more dialogue with the general public. The new strategic plan also stresses Wageningen's strengths for tackling global problems.

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KEEPING THE SHELVES FILLED

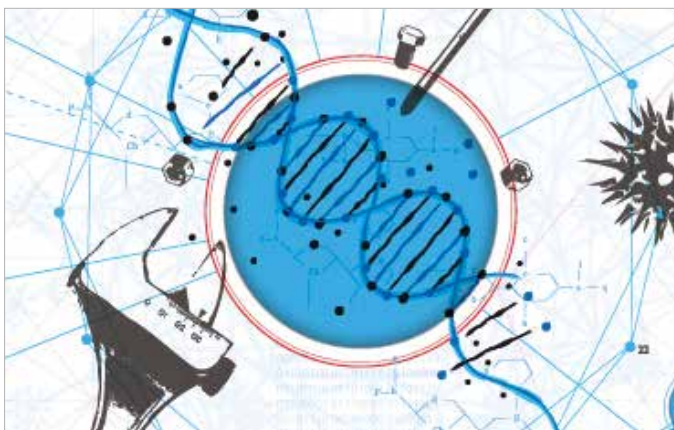
The world food supply can be made more resilient to price fluctuations, failed harvests and climate change. Socio-economic models show which investments are the most effective for boosting food security and economic development.



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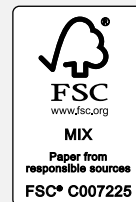
ORGANISMS ON THE DRAWING BOARD

Yeasts which can make colouring agents, stripped-down bacteria which produce pesticides: synthetic biologists are getting life to do their bidding. They are designing and manufacturing useful, living systems and cutting out superfluous genes.



COLOPHON Wageningen World is the quarterly magazine for associates and alumni of Wageningen UR (University and Research centre) and members of KLV, the Wageningen Alumni Network. A PDF version of the magazine can be found at www.wageningenUR.nl/en/wageningen-world **Publisher** Wageningen UR, Marc Lamers. **Editorial Board** Hans Bothe, Yvonne Fernhout, Ben Geerlings, Francine Loos, Jeanette Leenders, Jac Niessen, Irene Salverda, Erik Toussaint, Delia de Vreeze **Editor-in-chief** Pauline Greuell (Corporate Communications Wageningen UR) **Magazine editor** Miranda Bettonville **Copy editor** Rik Nijland **Alumni news** Yvonne de Hilster **Translation** Clare McGregor, Clare Wilkinson **Language editor** Clare McGregor **Art direction and design** gloedcommunicatie, Nijmegen **Cover picture** Joris Schaap **Overall design** Hemels Publishers **Printer** Tuijtel Hardinxveld-Giessendam **ISSN** 2212-9928 **Address** Wageningen Campus, Akkermaalsbos 14, 6708 WB Wageningen, PO Box 409, 6700 AK Wageningen, telephone +31 317 48 40 20, wageningen.world@wur.nl **Change of address alumni** www.wageningenur.nl/myprofile **Change of address associates** (mention code on address label) wageningen.world@wur.nl **Change of career details** alumni@wur.nl

The mission of Wageningen UR (University & Research centre) is 'to explore the potential of nature to improve the quality of life'. Wageningen UR includes nine specialist applied research institutes and Wageningen University. These institutions have joined forces to contribute to finding answers to crucial questions related to healthy food and a sustainable living environment. Wageningen UR has a staff of 6,500, 10,000 students, 35,000 alumni and 40 sites, with a turnover of 662 million euros. Institutes of Wageningen UR: Alterra, LEI, Plant Research International, Applied Plant Research, Wageningen UR Livestock Research, Central Veterinary Institute, Wageningen UR Food & Biobased Research, IMARES and RIKILT.



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Eradicating bird flu is a hopeless task; vaccinations are no more than a temporary emergency measure. The CVI Wageningen UR is considering a warning system to keep the risks down.

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Brazilian secondary school students in the city of Curitiba are going to monitor the air quality in their city using smartphones. Crowd sourcing makes people aware of conditions in their cities.

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Sugar beets are valuable little natural factories for more than just sugar. Wageningen researchers are trying to extract raw materials from beet pulp for thickeners and soft-drink bottles.

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The Wageningen campus is steadily developing into a lively, bustling meeting place for researchers, students and entrepreneurs.

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Wageningen University is developing forms of education that reach people all around the world and from all social strata. 'People are gradually starting to trust it.'

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Loes Mertens and Janne Mulders were among the first cohort of students on the Organic Agriculture degree course. Now Loes breeds vegetables and Janne lectures on food.

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PHOTO VINCENT VAN DEN HOOGEN

Tickling

'Why doesn't the road emit light at night? Why do we accept light pollution? These are the kinds of questions my team and I turn into art. At the moment we are working on the Smog Free Project: crowdfunding to build a tower in Rotterdam – a kind of enormous vacuum cleaner that sucks up air and cleans it. People can get together there to taste and smell a clean future. Artists and scientists share a curiosity, an inclination to ask questions. That is where creativity begins. I think we should stimulate each other in that so that we can repeatedly see reality as we know it in a different light. It is increasingly important to think and learn together. In the sciences too, you need to be tickled and prodded, not just by your colleagues but also by people with a different take on the world, different knowledge and experience. That makes you go on asking yourself searching questions. Along with acquiring knowledge, that is the essence of science.'

It is becoming more and more important to bring together soft and hard knowledge and creativity from different sectors so as to generate new insights into how we can make the world more beautiful, more exciting and more human. And to think about how to use technology or what we need to learn from nature. The world is so complex that we need cross-pollination. That makes knowledge socially relevant. A lot of scientific knowledge is still stashed away at universities: hidden capital with no footing in society. It is just like light: it only becomes visible if it bounces off something else.'

Daan Roosegaarde was the guest speaker at the opening of the academic year in Wageningen on 7 September. He is an artist and designer and heads Studio Roosegaarde in Rotterdam and Shanghai. The central focus of his work is the interplay between humans, technology and space.

New odour attracts sated mosquitoes

Wageningen entomologists and their colleagues in Kenya have developed a new odour blend to catch malaria mosquitoes.

Using the new blend, they caught malaria mosquitoes for the first time which had already fed on blood and were not hungry. The advantage of this is that it makes it possible to use a blood sample to see whether the mosquitoes had bitten livestock or humans. 'This helps enormously with the research on the spread of malaria outside the home,' says entomologist Niels Verhulst of Wageningen University.

The Wageningen entomologists had already developed a good odour trap, but it only captures hungry *Anopheles* mosquitoes. The new blend contains carbon dioxide produced not by fermenting sugar with yeast but by fermenting molasses, which is cheaper. Molasses turns out to contain substances that mosquitoes find irresistible, reported the researchers in *March in Malaria Journal*.
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PHOTO: SHUTTERSTOCK



PHOTO: BEN BEKOBY

Spitsbergen

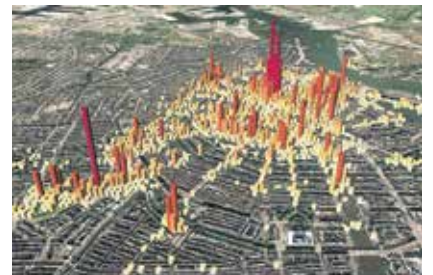
Twelve Wageningen researchers joined a scientific expedition to Spitsbergen in August. Their interests included the effects of oil pollution, the evolution of the reindeer, the behaviour of walrus and the development of tourism and the future prospects of the local residents on Spitsbergen. Martine van den Heuvel-Greve, a researcher at IMARES Wageningen UR and one of the expedition coordinators, called it 'a childhood dream come true'. 'Especially for someone like me who read the travellers' tales of Amundsen and Shackleton.' Van den Heuvel-Greve studied how animals such as certain northern amphipods and snails react to oil pollution. The toxicologist expects her research to be relevant in the near future, how that oil drilling in the North Pole region looks very likely to go ahead. Info: martine.vandenheuvel-greve@wur.nl

Flickr shows Amsterdam hotspots

Photos uploaded to Flickr can show how tourists move through a city. Master's student of Geo-information Science Sander van der Drift featured in the Dutch national media in June with this finding.

For his Master's thesis, Van der Drift designed software for using the data accompanying photos on Flickr to sift through the three million photos of the

Netherlands taken between 2005 and 2014 and selected those snapped by foreign tourists in Amsterdam. There turned out to be more than 100,000 of these Amsterdam snaps. He used an algorithm to bring some order to the jumble of photos and link them to a map. This map reveals hotspots such as the Dam and the I Amsterdam sign on the Museumplein. 'But it is just as interesting to see where hardly any tourists go,' says Van der Drift. 'The city could make use of



that in its publicity, to get people to spread out more.'

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NUTRITION AND HEALTH

African diet cuts risk of bowel cancer

Eating habits have a direct effect on the kinds of bacteria found in the bowel and therefore on the risk of bowel, or colorectal, cancer. This has been demonstrated by an interdisciplinary study in which microbiologists from Wageningen University were involved.

Bowel cancer is more common among African Americans than black South Africans: 65 cases per 100,000 people as opposed to fewer than 5. This is partly attributed to the American diet, which contains more animal protein and long-chain fatty acids, and less fibre. The two groups prepare their food differently too. The international research team published an article in *Nature Communications* in April describing their study of the role of fat and fibre. They put African Americans on a high-fibre, low-fat diet for two weeks, and rural Africans on an American-style high-fat, low-fibre diet.

Big differences exist between these two groups, including the composition of their gut flora and the concentrations of the bacteria's fermentation products, such as short-chain fatty acids.

The researchers found that in both cases the temporary change in diet had a big impact on the bacteria and metabolic products which are seen as risk factors for developing bowel cancer. Among the Americans more risk-reducing butyrate was released, while among the Africans levels of the harmful production of secondary bile salts went up. Moreover, among the Africans on the



PHOTO: ISTOCK

American diet, more biomarkers for bowel cancer were found in the colorectal mucosa. These are substances associated with a raised risk because they can lead to abnormalities in the colorectal mucosa, which can result in bowel cancer. Among the Americans on an African diet, by contrast, these biomarkers went down.
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EDUCATION

Online Master's degrees start

At the end of August the first 45 students embarked on the new Wageningen University Master's programmes which can be taken part-time and online: Nutritional Epidemiology and Public Health and Plant Breeding. Wageningen University is offering these programmes to enable people whose work or family commitments prevent them from coming to Wageningen for two years to get a Master's degree.

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NUTRITION AND HEALTH

New centre for research on smell and taste

At the beginning of July, the Gelderse Vallei hospital in Ede and Wageningen University jointly opened the first Smell and Taste Centre in the Netherlands. The centre will conduct research on the reasons behind smell and taste problems, as well as offering patients advice on lifestyle and diet. This is important because problems with smell and taste often affect eating habits and how much someone eats. The university will be allowed to use the anonymized research results in scientific studies. It is estimated that about 250 – 300,000 people in the Netherlands suffer from smell and taste problems.

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WAGENINGEN ACADEMY

Seminar on healthy diet for elderly

The elderly are a big and growing target group with specific nutritional needs and eating habits. This is a group that is particularly affected by age-related diseases and limitations such as a reduced sense of smell and taste. The seminar on the importance of a healthy diet for the elderly provides insights into the possibilities for stimulating healthy behaviour and diet choices among the elderly. The seminar offers up-to-date knowledge about nutritional needs, eating habits, product development,

marketing, applications and catering. It is intended for professionals in the food industry and retail trade who want to expand their knowledge about the needs and behaviour of fit elderly people.

15 November 2015 / Course manager Esmée Doets, researcher at Wageningen UR Food & Biobased Research.

For more information and other courses, see our website: www.wageningenacademy.nl



PHOTO HOLLANDE HOORTE

Ecosystems earn millions for Limburg

Seven ecosystem services contribute annually about 110 million euros to the economy of the Dutch province of Limburg. This is an average of 508 euros per hectare. The growing of food crops and livestock feed, and nature tourism are particularly lucrative. In two municipalities, areas where drinking water is sourced are valuable assets. Capture of fine particles, carbon sequestration and hunting are of less economic value to the province. The study was carried out by Wageningen University and the Statistics Netherlands with the aim of generating knowledge about the contribution of ecosystems to our economy. The results came out in April in Ecological Economics.

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NUTRITION AND HEALTH

Flexible people lose weight more easily

Losing weight is easier for flexible spirits. Because the more someone thinks of food in terms of good and bad, and the more strictly they try to stick to a diet, the bigger their chances of gaining weight in the end. In contrast to people with less rigid ideas, black-and-white thinkers are likely to overeat as soon as they have failed to deny themselves something. These conclusions are drawn by Katerina Palascha in an article in the Journal of Health Psychology, based on questionnaires she used for her Master's thesis.

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Small plastic particles are most dangerous

The number of animal species known to be affected by the plastic waste in the oceans has doubled since the last overview study in 1997, from 267 to 557 species. They swallow the plastic or get trapped in it.

The affected species include all seven species of sea turtles, 81 of the 123 species of marine mammals and half of the 406 species of sea birds. The numbers of fish and invertebrates known to be affected have risen too, write researchers from IMARES Wageningen UR in a new review of the effects of plastic waste on marine life to which they contributed: Marine Anthropogenic Litter.

IMARES also reveals the potential dangers of nanoplastics. These can, for example, release previously absorbed toxic chemicals in the animals that have swallowed them. Not much is known, however, about the precise sources, effects and further implications of nanoplastics at sea.

For fresh water, laboratory tests have shown that minuscule pieces of plastic have a much more negative impact on organisms than larger pieces of plastic. Over the next few years, environmentalist Bart Koelmans,

personal professor at Wageningen University, will be studying the pollution of Dutch rivers, streams and lakes with nanoplastics, in research partially funded by technology foundation STW. Fishery biologists have been studying the stomach contents of the arctic tern for more than 30 years. In a study published in Environmental Pollution, IMARES compared their data on the birds' stomachs with data from the American Sea Education Association. This organization has done a lot of research using surface nets on the garbage patch in the North Atlantic ocean gyre, a circular current where waste accumulates. The study shows that the amount of industrial plastic in birds' stomachs and nets has gone down but the total amount of plastic has barely changed. So the amount of consumer-generated plastic in the sea is still going up. Info: jan.vanfraneker@wur.nl



PHOTO JAN VAN FRANKEER

HABITAT

Photo of urban farming wins prize



PHOTO ROSANNE WIELEMAKER

Wageningen UR's photo competition on the theme of Metropolitan Solutions attracted nearly 50 entries from 15 countries. The winner was Rosanne Wielemaker from the Netherlands, with a photo of the Brooklyn Grange Rooftop Farm in New York. Her photo depicts the symbiotic relationship between agriculture and the city.

Wageningen UR ran the competition to set people thinking about the challenges facing the world as a result of urbanization. In its collaboration in the AMS (Amsterdam Institute for Advanced Metropolitan Solutions) and elsewhere, Wageningen UR works on solutions which help make cities and metropolitan regions – and the surrounding rural areas – livable, healthy and resilient, with a circular economy. The 10 best entries can be seen in an open-air exhibition in Wageningen in the autumn.

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NUTRITION AND HEALTH

Dietary advice after blood tests

A better vitamin status thanks to early identification and treatment of deficiencies and overdoses. This is the aim of NutriProfiel, personal dietary advice based on blood levels of four vitamins.

Wageningen UR and the Gelderse Vallei hospital in Ede developed Nutriprofiel together in the Nutrition Alliance. Early identification of deficiencies or overdosing can prevent potential complications such as fractures or damage to the nervous system, and the subsequent healthcare costs. To give the advice, blood concentrations of vitamins D, B6, B12 and folic acid are measured. Participants also fill in a short questionnaire developed by Wageningen UR, about how well they stick to the government's dietary guidelines. This score and the blood test results are then used to offer personal dietary advice. This gives people a basis for improving their diet themselves. In 50 percent of all vitamin D blood tests at the Gelderse Vallei hospital, a deficiency is found. Overdoses of vitamin B6 are also quite common.

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PHOTO SHUTTERSTOCK

ENVIRONMENT



PHOTO CORBIS

African vulture in danger

Most species of African vultures are seriously endangered. They are dying, and the main reason is poisoned carcasses. These are increasingly often being put out by poachers who do not want circling vultures to give them away. Because vultures have few offspring, their populations are badly dented by deaths among adult birds. Without vultures, carcasses are more often eaten by scavenger mammals such as wild dogs and jackals, increasing the risk of transmission of diseases such as rabies to humans. These findings were reported by Alterra researcher Ralph Buij and international colleagues in Conservation Letters in June.

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Vegetable gardens expand social network

Allotments in neighbourhoods help residents get to know each other better and make it easier for them to ask each other for help when they need it. They do not always improve relations in a neighbourhood, however.

These conclusions were drawn by Esther Veen in her PhD thesis. Veen studied how different types of kitchen gardens contribute to social relations, and what growing their own vegetables means to the users. She obtained her doctorate at Wageningen University in June.

At a community kitchen garden in which people from a neighbourhood come together, not everyone comes to the garden. It is also common for groups to form among the participants. The municipalities behind urban farming projects and other stakeholders often have unrealistic expectations of them. They would be better off adjusting those, says Veen. 'You don't just cut right through existing social structures with a community garden. It is difficult, too, to bring people from different socio-economic backgrounds together.'

In the case of allotments where people

from different neighbourhoods garden side-by-side, the contact between them is interchangeable, notes Veen. People enjoy having a chat, but it does not matter who with. Nor does the interaction lead to further contact or friendship. On the whole, however, all types of vegetable gardening helped to make people less isolated and widened their social networks.

Veen saw no evidence that people go to a community garden in protest against the current food system or because the garden

offers them an alternative food supply. The main reason people grow vegetables is because they enjoy it, not because they want to change the world. Veen: 'For some people eating from a community garden forms part of a lifestyle in which organic and local produce is important, but that is a more personal consideration.' Rather than access to food, the main reason people get involved in a community garden is to share food and learn about it.

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PHOTO: HOLLANDESE HOOGTE

UNIVERSITY

Most sustainable university

Wageningen University has won the SustainaBul award for the most sustainable university of any kind in the Netherlands for the third time in a row. The institution was compared by students on points such as water consumption, waste disposal, CO₂ emissions and transparency about sustainability. Student organization Students for Tomorrow launched the prize four years ago with the aim of bringing about a change of attitude to sustainability issues in Dutch higher education.

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BREEDING

In-breeding in dogs preventable

Researchers from Wageningen UR have developed a programme with which breeders of pedigree dogs can prevent in-breeding so as to reduce the number of genetic defect such as muscle conditions.

The method has already been applied to a handful of breeds including the golden retriever. It requires dog breeders to collaborate. For long-term success, it is not enough just to look at whether the desired father and mother are related. 'Because if an unrelated male suddenly becomes very popular, you will get an increase in in-breeding again in the next generation,' says researcher Jack Windig. So the simulation programme looks at the whole population. Limiting breeding

to animals with little kinship with any of the other animals in the population is the most effective measure against in-breeding. The study came out in May in *Journal of Animal Breeding and Genetics*.

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PHOTO: ISTOCK

METEOROLOGY

MARINE ECOLOGY

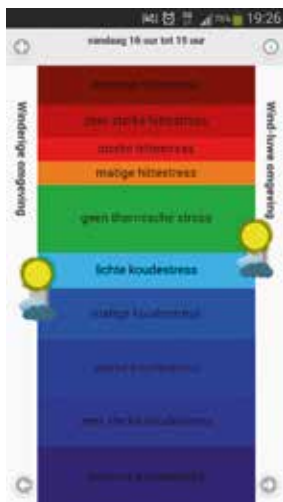


PHOTO: HOLLANDE HOOGTE

App knows how hot you feel

How do you experience a heat wave, or the cold on a clear winter's day? The new app Weerbeleving shows this for any chosen location in the Netherlands.

The free Android app works with colours and symbols and shows up to one day ahead how hot or cold it will feel out of doors. The perceived temperature is expressed in degrees of 'thermal stress'. After some experience the app should be useable for deciding what to wear, for example, or adapting plans to the information. The app was developed by a Wageningen student in collaboration with meteorologists from

Wageningen University. In order to be able to compare different types of weather, the Wageningen researchers used a model of the heat exchange between people and the atmosphere. How a person experiences the weather depends not just on temperature, sunshine, wind and humidity, but also on their own fitness, activity level and clothing.
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NUTRITION SCIENCE



PHOTO: CORBIS

Vegetables in baby food do not create fans

Starting babies on vegetables does not make them grow up to be keen vegetable-eaters. Babies whose first tastes were all of vegetables eat more vegetables in their first year than babies who start on fruit. But the difference has disappeared by their second birthdays, shows the thesis with which Coraline Barends graduated with a PhD on 30 June. But this does not mean there is no point in getting babies used to vegetables, says Barends. 'They have at least benefitted for the 12 months when they ate more vegetables.'

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PHOTO: ISTOCK

Plaice and herring flourishing

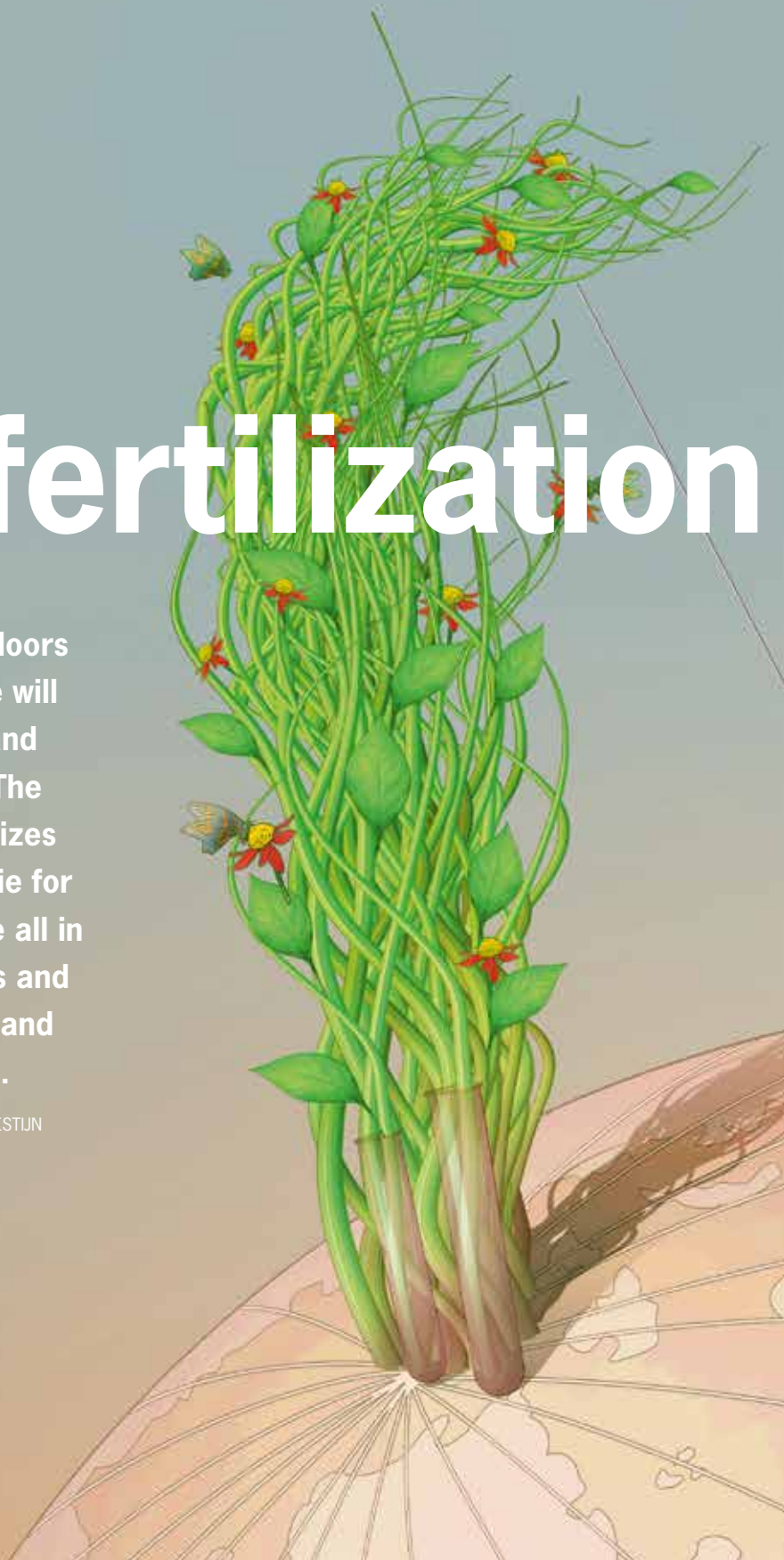
Stocks of plaice, sole and herring are doing well in the North Sea. Cod stocks, however, are making a slow recovery. So says the International Council for the Exploration of the Seas (ICES) in its recommendations to European fisheries ministers on the new catch quota for 2016. ICES bases its recommendations partly on research by IMARES Wageningen UR. Never since estimates of fish stocks began in 1957 has there been so much plaice in the North Sea. The European management plan allows for an increase in catches. The stocks of adult sole have been at a safe level too in recent years. The herring has seen a big population boom, and fisheries are now allowed to catch more of this fish too. Fish species that are still struggling are the turbot and the brill. Cod stocks are only recovering at a slow pace too, in spite of fishing quota. They are now above the minimum necessary to safeguard propagation but the persistently low population growth remains problematic.
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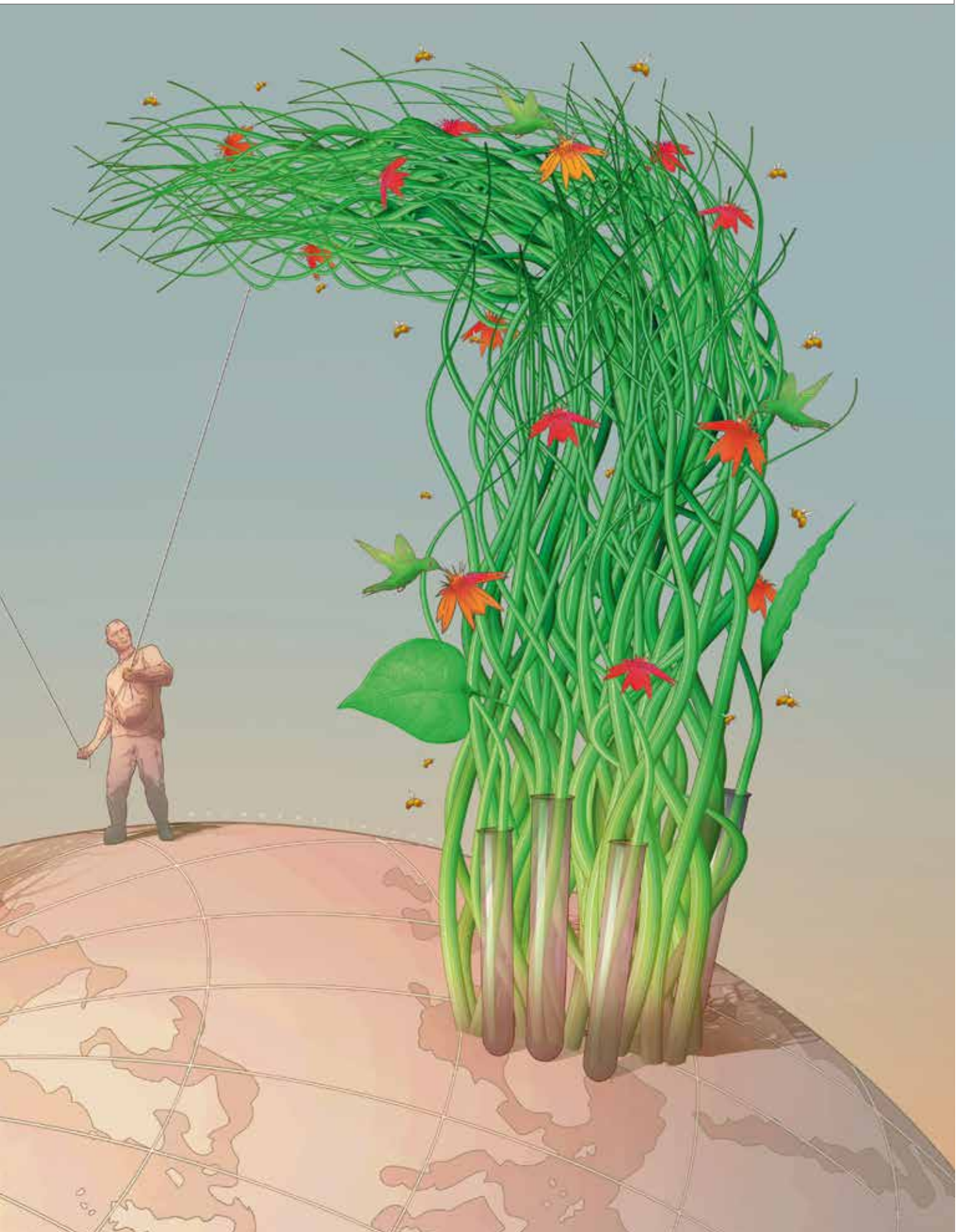
STRATEGIC PLAN 2015-2018

Cross-fertilization

Wageningen UR is throwing its doors open to the outside world: there will be more of a buzz on campus and more dialogue with the public. The new strategic plan also emphasizes where Wageningen's strengths lie for tackling global problems: above all in further integration of disciplines and its combination of fundamental and applied research and education.

TEXT YVONNE DE HILSTER ILLUSTRATION RHONALD BLOMMESTIJN







The Executive Board presented Wageningen UR's new strategic plan in July. The plan outlines Wageningen UR's ambitions and planned course for the period 2015-2018. 'In 2018, when we celebrate our centenary, we want to be even better and more relevant in our domain,' is how Executive Board president Louise Fresco describes the organization's goal. The strategic plan is much more than a piece of paper, stresses Fresco. 'Even more important is the process that has led to this end result. Talks have gone on at all echelons of the organization and with stakeholders, about key developments, existing opportunities and the direction we want to take.' In no way does she see drawing up a strategic plan as a tedious obligation.

LUCAS VOS,
general director at FloraHolland

'Research results are not actively enough presented to plant-breeders'



PHOTO NILS VAN HOUTS

'I thought the working dinner about the strategic plan was a great initiative. It was well run too, so you heard about the different perspectives of those present, from government or other institutions for instance. We don't often get together at this level in the sector to talk about important strategic issues that affect us all. I'd

be happy for Wageningen to organize more of these kinds of meetings; that is value creation too. A meeting about the TTIP trade treaty, for instance, to inform us as a sector and take a stand politically. What I wanted to tell Wageningen UR was to share their knowledge more actively and make suggestions for research. There is a lot of knowledge in Wageningen and the combination of fundamental and practice-oriented research is valuable, but research results are not presented to plant-breeders enough in active and user-friendly forms. At an information evening, perhaps organized jointly with us, researchers could also get topics for further research. That might help to fill the gap left by the Horticulture Product Board now it's been scrapped.'

'The strategic plan must be a living plan'

'Just the path towards it alone has strengthened internal collaboration, the One Wageningen we want to work towards.'

The planning started with extensive consultations in 2014. Discussions were held with groups of students, staff and consultative bodies about the vision, points for attention, business models and how to promote collaboration. The advisory boards of the various institutions in Wageningen UR, the AgriTop50 (the top 50 people in Dutch agriculture selected by sector magazine Boerderij) and the Wageningen Ambassadors were also all asked what they considered to be Wageningen's strengths. A draft plan was discussed over a working dinner. Fresco herself was involved almost from the start. 'It was a coincidence that preparations had just begun when I was appointed president, but it was lucky for me. Now it is my plan too, just as much as everyone else's here within Wageningen.' The same goes for the Executive Board. 'We want to go for this together,' says rector magnificus Arthur Mol. 'In the scientific field the strategic plan offers plenty of scope for exploring new avenues and reaching new depths.'

GOOD TIMING

The timing of the strategic plan is fortuitous. In September the United Nations replaced its millennium goals with sustainable development goals (SDGs), while the Scientific Council for Government Policy referred at the end of last year to the massive global challenge in the field of food supply. Agricultural production is coming up against ecological limits, multiresistant bacteria are emerging due to antibiotics use in livestock farming, animal diseases are being transmitted to humans and many people have unhealthy diets. Then there is the question of the robustness of the food system, and whether it can withstand shocks such as climate change. In the planning phase an analysis was made of the most important issues facing our world: the need for suffi-

cient, safe food and clean, fresh water for the growing world population; the sustainable use of the earth by developing a circular economy; the development and conservation of nature and biodiversity; and climate change. ‘We can see that we’re in a good starting position,’ says Fresco. ‘The SDGs are more sharply focused on our fields of expertise than the millennium goals were.’ So Wageningen UR’s mission remains unchanged. ‘To explore the potential of nature to improve the quality of life’ is still a hugely relevant aim, says Fresco.

COLLABORATION

So that this role can be tackled even more vigorously, there is going to be a greater emphasis on integrating different disciplines. This fits well with developments in science such as the use of Big Data – enormous databases, for example of DNA data in biological research. This emphasis on cross-fertilization is in line with the EU programme Horizon 2020, which says that the major social challenges demand a problem-focused approach bringing together resources and knowledge from different fields, technologies and disciplines, including the social sciences and humanities. For example, to provide people with an adequate supply of safe, healthy food and water you need not just adequate production levels but also a good distribution system, sustainable resource use, and insight into the roles of social context and people’s behaviour in production and consumption. Fresco: ‘That is why we place the emphasis in the strategic plan on strengthening collaboration between the various branches of Wageningen UR. The extent of our interdisciplinarity as an organization is quite unique. Building on that, our aim is to bring the applied and fundamental research closer together, including by involving the staff of our research institutes in the education side.’

The emphasis on improving collaboration has already borne fruit in relation to the subject of water, which is more prominently on the agenda in the new strategic plan. Fresco: ‘On the basis of our One Wageningen philosophy we are looking at getting the institutes and university to join forces in the field of water. We are also holding discussions about research in this area with water research organization Deltares, science organization TNO and the ministry of Infrastructure and Environment.’ Fresco sees more scope for collaboration in the field of biobased research as well.

INGRID JANSEN,

chair of the Dutch union of pig farmers

‘Wageningen’s raison d’être mainly comes from the farmers’



PHOTO NICK VAN ORMONDT

‘I responded to the invitation to the working dinner about the strategic plan because Wageningen UR is an important partner for us and it is important to maintain the connection between the business world and the scientific one. Now that the product boards are gone, you realize how much they did. With the

disappearance of collective funding not only must the sector reorganize itself, but Wageningen must play its new role too. But it is not clear to me yet how Wageningen UR will maintain adequate links with the primary sector in the coming years. The vision in the strategic plan is too abstract for that. Whereas Wageningen’s raison d’être mainly comes from the farmers. Without a strong primary sector the rest of the supply chain couldn’t exist either. I also thought it was a pity that we were invited for a discussion only after the broad lines of the plan had been laid down. If you want to broaden your support base, it might have been more useful to organize a meeting with the primary sector at an earlier stage.’

When it comes to research, Wageningen UR plans to invest in five research areas over the next four years. These themes represent key global challenges in areas in which the Wageningen approach, integrating natural science and social science research, comes into its own. The themes are A Global One Health (health for humans, animals and plants); Resource Use Efficiency (more sustainable and efficient systems of production and consumption); Resilience (of ecosystems and of economic and social systems); Metropolitan Solutions (to enhance the quality of life in big cities); and Synthetic Biology. These investment themes are explored in this issue of Wageningen World.

‘The five investment themes indicate the areas of >



‘Alumni are an important source of feedback’

SIMONE VAN VUGT

who led the consultation process in the Social Sciences Group at Wageningen UR, and has contributed to the contents from the Centre for Development Innovation

‘Our planning process was as participatory as possible’



PHOTO PAUL RIJSTER

‘I oversee a lot of change processes. It is important that we as staff and students work together on the strategic plan and the implementation plan that goes with it, because we are the ones who have to carry it and do the work.’

The planning process was as participatory as possible.

Sitting at a table together

to make a diagram of Wageningen UR’s core themes created openings for getting the various units to look beyond their boundaries. The brainstorming between professors, junior and senior researchers and students generated understanding of each other’s points of view, and brought differences to the surface as well. It is good that partners of Wageningen UR were consulted too. Something that could have made it even better was to have invited parties that have nothing to do with Wageningen UR, such as filmmakers, artists, architects and people from the healthcare sector – for their fresh take on things.’

innovation on which we intend to focus our efforts,’ says Mol. ‘But both social and economic value creation and innovation in education are priority areas too. We are going to further develop new forms of digital education and integrate them better with on-campus teaching. There are also going to be new programmes for top students, such as a research Master’s and honours programmes.’ Mol also stresses that there will be more summer schools and joint Master’s programmes with foreign universities.

MORE DIVERSITY

In fact there is quite a strong emphasis on internationalization in the new strategic plan. This applies both to the content of courses and research, and to staffing. ‘We want to make it easier for international researchers to come and work here,’ says Fresco. ‘A diversity of backgrounds is important, because it generates more ideas and approaches and contributes to creativity. We ourselves would like to work in the countries where there are the best opportunities, countries where a collaborative triad of government, business and knowledge institutions is present. We are working on an inventory of such countries.’ In any case, Wageningen UR aims to strengthen collaboration with strong players in its field in Europe and North America. These include the renowned French agricultural institute INRA, and Cornell University and UC Davis in the United States. Wageningen UR is also eager to strengthen links with alumni. ‘Alumni are an important source of feedback and we notice that they are keen to stay in touch too,’ says Fresco. ‘We want to help set up more alumni chapters overseas. That can be of interest to companies that work overseas in our domain and are looking for staff. I went to China for this earlier this year, for the founding of a chapter. We are also thinking of organizing a Wageningen Day in several countries: a day for both scientific exchange and a festive get-together. We want to celebrate our Founders Day abroad, too, and not just in Wageningen. And then there is the centenary of Wageningen University in 2018. That still seems far away but one thing that is already clear is that we really want to involve alumni.’

Wageningen UR also wants more dialogue with the general public in the coming years, in the same spirit as the consultations with a broad group of stakeholders on the development of the strategic plan. ‘Nowadays it is important that scientists don’t just emerge from

their ivory towers at the end of their research, but work on their contact with the public from the start and throughout their research, sharing the latest scientific insights with the general public is value creation too,' says Fresco. This contact will be called The Wageningen Dialogues. It will mean that researchers don't just publish reports, but that they do other things as well: from making an app to organizing a Food Film Festival to involve people in Wageningen issues. Wageningen UR can also function as a platform, says Fresco. 'You don't always have to have researched everything yourself to be able to say something about a subject or to organize an event related to it. Take the developments around modern genetics, animal welfare and the increasing scale of dairy farms. We are well placed to compare all the scientific data and insights on those topics.' Another

resolution has been made in this respect: to make the campus an even more lively place, with cultural events and debates.'

Since the presentation of the strategic plan in June, work has started throughout the organization on how to go about its implementation. Inspiration dinners are being held on the implementation of the five strategic research themes: how is the research going to be approached, and who is going to be involved in doing it? People have been assigned to take the lead on achieving the objectives for this year. New spearheads will be formulated for 2016. This ensures that the strategic plan is updated every year. That is important too, says Fresco. 'The strategic plan must be a living plan.' ■

www.wageningenur.nl/strategic-plan

SYLVO THIJSEN,

director of nature management service Staatsbosbeheer and chair of the advisory board of the Environmental Sciences Group Wageningen UR

'The basis for innovation is found at the interfaces between disciplines'



PHOTO ERNST DIRKSEN

'It was good that Wageningen UR held consultations within and beyond Wageningen circles. That way you can validate your own line, as an institution. What I drew attention to at the start of the planning process, as a member of the advisory council of Alterra/ the Environmental Sciences Group, was the importance of focus and prioritizing

in relation to potential sources of tension such as rising student numbers, internationalization and more self-supporting research in DLO. In the next few years Wageningen UR needs to set its sights on world-class education and research in the life sciences, and making the most of the interfaces between the various disciplines. Because it is often at these interfaces that you find the basis for innovation and for practical application.'



THEME ISSUE

The Strategic Plan 2015-2018 outlines the course Wageningen UR plans to take in the next four years: its ambitions in the fields of education and research. This theme issue of Wageningen World provides a window into these ambitions in several articles. Coverage includes online education, the development of the campus and relations with alumni, as well as the five research themes targeted for extra investment: A Global One Health, Resource Use Efficiency, Resilience, Metropolitan Solutions, and Synthetic Biology.



Learning to live with bird flu

Bird flu is an unpredictable threat for both poultry farming and humans. But it would be impossible to eradicate the disease; vaccinations are an emergency measure that can only give temporary relief. The Central Veterinary Institute at Wageningen UR is therefore considering a warning system to keep the risks down to a level that is acceptable for both consumers and poultry farmers.

TEXT RIK NIJLAND PHOTO HOLLANDSE HOOGTE INFOGRAPHIC SCHWANDT



‘Having a proper diagnostic test for the bird flu virus and working on the development of a vaccine — that’s our institute’s core business,’ says Ruth Bouwstra, a vet at the Central Veterinary Institute (CVI), Wageningen UR. ‘That will not change but this alone is no longer enough. We will never be able to eradicate bird flu so we will have to learn to live with it.’ That means that different social concerns need to be weighed against one another. Bouwstra thinks a multi-disciplinary approach will be needed then to decide on priorities. One example is animal welfare. The CVI expects consumer pressure to lead to an increase in the number of free-range poultry farms. But the probability of being infected with a bird flu virus is almost eight times higher for these farms compared with farms where the birds are kept permanently indoors. Chickens that roam around outside are more likely to come into contact with infected waterfowl. And that makes it not quite such an animal-friendly option. There have already been two outbreaks this year: laying hens had to be culled on farms in Milheeze and Tzummarum. Not that the virus they found — a mild H5 variant — was particularly dangerous. But European rules stipulate this rigorous approach as a mild bird flu virus can mutate into a more malignant variant.

INTO THE DESTRUCTOR

A more worrying outbreak was in November 2014 when the CVI detected a contagious variant of H5N8, first in Hekendorp and then in Ter Aar, Kamperveen and Zoeterwoude. Hundreds of thousands of chickens were culled. In Barneveld — the heart of the poultry industry — thousands of ducks were slaughtered as a preventive measure because a truck that had also been used in Kamperveen had been on the poultry farm. Bouwstra agrees that these are tough measures. ‘But this does prevent the disease from spreading. We soon had the outbreak under control thanks to our intensive inspections of poultry farms and rigorous measures, whereas the disease has been circulating for nearly a year now in Canada and the USA, where they have less stringent checks. The important thing is to find effective strategies that are acceptable from both a social and an economic perspective.’ The Netherlands has been particularly on the lookout for bird flu ever since 2003, when the highly pathogenic H7N7 was found in Scherpenzeel (also in the main poultry industry area). This avian flu virus had not been seen in the Netherlands since 1926. More than 30 million chickens, ducks and turkeys met their end, either because they became infected or because of preventive culling to

‘There will always
be some risk’

stop the infection from spreading. The disease was not confined to birds: one vet died from bird flu and dozens of preventive workers became ill. H7N7 is far from being the most dangerous variant for humans. In particular H5N1, the variant that so far has mainly been restricted to Asia, has caused the deaths of hundreds of people.

NEW VACCINE

One consequence of the 2003 epidemic in the Netherlands was that 15 million euros was made available for research. In that programme, both the CVI and Utrecht University developed a new vaccine, each for a different bird flu variant. But little can be done in practice with that scientific knowledge in Europe at the moment because the EU has a ban on vaccinations. An individual country can introduce emergency vaccinations but the vaccinated poultry cannot be exported as not all countries are able to distinguish between the antibodies in the blood of vaccinated birds and those in the blood of infected birds. That presents an export-oriented country like the Netherlands with a dilemma: trade or animal welfare? Italy did decide on vaccination in 2003 in order to contain the epidemic.

There are also numerous methodological and practical objections to vaccination. Human flu is fairly predictable as it comes our way during the winter, usually from Asia. But outbreaks of bird flu generally appear suddenly without warning. Given this, how can vaccine manufacturers make sure that there are sufficient stocks of the inoculum — or the vaccine spray in the case of a barn with hundreds of thousands of chickens — for the right virus type? It also takes a few weeks after the vaccination before the birds have built up enough resistance to bird flu. So vaccination is not an option during an outbreak as the virus spreads faster than the resistance created by vaccinating. Vaccinations are regularly carried out in Asia, says Bouwstra. That curbs the spread of the virus, but the effect is limited and only temporary due to low vaccination rates.

Bouwstra also thinks it is an illusion to imagine that preventive measures can stop the disease entering the Netherlands. As the research programme prompted by the 2003 disaster showed, there is a permanent >

BIRD FLU

Infection with an avian flu virus may result in mild symptoms, severe symptoms or even death, depending on the variant. Humans can become infected too occasionally. There is a danger of a new flu pandemic erupting due to the virus being transmitted from the host to humans. Previous pandemics led to the loss of millions of human lives.

Prevention

Bird flu is found worldwide. Since the early twentieth century there have been hundreds of recorded outbreaks among poultry in Europe, Asia, the USA and Africa.

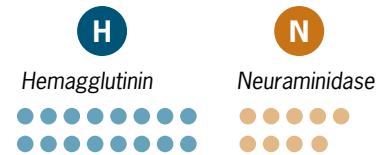
Countries with bird flu between 2010 and 2015



Variants

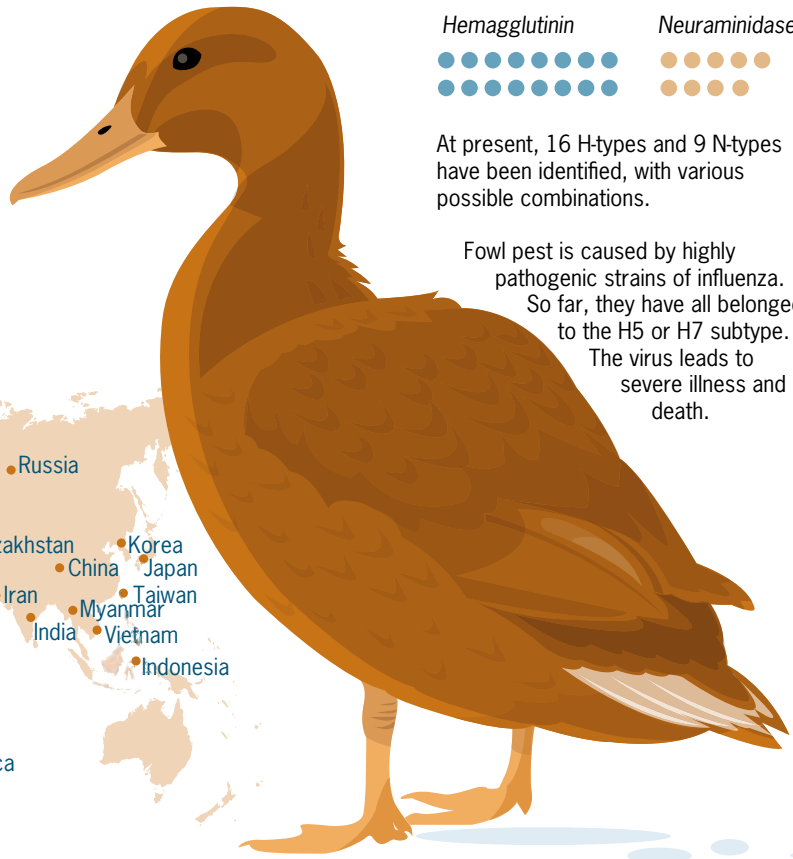
There is a mild form of bird flu and a dangerous form, also known as fowl pest. The mild form can mutate to become the highly infectious variant known as Highly Pathogenic Avian Influenza (HPAI).

Avian influenza virus variants are classified on the basis of the two proteins on the virus surface:



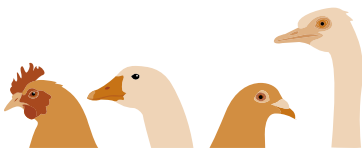
At present, 16 H-types and 9 N-types have been identified, with various possible combinations.

Fowl pest is caused by highly pathogenic strains of influenza. So far, they have all belonged to the H5 or H7 subtype. The virus leads to severe illness and death.



Infection

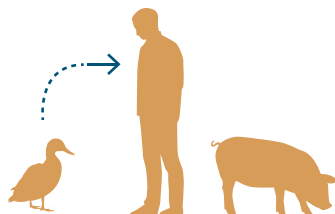
Bird species that can get bird flu are:



Gallinaceous birds (chickens, pheasants, etc.), ducks, geese, swans, pigeons and ratites (flightless birds such as ostriches, etc.).

Infections occur through direct contact with infected birds or materials (feed, crates, vehicles and people).

In rare cases, some variants of the virus, including H5N1, can also infect humans or other mammals such as foxes and pigs, but this is only possible if they come into very close contact with infected waterfowl or poultry.



Pandemic

The transmission of an HPAI virus from infected poultry to humans could lead to a new global flu epidemic (pandemic) as the virus adapts to its new host. That is probably what happened in 1918 with the Spanish flu (about 40 million deaths).

Bird virus genome segments can also mix with a human influenza virus. That could well have been the cause of the Asian flu pandemic in 1957 and the Hong Kong flu pandemic in 1968 (2 to 3 million victims each).

reservoir of bird flu viruses among waterfowl. Those birds might get a bit snotty at most but they can still pass on the disease. The H7N7 in 2003 was probably brought by ducks coming from Siberia. Once the virus had got inside a barn, it turned into a mass murderer. There was circumstantial evidence pointing to wild birds as a source last year too. In the area around the farm affected by H5N8 in Hekendorp, the same virus was found in the droppings of widgeons. An analysis carried out by the CVI showed that this variant came from an H5N8 strain that was circulating in China in 2009 and subsequently spread to South Korea and Japan. According to Bouwstra, that is supporting evidence for the hypothesis that H5N8 was passed on among migratory wild waterfowl in their breeding areas in Siberia and then carried to Europe by migrating waterfowl.

It is not yet clear how the virus took the final step and was actually carried into the Hekendorp farm, which is not free range. Perhaps rodents were responsible, or perhaps the droppings of wild birds were carried into the barn on visitors' shoes.

VIRUS RESERVOIRS

Bouwstra says you can never completely prevent bird flu from getting into Dutch barns. 'We are working with ecologists to see whether you can make the area around poultry farms unattractive for waterfowl. But there will always be some risk as long as those 'virus reservoirs' are flying over the farms. We will need to learn how to live with that threat. Farmers are wondering whether we could prevent the wild birds from entering the Netherlands in the first place but I don't expect broad public support for the mass shooting of wild ducks, geese, swans and seagulls.'

But she says that does not mean we should stand by and do nothing. 'We should work worldwide on improved monitoring so that we know which viruses are circulating in the populations of wild birds. I'd like to link this information to an alarm system that could say: the wind is blowing in that direction in Siberia, or it has been very cold for several days now, so ducks can be expected to fly our way. Then we know what is coming when and we can prepare for it. You could temporarily keep the chickens indoors, for example, and carry out extra checks, especially if a virus like H5N1 is involved that can be transferred to humans.'

The researcher thinks we need to find an approach where the degree of risk incurred is acceptable for various groups in society. Farmers are quite prepared to take even more rigorous hygiene measures, thinks Bouwstra. 'But this has to be practicable. Not everyone

wants to shower ten times a day and change their clothes 20 times. And the financial prospects need to be sufficiently attractive for them to continue farming.' On the other hand, they may need to make concessions to appease consumer concerns. Bouwstra: 'The risk of contamination can be reduced substantially by keeping chickens indoors but that is diametrically opposed to consumers' wishes to have farm animals ranging outdoors as that is closer to their natural behaviour. So we need to weigh up these different viewpoints. And you need more than just veterinary expertise for that.' ■

www.wageningenur.nl/global-one-health



INVESTMENT THEME GLOBAL ONE HEALTH

Countless infectious diseases can be transmitted from animals to humans. Ebola for example comes from apes, Q fever from goats and sheep. The connectivity between the health of humans and animals is termed One Health, explains Wim van der Poel, a researcher at the CVI Wageningen UR and professor of Emerging and Zoonotic Diseases at Liverpool.

'At Wageningen UR we are taking the investment theme Global One Health one step further. We are not just looking at infectious diseases; we also want to keep people healthy in interaction with their environment. A key factor in this respect is the need to have sufficient food and a varied diet, to build up disease resistance for instance, and hygiene, environmental conditions, water and the provision of advice are also important.'

Van der Poel gives the example of type 2 diabetes, a disease linked to consumption habits that is increasingly prevalent in developing countries. 'It is not enough to simply treat the disease. That will not stop the source of the problem; people's behaviour has to change. To achieve this through Global One Health, it is important for different disciplines to work together.'

He says Ebola forced us to face facts in that respect. A focus on nursing and developing vaccines will only get you so far. 'Cultural aspects also play a role in West Africa. People have a lot of bodily contact with the deceased during the mourning process. That exacerbated the epidemic considerably but there was insufficient recognition of this effect and it seems difficult to change,' says Van der Poel. 'We need to produce students and PhD candidates who are used to broad interdisciplinary collaboration.'

Monitor your city

Brazilian secondary school students in the city of Curitiba are going to monitor the air quality in their city using smartphones. In the Dutch town of Ede schoolchildren looked for the hottest and coldest spots in their neighbourhood. Crowd sourcing makes people aware of the conditions in their cities.

TEXT ALEXANDRA BRANDERHORST PHOTO HOLLANDSE HOOGTE

A woman clutching a smartphone crouches beside a tree by the pond in De Dreijen Arboretum in Wageningen. It is 31.2 degrees Celsius, the app on the phone tells her. She walks over to a clump of trees. 'There is a bit of a breeze here, maybe it's a bit cooler.'

The woman is taking part in a workshop on Climate Phone Mapping run by research institute Alterra Wageningen UR. The participants have the use of a smartphone with an antenna where earplugs would normally be plugged in, which functions as a thermometer. The phone is equipped with a special app which stores the measured temperatures and sends them to an online database through a wireless connection. Workshop leader Matthijs Danes of Alterra is doing research on crowdsourcing of spatial data data collection by the general public. In May 2014 Danes got a class of 10- and 11-year-olds at the King David School in Ede to measure temperatures around their school. This enabled Danes to test the lesson materials he developed together

with teachers at the behest of Wageningen University's *wetenschapsknooppunt*, an organization for giving children some hands-on experience of science. 'It was fun to work with schoolchildren. They ran around the

neighbourhood and tried to take measurements for every brick and paving stone,' says Danes. The measurements showed that trees provide a more temperate climate, which means it is cooler on hot days and warmer

'The students become more aware of the importance of clean air'



on cold days. 'That is because vegetation has an insulating effect. We knew that, but this shows you can get the figures on it just as well from schoolchildren,' explains Danes. This Dutch project drew interest from the Brazilian city of Curitiba, which sets great store by sustainability. During a trade mission, Unilivre, a non-profit organization which develops teaching materials on urban sustainability, expressed interest in the project in Ede.

MEASURING AIR QUALITY

In 2016, Alterra will measure the air quality in Curitiba with the help of about 40 students at two secondary schools. 'Carbon monoxide is a good indicator of the volume of traffic,' explains Danes. 'But there is no standard method for measuring carbon monoxide. We want to develop a prototype. We are still figuring out whether to link the meter physically through the audio socket or

the mini-USB port, or wirelessly with Bluetooth. There is something to be said for both solutions. One is cheaper, while the other is more user-friendly.'

Crowdsourcing is a growing trend, especially now that everyone is walking around with smartphones and tablets, and the data can be passed on wirelessly. 'In the traditional research world crowdsourcing was regarded with suspicion because it is often surrounded by uncertainties and you can be sent incorrect data.' But even these data are of value, Danes emphasizes. 'The temperatures may not be precise, but you can still see the relative differences between the hot and the cold spots. What is more, if you get a lot of data, you can filter the inaccurate data out.'

Of most interest to Danes is the way people go about taking the measurements. 'People often have a nose for the hottest and coolest spots in town. Sometimes you don't want average temperatures. If you want to protect the elderly from the effects of heat, the important thing is to know which particular spots they should avoid.'

DO-IT-YOURSELF

Another aim of crowdsourcing is awareness raising. 'Take for example the children from Ede who had lessons from us. They are now aware of the big temperature differences that can be found in a small area as a result of different planning choices, such as paving or vegetation. They also know what steps residents can take to influence the temperature. Maybe later on they won't pave their gardens, but will opt for a nice tree instead,' explains Danes.

This objective plays a big role in the project in Curitiba too. Danes: 'The students become more aware of the importance of clean air and what they themselves can do to ensure it.' Curitiba also wants, with Alterra's help, to set up a system in which crowdsourcing will be a constant source of information about air quality in the city. 'It is very expensive for a city to set up and maintain a detailed monitoring network. So it is nice if the residents themselves collect the information.' ■

www.wageningenur.nl/en/metropolitan-solutions



INVESTMENT THEME METROPOLITAN SOLUTIONS

In 2050 there will be about 9 billion people living on the earth, with 70 percent of them in cities. Several different groups in Wageningen UR are doing research on urban issues. 'The life sciences provide solutions to urban problems relating to heat and drought in cities, flooding, water purification, air pollution, waste, infrastructure, green space and – not to be forgotten – the food supply,' says Carmen Aalbers of Alterra. From now on Wageningen UR will be pooling these research efforts under Metropolitan Solutions, one of the five investment themes in the new strategic plan. 'This makes Wageningen's contribution more visible to the outside world, so that more of the knowledge ends up in the big cities. Within the metropolitan areas, Wageningen UR is working on solutions with governments, businesses, civil society organizations and residents. These collaborations also throw up relevant research topics for Wageningen UR, says Aalbers.

An example can be seen in the Institute for Advanced Metropolitan Solutions (AMS) in Amsterdam, in which MIT in the US, the technical university TU Delft and Wageningen UR collaborate on urban issues. Other examples are projects such as the 'circular city', in which waste is used as a resource, and research on the relation between ADHD in children and green space in cities.





Sugar beet has more to offer

Sugar beets are valuable little natural factories for more than just sugar. Wageningen researchers are trying to extract raw materials from beet pulp for thickeners and soft-drink bottles. 'This will lead to a greener chemicals industry and better prices for farmers.'

TEXT RENÉ RECTOR INFOGRAPHIC ONTWERPSTUDIO GO PHOTO HOLLANDSE HOOGTE



Each year, Dutch farmers harvest more than 6 million tons of sugar beet. Most of the profit from sugar beets comes from the sugar. But that will change if Wageningen UR Food & Biobased Research and Royal Cosun (the parent company of Suiker Unie) have anything to do with it. They want other sugar-beet components to make a bigger contribution to profits. Cellulose and galacturonic acid are two such components.

Sugar beets are very useful. After harvesting, the only parts of the crop left in the field are the leaves. Eighty percent of the biomass is in the beet in the soil and that is processed entirely to produce sugar, molasses, fertilizer and animal feed. Biogas is also produced from the waste products and pumped into the natural gas distribution network. From this point of view, the beet processing industry is an excellent fit with the Wageningen UR investment theme of ‘Resource Use Efficiency’.

HIGH YIELD

But sugar beet has much more potential, which is not yet being used to the full. ‘That’s a pity,’ thinks Jacco van Haveren, Biobased Chemicals programme manager at Food & Biobased Research. ‘The Netherlands is ideally suited to the cultivation of sugar beets, as is the whole of northwest Europe really. No other crop grown here has such high yields in terms of dry matter per hectare.’

Sugar beet easily outdoes other crops such as fodder beet and maize with its 25 tonnes of dry matter per hectare. If you also take the ending of the EU sugar production quota in 2017 into account, which is expected to lead to an increase of 14 percent in Dutch farmland used for sugar beet cultivation, sugar beet starts to look like a very interesting crop for maximizing resource use. That is why Wageningen UR Food &

‘Beet cellulose can serve as raw material for thickeners’

Biobased Research is working with a consortium of companies — coordinated by Cosun — to see if more value could be got out of beets than is the case at present using current applications. The most recent project is Pulp2Value, which started in July this year. A grant of six million euros from the European Biobased Industries Consortium will be used to investigate whether biorefining pulp can increase returns.

CHIPS

Beets are normally peeled, cut into chips and then boiled out. The mushy ‘raw juice’ that results, containing dissolved sugar, is refined to produce granulated sugar and molasses, a kind of syrup that is used in the manufacture of alcohol. The pulp that remains after the raw juice has been extracted is turned into animal feed and biogas. The sugar from sugar beets is used to sweeten processed foods. Sugar from beets can also easily be converted into bioethanol, which can be mixed in with car fuel. But rather than having the sugar end up in car fuel tanks, sugar beets could also be used for applications in higher-grade products, such as plastics.

Petroleum, the traditional raw material for plastics, is gradually being depleted. So >

VERSATILE SUGAR BEET

Sugar beet is not only used to produce granulated sugar but also molasses, fertilizer, animal feed and green gas. The sugar can also be converted into fuel or plastic. New research has also shown that valuable substances can be extracted from the waste product pulp, such as cellulose and building blocks for biobased plastics.



Refining

The beets are processed to produce granulated sugar. The waste products are molasses and pulp.

Sugar



Sugar is used in food products and can also be converted into the fuel bio-ethanol or into products used in the chemicals industry.



fuel



food



PET + PEF

Sugar can be converted into the plastic polyethylene terephthalate (PET), as in the familiar PET bottles. This is not yet viable in practice. However scientists are getting close to the viable production of polyethylene furanoate (PEF), which is very similar to PET.

Molasses



Molasses, a thick syrup, is a by-product of the sugar production process. It is used as animal feed and for the production of alcohol.

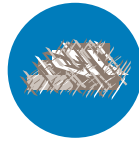


animal feed



alcohol

Pulp



When the sugar is extracted, the pulp is separated off, used in animal feed and converted into biogas. Research is being done to see whether bio-refining the pulp can be turned into a viable option.



animal feed



biogas



PEF

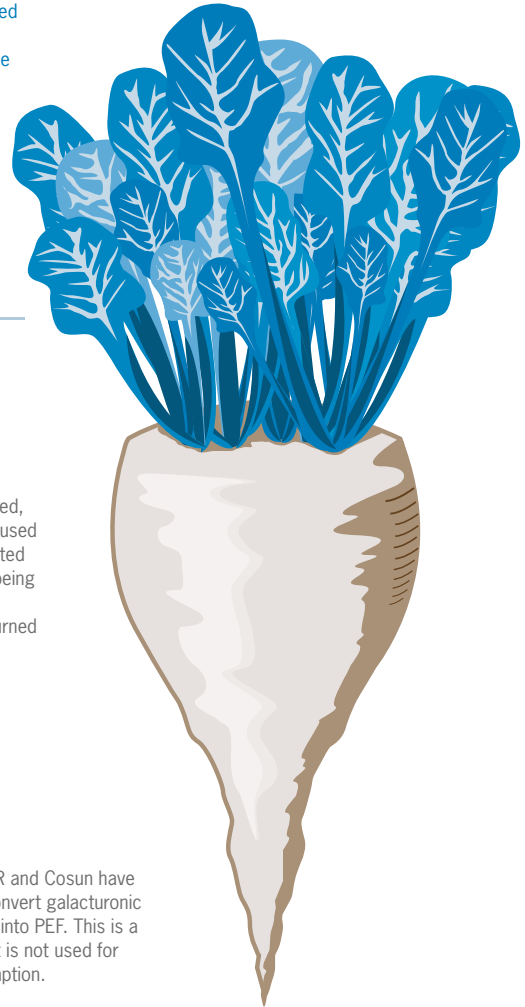
Wageningen UR and Cosun have managed to convert galacturonic acid from pulp into PEF. This is a sugar acid that is not used for human consumption.



Cellulose

Cellulose makes up a third of the pulp from beets. Wageningen and Cosun have managed to extract pure cellulose from it and are now working on scaling this up in the Pulp2Value project.

Sugar-beet cellulose can be used in combination with other polysaccharides as a raw material in thickeners. This allows it to be used as a stabiliser in paint, cement or even detergents.



people are working hard around the world on the alternative option of producing plastics from biomass. Whether such a conversion is economically viable and practicable in terms of the energy use depends on the crop and the end product. Each conversion requires new research. In theory sugar can be turned into polyethylene terephthalate (PET), the plastic used to make most soft-drink bottles. 'You need several steps to convert the sugar into plastic.

It's certainly possible in the lab,' says Van Haveren. 'But the chemical route we've come up with so far consumes far too much energy.'

A more promising option is polyethylene furanoate (PEF), which is very similar to PET. Viable production of this plastic from sugar is possible. However Food & Biobased Research and Cosun have managed in the lab to make PEF from the pulp, the much cheaper waste product. Van Haveren hopes

to develop this technology further and make it an economically attractive option. Gerald van Engelen, general manager of Cosun Biobased Products, is cautious: 'We have learned an awful lot, but scaling up to a commercial production line is a very different ball game.'

Even without the soft-drink bottles, the pulp is still thought to be worth more potentially than the returns currently obtained. Cellulose-like substances make up a third



INVESTMENT THEME RESOURCE USE EFFICIENCY

The expanding world population and increasing scarcity of raw materials underline the need for a new approach to land use and the production and consumption of agricultural products. That is why Wageningen UR has selected Resource Use Efficiency as one of the five themes it will be investing in over the next few years.

'At present we assume in agriculture that we grow a crop for one purpose only. The components of a plant that are not used for that purpose are labelled as waste products,' explains Karin Horsman, Strategy section head within Corporate Education, Research & Innovation. 'The waste products are often used too, as the sugar beet example shows. But we are taking a fundamentally different approach in this investment programme: ideally there would be no waste products at all.' This alternative approach means for example that researchers start from scratch cataloguing the possible uses for all the harvestable biomass in a crop, both in the food industry and in industrial applications, so that all the biomass can be put to good use.

Eventually this could result in different choices being made in breeding programmes. In the case of sugar beets, the focus has always been on maximizing sugar yields. That will remain important but it won't remain the only criterion in the cultivation of sugar beets. New insights within the programme could lead to the cultivation of variants on the existing crops that may yield less of the traditional product but could still be used much more effectively when considered as a whole.

'Making better use of the pulp does not compete with sugar production'

of this waste product. Van Engelen: 'Mention cellulose and everyone thinks of paper, and you could certainly use it for that. Paper's an obvious solution when you extract cellulose from wood, but wood contains a lot of lignin, which makes it more difficult to get pure cellulose from wood. That lignin cannot really be removed except by using large amounts of energy. Sugar-beet cellulose, on the other hand, contains no lignin and can therefore be extracted and processed more easily in products where wood cellulose is too expensive. Sugar-beet cellulose is ideal for combining with polysaccharides as raw materials in thickeners.' Sugar beets could for example soon be used as stabilisers in paint, cement or even detergents.

SCALING UP THE TECHNOLOGY

Pure cellulose can be extracted from sugar beet waste products. Food & Biobased Research and Cosun have successfully demonstrated this in recent years. The aim of the Pulp2Value project is to scale up the technology. Cosun is currently able to produce a couple of buckets of high-grade thickener from sugar beet cellulose in a production line. The plan is to produce it by the barrel next year. If the production process proves to be a success, Cosun intends to set up a production line at the end of the project.

But there is still a lot of work to be done before they get that far. The cellulose has to be removed from the pulp before it can be used as a thickener. 'That is a finely tuned process,' says Van Haveren. 'That's because the cellulose fibres clump together if you try and dissolve them in water. That's a useful property when you are making paper, but here you want to be completely in control of the process whereby you create a suspension of cellulose. So we are still facing a major challenge to get this working properly on a big scale.'

Food & Biobased Research and Cosun are concentrating on the pulp because that is where the big gains are to be made in resource use efficiency. Van Haveren: 'Beet pulp is a great raw material for animal feed, for instance, but that application has its downsides: the financial returns are poor and it does not have much nutritional value for livestock.'

So it's a win-win situation: you make better use of the pulp and there is no competition with the sugar production as this is a waste product. Processing the pulp to produce thickeners is also a good way of getting more value from the pulp than is the case with the current applications. This project should make the chemicals industry a little bit more sustainable and get a better price for sugar-beet farmers.' ■

www.wageningenur.nl/en/resource-use-efficiency

Collaboration on one square

The Wageningen campus is steadily developing into a lively meeting place for researchers, students and entrepreneurs.

TEXT ALEXANDRA BRANDERHORST
PHOTOGRAPHY AEROPHOTO-SCHIPHOL

One are the days when students crossed Wageningen to go between lectures; this summer the university turned out the lights on the Dreijen campus in town. From now on all the research and the teaching will be concentrated on campus. 'We want to promote interaction between research, education and the business world, stimulate entrepreneurship and liven up the campus,' explains Peter Booman, director of Facilities and Services. The campus is one of the cornerstones of the idea of One Wageningen, Booman adds. 'Collaboration in one place where you bump into each other a lot and can work together creatively: that is the basic idea.'

During the day there are lots of people walking and cycling across the campus, but at night it dies out completely. That is set to change in 2016, by which time there will be housing for 400 students, a crèche and a few shops at the Campus Plaza. There is already one meeting place and a student café, and an amphitheatre will be created for outdoor performances. A second sports hall is planned at the Bongerd Sports Centre, which will also be used for cultural activities.

The layout campus has been designed to leave space for business activities. 'In Triton students and PhD researchers can have space for a startup business for next to nothing. If their business grows, they can make use of PlusUltra, which provides facilities for startups as well as a business centre for R&D departments that are too small for a building of their own.

A lot of space has also been reserved on the campus for national and international research partners such as FrieslandCampina, which has located its Innovation Centre here. 'It is not our aim to sell land as fast as we can,' says Booman. 'We only want activities which fit here. Production and logistics, for example, are not in place here. Above all, we want to attract research institutes and R&D departments of large international companies in our research areas. ■

www.wageningenur.nl/en/campus

AMPHITHEATRE, READY IN 2016

With sound equipment and sockets for shows and meetings.

TRITON: STARHUB AND FABLAB.

StartHub: creative breeding place for students. Office and lab space, advice and possibility of microcredit.
 FabLab: fabrication laboratory, a workshop with high-tech machinery.

THE FIELD, 2015: CAMPUS GARDEN

Students and staff can put their gardening ideas into practice here. Next year 100 apple trees will be planted.

FUTURUM: IMPULSE MEETING POINT AND RESTAURANT OF THE FUTURE

A good place for debates, shows and concerts. With a piano. In the Restaurant of the Future, research on consumer choices.

NEXUS

ExpatCenter Food Valley, plus a vaccination centre and student doctor from end of 2015.

1 Lumen and Gaia: Environmental Sciences, Alterra, Isric World Soil Information and the soil museum **2 Forum:** Education building and library **3 Education building** **4 Atlas:** Administrative headquarters, Environmental Sciences, Alterra, the Science Shop and Wageningen International **5 Radix:** Plant Sciences, Plant Research International, Greenhouse horticulture,

mile

HELIX, 2015

Agrotechnology and Food Sciences. When it is ready in October 2015 the last chair groups will move from the Dreijen to the campus.

AMPHITHEATRE OUT OF SAND

Horseshoe-shaped with grass and flowers.

NATURAL WATER GARDEN, 2016:

The original vegetation will be restored here, with grasslands, water and bridges.

CAMPUS PLAZA, READY IN 2016

Student housing, a crèche, shops and catering outlets.

SECOND SPORTS HALL

ready in 2016.

PLUSULTRA, READY END OF 2015.

Facilities and advice for 20 to 40 startup knowledge-intensive companies. With a 'techno hall' by Kadans Biofacilities.

Wageningen Academy, Centre for Development Innovation. **6 Nergena:** Uniform experimental farm, AlgaePARC. **7 Droevendaal:** Organic experimental and teaching farm **8 Actio:** Facilities and Services **9 Axis:** Agrotechnology and Food Sciences, Food & Biobased Research and the Centre for Biobased Economy. **10 Carus:** Animal Sciences,

Livestock Research **11 Innovatron:** Workshop for Agrotechnology and Food Sciences. **12 Zodiac:** Animal Sciences, Livestock Research. **13 RIKILT** **14 De Bongerd Sports Centre.** **15 De Leeuwenborch:** Social Sciences and part of the LEI **16 FrieslandCampina Innovation Centre.** **17 NIOO-KNAW.** **18 Stoas Wageningen – Vilentum.**

WORKING ON A RESILIENT FOOD SUPPLY

Keeping the shelves



Women in Thies, Senegal, conserving green beans for their own use.

filled

The world food supply can be made more resilient to price fluctuations, failed harvests and climate change. Socio-economic models show which investments are the most effective for boosting food security and economic development. 'This is based on trends that are already under way.'

TEXT RENÉ DIDDE PHOTOGRAPHY ROBERTO FAIDUTTI

'Big fluctuations in food prices can be disastrous for sections of the population living at subsistence level. They have no reserves and can be made destitute by sudden and drastic price rises, even farmers who normally have some food themselves,' says development economist Thom Achterbosch of LEI Wageningen UR in The Hague.

And this, Achterbosch explains, poses a threat to food security, the guaranteed supply of sufficient, affordable food. The resilience of food systems in the face of disasters such as failed harvests and price fluctuations depends on a complex interplay of factors. These range from agricultural factors such as soil quality and land use to socio-economic factors such as the standard of living in a country, its public services and the strength of its currency. And then there is the steadily changing climate with the rising sea levels and temperatures it brings with it.

'In a country that is ill-equipped to cope with sedimentation or the exhaustion of farming land, farmers are already facing difficult conditions. Matters are made worse by unreliable weather due to climate change and expanding cities with strongly fluctuating food prices. With all the negative consequences this entails: poor harvests and empty shelves. This can increase tensions between sections of the population and

stimulate migration to the cities or abroad,' says Achterbosch.

Big food security issues are Achterbosch's daily fare. LEI Wageningen UR is working on various models intended to result in scenarios which will help European Union policymakers take more evidence-based decisions for improving world food security. The project is called FoodSecure and aims to combat the often disastrous effects of failed harvests and food losses, thus helping to reduce hunger and undernutrition in the world. The EU spends three billion euros of its annual development aid budget on food security around the world. 'That ranges from emergency aid and agricultural projects to adding iodine to flour, or awareness-raising campaigns about the benefits of breastfeeding,' says Achterbosch. 'On the basis of our models, we shall be offering policymakers instruments with which they can make better choices in developing a long-term strategy for food security for every country in the world. They will be able to choose from a range of different recommendations, such as putting more money and effort into accruing knowledge and strengthening collaboration in agricultural supply chains, removing trade barriers, or improving soils.'

To create a range of these recommended options, LEI Wageningen UR is collaborating on advanced model research with >



American researchers at the International Food Policy Research Institute (IFPRI) in Washington, the Netherlands Environmental Assessment Agency, and the International Institute for Applied Systems Analysis (IIASA) in Vienna. 'For each country or region we propose several possible paths it could take in its development up until 2050,' says Achterbosch.

BRINGING IN MONEY

Commercial crops bring in money with which food security can be improved and the food system can be made more resilient, suggest initial analyses by the FoodSecure project. There is more capital available for investments, which leads to innovation. In the wake of this traders and cooperatives often emerge, promoting further commercialization of the crops.

Take the successful green bean farmers of dirt-poor Senegal, for example. 'Thanks to strong sales by Albert Heijn, Aldi and other global supermarkets, green beans have become a successful export product for Senegal in the last ten years. It is an important cash crop for the country, which offers a way out of poverty,' says Achterbosch. 'But not all farmers manage to meet Albert Heijn's standards. Some families end up landless because they sell their land to the successful farmers.' At the same time, the successful export farming swallows up land that is still being used to grow rice, Senegal's staple food.

On balance, however, the bean farming seems to have been positive for economic development, as more money is flowing into Senegal. 'There is money for artificial fertilizer and better vegetable seeds and rice varieties, which means more food can be grown on less land. Our models show how agriculture and food supply chains could develop in Senegal towards 2050, given the projected food requirements and population growth.'

Driven by the success of the green beans, food supply chains with a wider range of products can grow up around big cities such as Dakar. This is partly due to the emerging

middle class with more money to spend. 'The model highlights promising sectors for supplying protein, such as poultry keeping, beef cattle farming or combinations of these. The poultry sector is booming all over Africa in fact, since it is not land-dependent.' This kind of diversification can improve the food supply all down the line, especially if sustainability criteria are built in. Bean and rice farming must not be allowed to exhaust the soils; poultry farming must not pollute water supplies.

The models could be of interest to the Dutch agrifood sector too, Achterbosch believes. 'There could be breeding programmes for productive cows suited to conditions in West Africa, for instance.' Such developments show up in the results of the models, says Achterbosch: 'We try to forecast these developments up to 2050.' The researchers use statistical methods to try to determine which factors are decisive. What happens to food prices, for instance, is a crucial factor for future agricultural development. It is often suggested that food prices will soar because of the rising world population. LEI Wageningen UR has a different take on this. 'Our estimate is that the food price index will not change dramatically between 2005 and 2050,' says Thom Achterbosch. 'With plausible assumptions about population growth and economic development, projections from a range of models, including our MAGNET model, vary from a fall in prices of 25 percent due to developments on the technical and productivity fronts, to a rise of 50 percent. The latter would mean an annual price rise of 1 percent maximum. We double-check assumptions and uncertainties about



'We can develop a long-term strategy for food security for every country'

this with other model researchers in order to offer policymakers a better service.'

BORDERLINE

Just as crucial are the models which calculate future changes in land use and agricultural systems, such as the rise of livestock farming in Africa. Models which forecast the effects of climate change, too, are combined with the socio-economic and agricultural models. 'We can predict the likeliest trend in land use as well as socio-economic developments given a temperature rise of 2 degrees Celsius, which is already borderline. But we can, if anyone wishes, show what will happen if the temperature goes up by 3 degrees.' On a global scale this latter scenario would probably lead to a decline in agricultural productivity and higher food prices, which would also fluctuate wildly. This would also undermine the self-reliance of vulnerable societies when hit by natural disasters or economic downturns.

The data analysis has already thrown up some surprising outcomes. 'In general, undernutrition goes down in a country when the gross national product goes up,' says Achterbosch. Stunting among children, for instance, goes down by 6 percent when the per capita income rises steadily by 10 percent. 'In Nicaragua, however, a decrease in undernutrition was observed in the absence of economic growth. By contrast, the strong growth in India has hardly been accompanied by any drop in undernutrition,' says Achterbosch. So something else must be going on there. 'The caste system, for example, means the economic growth is unequally distributed.'

Achterbosch and his colleagues at LEI Wageningen UR are also working on ways of integrating what is being called ‘nutritional security’ into the models. ‘Nutritional security is a somewhat clumsy concept which is used to identify the quality of the consumption pattern,’ explains Achterbosch. Besides the simple availability of sufficient calories (food security) the important thing in most countries is a healthy and varied diet without too much sugar or fat: nutritional security.

‘A rise in income of 10 percent leads to a 7 percent rise in overweight among women. It is clear that poor nutritional security can eventually have a negative impact on a country’s socio-economic development, for instance through obesity, cardiovascular disease and diabetes. The models can provide insights into the effects of a changing diet on a country.’ The writing is on the wall in many African and Asian cities where a slightly wealthier middle class has grown up and consumers are exchanging their original rural diet of grains and pulses for meat, sugar and soft drinks.

TIMES OF SCARCITY

Achterbosch thinks his research can really contribute to increasing the resilience and robustness of food systems. ‘Our models can generate insights with which both policymakers in Brussels and individual countries can adapt their agricultural policies. For example, the billions of euros in European development aid funding could be used more for innovation, or the World Trade Organization’s rules could be adapted so that grain keeps on flowing to areas that depend on it even during times of scarcity.’

All this calls for more than just academic knowledge. Achterbosch: ‘The scenarios and models have been discussed with lots of stakeholders such as businesses and NGOs. So this is based on trends that are already under way. It is important to steer them in the right direction so as to reduce poverty and hunger around the world.’ ■

www.wageningenur.nl/en/resilience



INVESTMENT THEME RESILIENCE

Resilience is a crucial quality for natural and agricultural ecosystems as well as for the economy or an individual organism. Resilience determines the response to sudden changes such as technical progress, climate change or socioeconomic developments. This resilience will be one of the spearheads of Wageningen UR’s research in the coming years.

Take pig-farming. Because feed is imported, pig farms have traditionally been located close to harbours. ‘That led not only to environmental and health problems but also to a strong orientation to cost price,’ says Krijn Poppe, research manager at LEI Wageningen UR. The sector also faces criticism focused on animal welfare. ‘The question is whether this system can adapt,’ says Poppe. ‘And in what direction adaptation will go: less meat-eating, a more expensive production process and making meat more expensive, or moving production to areas where the feed is grown?’

Resilience is already an important theme for Wageningen UR in several scientific fields. Many of the underlying principles, such as mathematical and experimental approaches, are universally applicable. Professor Marten Scheffer is one of the people who have made their names with this concept. Poppe: ‘In the first instance the researchers are obviously looking for scientific insights, but there is interest in companies too in gaining a better understanding of how systems can be made more robust. Wageningen UR is working on new interdisciplinary applications of resilience in order to bring more depth and breadth to the research on it.’

Poppe illustrates the complexity of the issue with a story about climate change in Greenland in the Middle Ages, which led to the decline of the Vikings. ‘The cause of that was not just that it got colder. The problem was also at the cultural and institutional level. There was overgrazing, which did not bother the elite because it gave them more power over the farmers. That overgrazing might not have been fatal if the Vikings had learned to eat fish, but strangely enough these seafarers were not fishers. They could have picked it up from the Inuit who were coming in.’

Teaching in front of a camera

Wageningen University is keen on developing forms of education that reach people all around the world and from all social strata. 'There are a lot of misunderstandings about online education but people are gradually starting to trust it.'

TEXT ALEXANDRA BRANDERHORST **PHOTOGRAPHY** AART-JAN VAN DE GLIND

It is very odd, teaching without students. You have to look at the camera but you don't get any response. That took some getting used to at first,' explains Gerrie van de Ven, assistant professor in the Plant Production Systems chair group. She helped develop the online course Future food production: Crops, one of two Massive Open Online Courses (MOOCs) launched this year by Wageningen University. The basics of the course topics are covered in short films and three- to seven-minute presentations using techniques such as animation and voiceover. 'It forces you to take a thorough and really precise look at the material. During a lecture, when you see students frown you can clarify a point: now it has to be clear from the start,' says Van de Ven.

No one on her team had any experience of creating online teaching materials. 'But there was good collaboration with technicians and education specialists. We are now using these films on the Bachelor's programme too, and we've given students here access to the simulation model for crop production.' The material for the other Wageningen MOOC, Nutrition and Health Part 1:

Macronutrients and Overnutrition, is used on the conventional courses too. 'It is such good material, we really have made a great leap in quality,' explains Sander Kersten, professor of Nutrition, Metabolism and Genomics. The diversity of the participants on the MOOC has been a great inspiration to him. Kersten: 'On the forum 600 people from all over the world and all echelons of society introduced themselves. It is fantastic that you can reach all these different groups.'

FREE

The two MOOCs – free of charge except for 50 euros for the certificate – attracted 55,000 people from 196 countries. Most came from the US, Canada, India, EU countries, Brazil and China, says Ulrike Wild, director of Online Learning. About 15 percent of the participants made it to the course, watching the films and obtaining their certificates after getting good test results. These MOOCs are already running again and eight new ones will be launched in 2016. And a Chinese licence has now been obtained to translate them and offer them to Chinese speakers.



September will see the start of the first Wageningen online Master's programmes: *Plant Breeding and Nutritional Epidemiology and Public Health*. The students come once or twice to Wageningen for a short period of practicals and to meet their teachers and each other. The part-time online Master's programme can be completed in four years, but the actual duration depends on how much time the student can make for it. Students from within the EU pay the statutory tuition fees of almost 2000 euros, the same as for a regular Master's course. Students from outside the EU pay 7900 euros,

'The education will still be typically Wageningen: small-scale and interactive'



Video clips for MOOCs, online Master's and other courses are recorded in a film studio in Wageningen.

half of what they would pay if they came to Wageningen for a Master's. Online students get exactly the same qualification as those who take their degree on campus in Wageningen.

Registration has not closed yet, but there are now about 45 students enrolled for the online Master's, reckons director of Online Learning Ulrike Wild. Most of them come from EU countries such as Greece and the Netherlands. 'They are mainly people who combine work and studying. The average age is 31,' says Wild. In their letters of application, some students referred to the Wageningen MOOCs they had followed. Wild: 'The MOOCs are a great advert.'

For the production of all the online lesson material, the university has invested in a film studio at the Dreijen campus in

Wageningen, and in support from multi-media specialists. Teachers go on courses and get guidance from specialists and colleagues such as Cora Busstra of the Nutrition and Disease chair group. In her PhD work, Busstra specialized in developing e-learning modules, and now she helps other teachers make the switch.

NEW WAYS OF WORKING

The online Master's programmes are quite different to the large-scale MOOCs, explains Busstra. In the Master's courses, the short 'knowledge clips' dealing with the essential topics are directly linked to an assignment to help the students actively assimilate the knowledge themselves. Teachers can also use them to test whether the material has come across well. Busstra: 'The teachers had to think up new ways of working. Getting students to make a film clip, for instance, in which they present a research setup they have thought up themselves, or to respond to someone else's idea, or to work on a document in groups.' The students also got the chance to post a question while they are watching an online film – the equivalent of putting your hand up during a lecture. Fellow students and teachers can then answer the question online. 'There are a lot of misunderstandings about online education,' says Busstra, 'one of them being that there is only one-way communication. But people are gradually gaining confidence in it. It will stay typically Wageningen: small-scale and based on interaction and group work.'

The investment in online learning is paying off in the regular education programme too, according to Busstra. Students in Wageningen can pick up the basics at home through the knowledge clips. During lectures, teachers can then provide more in-depth analysis, talk about their own work and supervise students more personally. 'Increasingly, on-campus and online education will no longer be two separate worlds,' expects Busstra. ■

www.wageningenur.nl/online-education



ONLINE EDUCATION

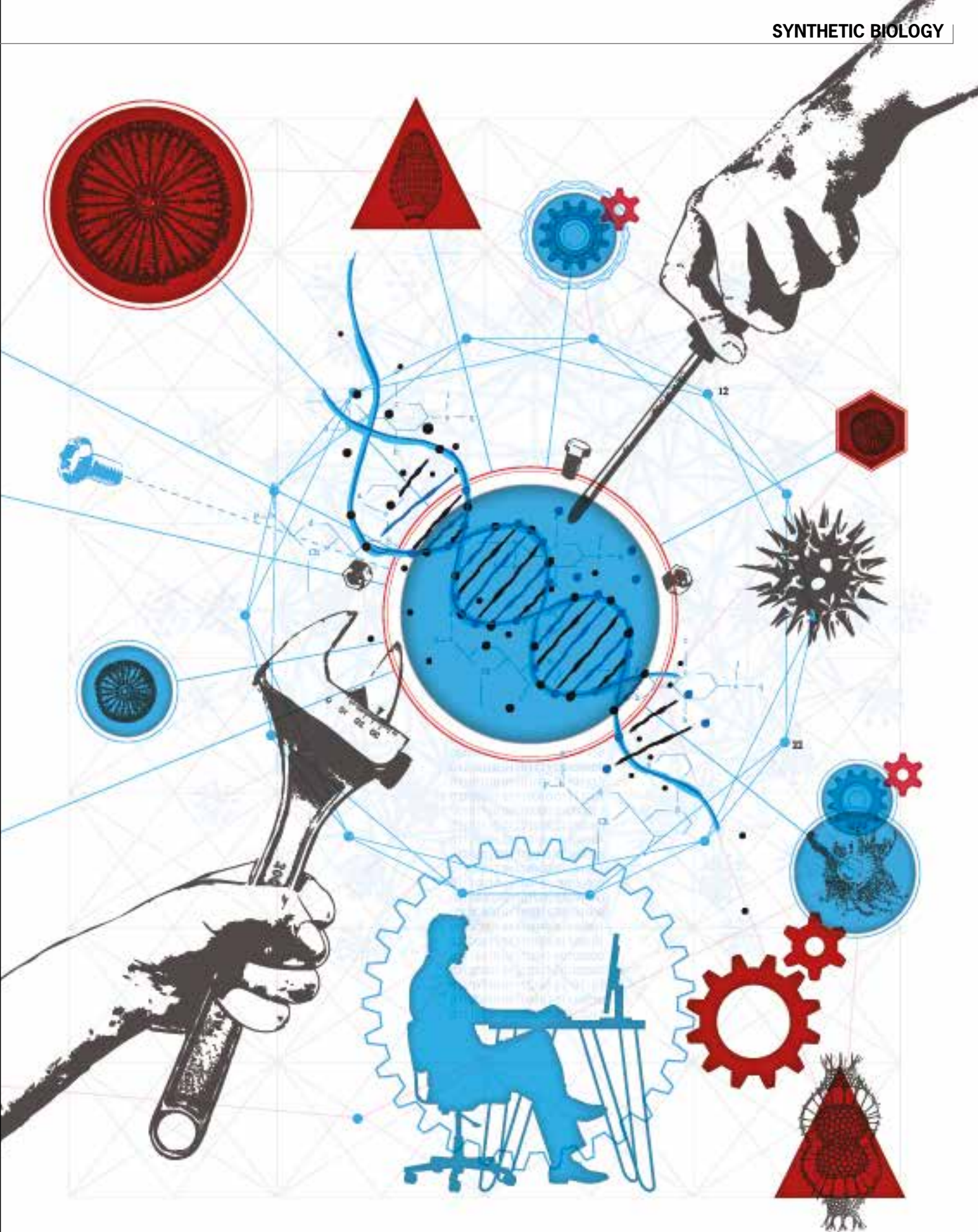
'We want to work towards a cohesive education system, both for students on the campus and for people working elsewhere around the world,' explains Michèle Gimbrère, educational policy advisor at Wageningen University. Four guidelines have been established to safeguard the small scale and quality of the education, even if online student numbers should soar. 'First of all, we approach the student as an active participant and not as a passive observer. Secondly, it is essential that teachers give good feedback. Online learning analytics can support that,' says Gimbrère. 'When 20,000 students take part in a MOOC, it is not difficult to show a student that he or she is in the top 500, in terms of results, or is bringing up the rear.' Another principle is 'learning in communities': creating added value through intensive collaboration with teachers, fellow students and professionals in the field. Finally, says Gimbrère, it is important to aim at diversity because students come from all sorts of different backgrounds and have different priorities. 'You can meet that by enabling people to plan out their own paths through the course.'



Organisms on the drawing board

Yeasts which can make colouring agents, stripped-down bacteria which produce pesticides: synthetic biologists are getting life to do their bidding. They are designing and manufacturing useful, living systems and cutting out superfluous genes.

TEXT MARIANNE HESELMANS ILLUSTRATIONS KAY COENEN





There is a yeast stored in a Wageningen UR freezer that has something in common with a grapefruit. It can use sugar to manufacture naringenin – one of the compounds that give grapefruits their bitter taste.

The same yeast is stored in a freezer at the technical university TU Delft as well. This is because it was made by Wageningen plant scientists and Delft microbiologists together. The Wageningen scientists developed the DNA for naringenin based on plant genes, while the microbiologists helped the yeast DNA to adapt so that the yeast could start producing this phytochemical efficiently itself. A yeast that can make phytochemicals could have its uses. It could make companies manufacturing flavourings and colourings less dependent on variable harvests.

Dirk Bosch, Synthetic Biology research team leader at Wageningen UR, refers to this piece of plant DNA for naringenin as a standardized ‘biomodule’. A company

‘Twelve PhD students spend all their time modelling and are never in the lab’

could combine this module with others, such as one which makes the yeast grow faster, or which converts sugar on receiving a particular signal. ‘Just as you design parts of a car and combine them to get the car you want,’ says Bosch. He even talks in terms of a ‘chassis’ which biomodules are attached to – in this case the yeast from Delft.

Terms such as ‘biomodules’ and ‘chassis’ are common parlance in the discipline known as synthetic biology. Synthetic biologists like to compare themselves to

engineers who build cars, bridges or boats. They do not design and manufacture steel or plastic products, but useful living systems. These can vary from bacteria which manufacture plant substances to healthier bowels and little glass sheets with cells which light up when exposed to certain flavourings.

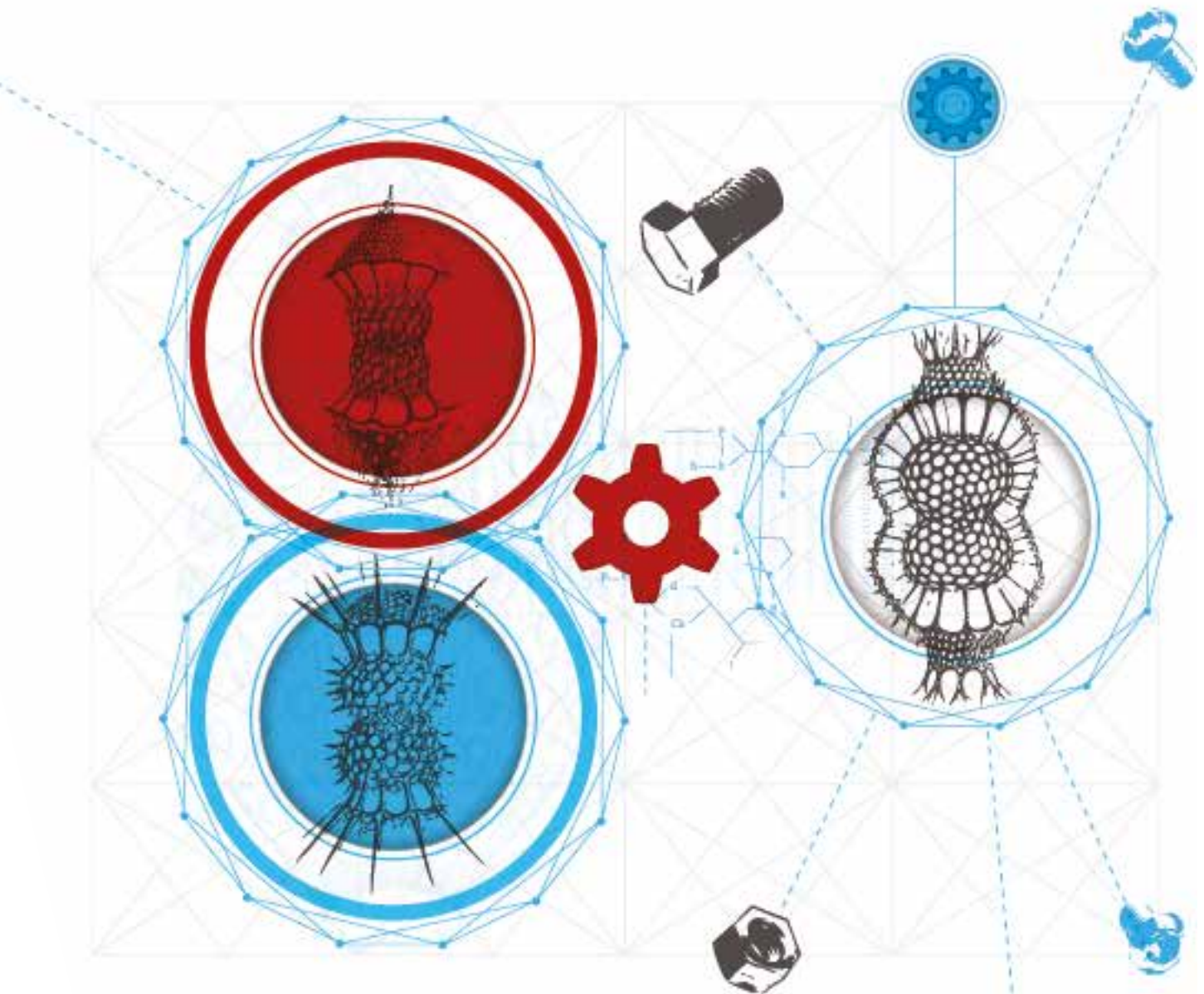
MILLION TIMES MORE

Typically, synthetic biology entails designing modules and organisms on the computer before they are actually created. The production process is therefore more systematic than the biotechnology of the past, which had a bigger element of trial and error. This means that expectations run high. Of the performance, for example, of bacteria and fungi which produce enzymes for making bioplastic out of maize waste and beet leaves. The new approach could enable them to produce a thousand or a million times as much enzyme per reactor tank, bringing down the price of the enzymes. This would make it more attractive for companies to stop using petroleum-based plastics. In view of the potential of this engineering approach, Wageningen UR has included synthetic biology as one of the investment themes in its strategic plan. ‘Synthetic biology is not at all the same thing as genetic modification,’ emphasizes Vitor Martins dos Santos, professor of Systems and Synthetic Biology at Wageningen University, who leads this investment theme together with Dirk Bosch. ‘Genetic modification is a matter of introducing a couple of genes, seeing whether it works and then trying

LIGHT-EMITTING TONGUE DOES TASTE TEST

The cells or organisms which synthetic biologists tinker with are usually destined for a reactor. But there are many other possibilities. Dirk Bosch of Plant Research International shows a simple rectangular glass slide in his laboratory. ‘You can make an illuminable tongue with this,’ says the researcher. Working with Dutch firm Micronit Microfluidics, he developed a prototype for the fast detection of certain flavourings in, for example, a new variety of tomato or bell pepper. For laboratories this entails channelling juice through tiny little canals on the slide, upon which illuminable mammal cells betray the presence of flavourings. This is possible due to cells placed on the

slide which have been given two genes. One is for a receptor from the human tongue or nose (there are 350 odour receptors in the nose). This detects flavouring X, Y or Z, depending on the type of receptor. On detection of the flavouring, the second gene emits coloured fluorescent light. This biological system with its different receptors was first designed on a computer. ‘An optical tongue like that also helps us understand which flavourings and aroma compounds people like best,’ says Bosch. ‘Because it is every bit as sensitive as a taste panel. It turned out that the human testers and the optical tongue stopped being able to taste Tabasco at the same dilution.’



a better idea. We are working on the basis of systems biology, using analysed data and computer models. When you understand the system you can write the building instructions. Then you can model and influence the system so that it does what you want. That is engineering.'

STRANGE CREATIONS

The term synthetic biology came over from the US about 12 years ago. There, a group of young professors, among them mechanical engineer Drew Endy and microbiologist Jay

Keasling, launched the now popular iGEM competition. The prize goes to the student team which builds the most useful, original or well-functioning organism based on bio-building blocks of their own design. Student teams have come up with the strangest organisms for this competition. Cells which light up when a pathogen appears on the kitchen counter, and bacteria that can stuff themselves with iron. Last year a Wageningen team came second out of the 245 teams with its BananaGuard, a bacterium which targets and attacks >

the destructive banana fungus *Fusarium oxysporum* in the soil.

Synthetic biology means a lot of computer work. Martins dos Santos shows a diagram illustrating the carbon metabolism of a bacterium. This diagram is used by researchers for modelling. It includes about 1000 genes and enzymes, all linked by arrows. A diagram like this comes with a calculation model, created by modellers and bio-informatics scientists. 'Twelve of my PhD students and three post-docs spend all their time modelling and are never in the lab,' says the professor. They look at what happens 'in silico' in a computer simulation if gene A starts working five times as hard, or gene B is switched off. Do you get more product? Don't you get too many by-products? The results give people ideas for an improved design.

CHANGING BACTERIA


Martins dos Santos has just acquired two EU projects worth 16 million euros between them. Of that funding, 2.2 million will go to Wageningen. In one of the two projects, *Empower Putida*, his team is going to change the bacterium *Pseudomonas putida*. This adapted bacterium will then be put into enormous reactors where it will convert sugar into the raw materials for bioplastic and bioenergy. These include isobutanol and *n*-butene, compounds which can currently be made more cheaply from petroleum. *P. putida* bacteria with other built-in modules will use sugar to produce new pesticides such as the potentially powerful herbicide tabtoxin. Wageningen UR is working on this in collaboration with four other European scientific institutions and four companies, including the German corporation BASF and the Spanish multinational Abengoa.

The professor's story is full of engineering terms such as 'reprogramming', 'biofactories' and 'model-driven design'. 'Linking up biomodules is not the same as building something with Lego, of course,' says Martins dos Santos. 'It's about biology, so


the modules often work differently in one system compared to another. But at the same time, bacteria or yeasts are somewhat comparable to factories.'

To be able to predict the effect of interventions in these living factories, the synthetic biologists aim for simple organisms. In nature, *Putida*'s genome consists of 5500 genes. But for production purposes many pieces of DNA just get in the way: these include 'jumping' DNA fragments which move randomly through the genome, and genes for flagella, the hairs bacteria use to propel themselves along. So in a previous EU project the group already removed 15 percent of the genome.

The modules are then built into the 'stripped' bacterium. One of the EU team's aims is to design a module which will let the bacterium grow without oxygen. Oxygen disrupts the functioning of some enzymes that are essential to the production process. A second module that is under construction speeds up the growth of the bacteria and then makes it concentrate solely on making the desired molecule. The signal for this can be light. Researchers led by microbiologist Willem de Vos are creating gut bacteria with light receptors for various wavelengths such as red and blue. So a company will be able to link a module for 'react to blue light' with one for 'stop growing'. And one for 'react to green light' with one for 'now make isobutanol from sugar'. This makes it easy to steer microbial processes. 'You build



Once you understand
the system you can
write the building
instructions'



modules in collaboration with many research groups,' says Martins dos Santos. 'That is another interesting aspect of synthetic biology.' The Wageningen groups working on this have joined forces in the Wageningen Centre for Systems and Synthetic Biology (WCSB).

ETHICAL ISSUES

The members of the centre will be doing more than just practising hard-core science. They will also be addressing such questions as: is a new bacterium safe? Is it permissible for the industry to describe flavourings made by yeasts as 'natural'? How do you make sure poor farmers don't suffer as a result of the new production method? Public acceptance of the new technology will also be studied.

Henk van Belt, assistant professor of Applied Philosophy, works on these kinds of social and ethical questions. One of the most important issues, in his view, is who gets access to synthetic biologists' research results. Patents could strengthen the concentration of power in industry, and concentration of power is one of the reasons genetic modification is unpopular with many NGOs. So Van den Belt is monitoring how synthetic biologists around the world patent their products.

'You see two tendencies,' says the philosopher. 'The group of professors behind the iGEM student competition has an explicit strategy of keeping basic modules accessible

in a 'Registry of Standard Biological Parts'. But we are also seeing that most groups are patenting biomodules.' This could lead to opaque 'patent clusters', he comments. There are hundreds or even thousands of patents, for example, on the fluorescent reporter proteins which are used a lot. This is not a problem for academic researchers and teams of students, because patent holders can't be bothered to pursue it if they use these proteins anyway. But for small businesses it can be problematic, says Van den Belt. They don't have the money, for instance, to find out who owns which patent. Or the patent-holder might refuse them a licence, which increases the concentration of power. The Wageningen synthetic biologists do patent some discoveries, but not all. It is expensive to hold on to a patent and defend it if necessary, explains Dirk Bosch. So the decision depends on questions such as: do we need to recoup the investment? How many licence applications can we expect? And how easy is it to bypass the patent?

MAKING DRUGS

That synthetic biology can work is clear from the production process for artemisinin, an antimalarial drug. Artemisinin was harvested solely from the plant *Artemisia annua*, or sweet wormwood, until the aforementioned American Jay Keasling and his team managed around 2005 to get baker's yeast to make a miniscule amount of the drug. They did this by building in DNA for artemisinin production which they had designed on the computer. They hoped to use the yeast to make the production of artemisinin cheaper and more stable – less dependent on unpredictable harvests of *Artemisia*. The Bill and Melinda Gates Foundation put 40 million dollars into this pilot project and biotechnology company Amyris stepped up production. After many simulations and trials with new yeasts, Amyris succeeded in getting 25 grams of artemisinic acid per litre of end product, which is at least 1000 times more than the couple of micrograms the yeast was produc-

ing at first. Last year pharmaceutical firm Sanofi-Aventis produced 16 million courses of treatment with artemisinin from yeast. There is a success story in the Netherlands too, partly thanks to Wageningen UR. Until recently, orange flavouring (valencene) could only be obtained using large quantities of orange peel. Since last year the Dutch company Isobionics has been marketing orange flavouring manufactured by *Rhodobacter* bacteria in reactors. The company aims to produce at least 1500 kilos of valencene this year, enough to give 90 billion litres of fluid a fresh orangey taste. For commercialization Isobionics has applied for a patent on the valencene research by Wageningen UR. The company hopes to become less dependent on orange peel, which is not always available in sufficient quantities.

'Using synthetic biology, reactors can be made which respond fast to new demand,' predicts Bosch. Demand from an ice cream producer, for example, who suddenly needs a lot more orange flavouring in the summer. A company such as Isobionics wants to be able to deliver the goods quickly. Another example would be a company that produces vaccines and wants to be able to respond immediately to an epidemic. Or a factory which converts crop waste into bioplastic and gets maize stalks one week and grass or beet leaves the next.

With all these different demands and seasonal changes, it is useful to have flexible biological systems which can produce whichever product is needed. Bosch: 'That is why we and the technical university of Delft have made that yeast which produces naringenin, which is used as a base in colourings, flavourings and anti-oxidants. Biomodules for various products can be combined with the module for naringenin.' Light receptors in the yeast could be of help here. Green light: orange flavour. Blue light: orange colouring as well. Red light: grapefruit flavour. But that is a long way off still. ■

www.wageningenur.nl/en/synthetic-biology



INVESTMENT THEME SYNTHETIC BIOLOGY

Our knowledge about how cells, genes and enzymes work is growing fast. Microscopes are improving, chemical techniques are becoming more precise and methods of calculation are getting faster. Research consortiums, too, are getting bigger and more effective. Between them they have already mapped out the DNA of thousands of micro-organisms, hundreds of plants and dozens of animals.

All that information, stored in databases, offers more scope for synthetic biology: the systematic design and manufacture of living systems. Algae or yeasts, for example, which efficiently make products such as pesticides and vaccines, or fats and proteins for the food industry. Or biosensors which monitor water for toxic substances.

In view of synthetic biology's massive potential, Wageningen UR has made the discipline one of its five investment themes. Extra investment is aimed at increasing the chances of collaboration with research groups abroad. Natural and social scientists will also be joining forces to study the ethical and social implications of the new technology. What is life? How can the scientific world and society together ensure innovation is ethical? Coordinator Vitor Martins dos Santos: 'We shall engage in dialogue with groups in society in every project.'

ORGANIC AGRICULTURE SCIENTISTS 13 YEARS ON

Going all out for tasty, fair food

They were among the first batch of students doing the Organic Agriculture degree course. Now Loes Mertens is breeding vegetable varieties for the organic seed company De Bolster. Fellow student Janne Mulders is now a lecturer on food at Amsterdam University of Applied Sciences.

TEXT ALEXANDRA BRANDERHORST PHOTOGRAPHY HARMEN DE JONG

‘These are my babies,’ says Loes Mertens pointing to a large group of tomato plants, ranging from cherry and snack tomatoes to large fruits. Some plants tower above the rest while others have lots of foliage. ‘We are cross-breeding plants with a single stem and plants with multiple stems to get a double cluster. I’m also cross-breeding to develop resistance to fungal infections and we are working on improving flavour and reducing the amount of foliage because all those leaves are a nuisance for growers. You have to go through a lot of stages – plant breeding is a lengthy process.’ After Mertens graduated in Organic Agriculture in 2010, she got a job with the organic seed and plant breeding company De Bolster in Epe. She learned about plant breeding from the owner Bart Vosselman, who obtained a doctorate in genetics in Wageningen. ‘Once during the first year, I ended up in tears in the greenhouse. I thought I would never get the hang of it,’ recalls Mertens. Now she is a fully fledged

plant breeding specialist. ‘The key in plant breeding is intuition and enthusiasm.’ In the winter she mainly spends her time writing up trial results and observations from the growing season. She also devises new breeding plans for such vegetables as tomatoes and broccoli. The next round of planting, selecting and cross-breeding starts in the spring. Mertens also maintains contacts with growers and consumers and she gives guided tours and talks. She still has strong links with Wageningen. In 2013 she was involved in the launch of the Farm Experience Internship, a summer school in which internships on organic farms are organized for students. Mertens made the ‘Sustainable Young 100’ in 2013, a list of 100 young sustainable movers and shakers. Fellow student Janne Mulders is equally enthusiastic about her work. Since 2013, she has been teaching the Nutrition and Dietetics degree programme at the Amsterdam University of Applied Sciences. ‘Students surprise you every day. In the

morning you come in and everyone is alert.’ In the first year students have to develop new healthy snacks and put together a healthy menu, working in groups. ‘That involves trend analysis, consumer research, nutritional values and marketing & sales.’ Our students often win prizes in the Netherlands Nutrition Centre’s Bachelor Awards,’ she says proudly.

TOPICAL ISSUES

She also teaches first-years about topical issues in global food production, such as animal welfare, food safety, the environment and genetic modification. ‘That’s quite tricky, as first-years are still very focused on what is in the food and what it does to their own body. But it is important that they realize what impact our food has and that a hype here, such as eating quinoa, can lead to food scarcity or water shortages elsewhere.’ Mulders, who grew up in Haarlem, started studying Nutrition and Dietetics in Amsterdam herself. ‘But I realized in the



‘We are able to achieve high yields with minimal resources’

first year that I’m not the kind of person who wants to end up telling people how many sandwiches they should eat. Yet I did want to do something with food. I’m a real foodie and I love eating well.’ At an open day in Wageningen, there was a comparison of organic vegetables with conventionally grown vegetables. Organic vegetables were slower to turn mouldy. ‘I found that difference intriguing but also logical. That’s

when I decided to study organic agriculture,’ explains Mulders.

Organic Agriculture was a new degree programme and Janne Mulders was one of the first batch of students. ‘That gave a lot of freedom while the lecturers were still feeling their way. There were eight of us to start with, a small but very diverse group,’ says Mulders. The transition to Wageningen worked out fine. ‘You can e-mail the >

LOES MERTENS

Age: 30

Studied: BSc and MSc in Organic Agriculture, 2002-2010

Works: Plant breeding specialist for organic seed company De Bolster in Epe



‘Teaching always fills me with enthusiasm: that’s true riches’

JANNE MULDER

Age: 33

Studied: BSc Organic Agriculture + MSc Applied Communication Science, 2002-2010

Works: Lecturer at the Amsterdam University of Applied Sciences, field of Exercise, Sports and Nutrition

professors personally and it is easy to make friends. Unlike Amsterdam, it doesn’t matter what you look like.’

Mulders and Mertens used to help out with open days and were actively involved in the Ecological Agriculture Study Association (StEL). Organic agriculture was still relatively new back then. ‘Some students went around in T-shirts that said: “Organic is not logical at all,”’ says Mulders. Mertens:

‘When I decided to study organic agriculture, people questioned whether there was any work in that area.’

Loes Mertens grew up in Arendonk, a little town in Belgium just over the Dutch border. She wanted to do something with nature and the environment. When she attended an open day in Wageningen, she was immediately won over by the international ambience and open atmosphere. However, she started

THE ORGANIC AGRICULTURE DEGREE PROGRAMME

Since 2004, 221 people have obtained a Master's degree in Organic Agriculture, most of them since 2012. There is no data yet on the jobs these alumni are doing. The Organic Agriculture Bachelor's degree was taught from 2001 to 2006. The qualification was obtained by 24 students, who went on to do various follow-up studies.

The number of Master's students has grown steadily over the years. They now come from a range of Bachelor's programmes, such as Biology and Plant Sciences. In August 2015, Organic Agriculture had 122 Master's students. Another 30 or so students will be joining in September.

Source: KLV Alumni Network and Plant Sciences, Wageningen University.

to have doubts during the first year of her Environmental Sciences degree. 'It is a pity that you spend most of your time in Environmental Sciences on how to clear up the trash,' is how Mertens puts it.

CROSSING THE SAHARA

Then she spent six months travelling across the Sahara to Senegal in an old Land Rover with a friend; they passed through areas with abundant food and water but also areas with very little of either. 'Then I realized that I wanted to do something with agriculture because food production is relevant all over the world. Organic was an obvious choice for me; I was already a vegetarian who ate organic products.'

Mertens started on the Bachelor's in Organic Agriculture in 2004. In 2009 she went to the university in Viçosa, Brazil for her final thesis on soil fungi in coffee plants. The university was part of a powerful agro-ecological movement, along with NGOs and farmers, that advocated non-polluting, fair agriculture and the emancipation of smallholders. 'I found the conviction and commitment of the researchers and students very inspiring.' After that she worked as an intern for the Louis Bolk Institute, a centre of expertise for sustainable agriculture, where she interviewed seed potato growers and plant breeders about potato breeding in the Netherlands. She was impressed by the enthusiasm with which plant breeders worked on their crops. This was also how she met De Bolster's Bart Vosselmans, who offered her a job while she was still working on her thesis. After Janne Mulders had completed her Bachelor's, she chose the Master's in Communication Science so that she could combine communication and organic farming. For her final thesis, Mulders looked into

which regional products were being sold in Amsterdam and where.

She did her internship in Bra, Italy, at the University of Gastronomic Sciences, the home of the Slow Food movement, which promotes traditional, local food cultures. 'If you buy tomatoes in the market in Italy, they ask you whether you need the tomatoes for a soup, a sauce or a salad. In the Netherlands we choose beautiful, glistening tomatoes in the supermarket that we then use for everything.'

In the Netherlands, Mulders buys most of her food from the supermarket and the Turkish greengrocer. 'I like the convenience but the most important thing to me is that the food should taste nice, so I'm quite selective. What I harp on about is that people should know where the food comes from and what route it had to take to end up on their plate. Then it's up to them what choices they make.'

ENTHUSIASM

After graduating, Mulders worked as a policy officer for the arable farming product board (which has since been abolished) and subsequently for the industry organizations for supermarkets and nutritional supplements. 'I never really felt at home in these jobs. Teaching on the other hand always fills me with enthusiasm: that's true riches.' At the Amsterdam University of Applied Sciences, she is setting up a network centred on food with the aim of linking up local events and initiatives, education, research and the business community. 'Amsterdam is a pioneer when it comes to food trends and the debate on food. We would like to tap into that.' Her personal life will also be undergoing a major change soon as she and her husband are expecting a baby.

In the past few years, Loes Mertens has become increasingly convinced of the need for organic farming. Some people say you will never be able to feed the global population that way, but we are able to achieve high yields with minimal inputs. To give an example, traditional pumpkin breeding at De Bolster has resulted in a doubling of yields with less fertilizer. A lot of the knowledge, technology and social innovation has spread to conventional agriculture too, such as minimum tillage, organic pest control, short supply chains and consumer information.'

ARM-WRESTLING

De Bolster, Mertens points out, is one of the few organic seed and plant breeding companies in the Netherlands. Multinationals in the conventional sector are increasingly patenting properties that other breeding companies also work with and that are found naturally in plants due to their genetic diversity. 'It's a kind of legal arm wrestling. It's not about the facts, it's about power. I feel unfair tactics are being used to sideline the little companies. That is a real threat for De Bolster too,' says Mertens. She feels a great affection for the company. Even so, Mertens will be moving to inland Portugal at the end of the year where she will be joining a group of people setting up a self-sufficient organic farm. 'It costs ten times as much to buy land here. And Portugal is a wonderful country with lots of potential.' The plan is to have a cooperative that is also involved in seed cultivation and breeding. 'I've learned at De Bolster how to make something like that succeed and how to scale it up. It is also a personal challenge. I have a comfortable life here in the Netherlands but I'll have to stretch myself there.' ■

UNIVERSITY FUND WAGENINGEN: A ONE-STOP SHOP FOR ALUMNI

Strengthening ties

What can the university and alumni do for one another? That will be the question driving Wageningen University's efforts over the next few years to further strengthen ties with alumni at home and abroad.

TEXT YVONNE DE HILSTER PHOTOGRAPHY HARMEN DE JONG

Alumni can help Wageningen UR fulfil its ambitions and contribute to its success in science and in society, says Wageningen UR in its new strategic plan for 2015-2018, which was presented in June. The university will therefore be investing more in its contacts with alumni. 'All of our graduates are really ambassadors for Wageningen,' says Delia De Vreeze. De Vreeze started out as the head of alumni relations and funds in 2011. As of 1 September, she is heading up the University Fund of Wageningen (see text box), the new organization responsible for maintaining relations with alumni and members of KLV Wageningen Alumni Network and raising funds. 'Nearly all alumni have fond memories of the university. KLV, our alumni society, has quite a lot of members too when compared with other universities.' The term 'alumnus' covers more than just

students whose study in Wageningen resulted in a Bachelor's or Master's degree or PhD. People who have been on a course at Wageningen International (or the International Agricultural Centre before that) feel equally involved, says De Vreeze. 'If you go to an alumni gathering in Indonesia for example, you'll see former course participants as well as alumni with a BSc, MSc or PhD. That makes Wageningen unique compared with other universities.'

KEEPING IN TOUCH

All organizations that maintain contacts with alumni merged their operations as of 1 September: the university's Alumni Relations and Fundraising department, the Wageningen University Fund (WUF) and the KLV office have combined in a new organization under the charge of the Wageningen Foundation (UFW). The aim

is to have better coordination between the different activities.

The merger will mean that from now on alumni will get just one invitation for activities such as the World Lectures, alumni group meetings, a new KLV course or information about which students were awarded a sports scholarship by the Niels Smith Fund. In the past, alumni found it confusing because they would be sent information, letters asking for donations and requests for support several times a year from various parts of the organization.

There will be other changes too for alumni resident abroad. We have already started setting up alumni chapters in various countries similar to the regional alumni groups in the Netherlands. The Dutch groups organize meetings several times a year with the support of the Alumni Office. These meetings cover topical themes in a Wageningen domain and are held at an appropriate location in the region.

Now that increasing numbers of international students are graduating from Wageningen, many of whom then move back abroad, the number of former students living outside the Netherlands who keep in contact with Wageningen for work and personal reasons is growing. Wageningen UR itself also wants to keep in contact with these graduates as they form an important network for its international strategy in the areas of research and education.

The University Fund of Wageningen is also in charge of managing the funds and acquir-

MORE COHESION

KLV is the oldest of the three organizations that are now collaborating within the University Fund of Wageningen Foundation (UFW). This society, which was established in 1886, is a network of Wageningen graduates and other professionals who have an affinity with Wageningen. KLV offers career support, such as affordable courses, and contributes to the dialogue with society, for example through its World Lectures.

The university's Alumni Office organizes activities for all alumni, including the alumni group activities and the reunions. The third partner, the Wageningen University Fund, manages various funds set up to support students and staff at Wageningen UR, and raises money for that purpose.



‘Our social value could be so much greater’

Delia de Vreeze, head of the new foundation University Fund Wageningen.

ing financial support, for example for the Anne van den Ban Fund, which supports students from abroad during their studies at Wageningen University. That is part of a long tradition, says De Vreeze. ‘Even the old national agricultural college had funds to enable poor students to continue their studies.’

PIONEER

According to De Vreeze, the Anne van den Ban Fund has been a pioneer in fundraising activities. ‘By paying more attention to building relationships and publicizing the impact of donations, it has managed to obtain not just little gifts but also more regular donations and larger donations, from alumni and even from people who

never studied here.’ The Food for Thought campaign in 2010 was groundbreaking in that respect, says De Vreeze. It raised 15.5 million euros, most of the money coming from people other than alumni. Together, the donors have enabled innovative research to be carried out that could not have been financed from the usual funds. The University Fund Wageningen is now working on preparations for a follow-up campaign. De Vreeze says, ‘The objective is still to encourage innovation, but this time it doesn’t have to be research; it could also be innovative teaching methods, contributions to the dialogue with society or activities on campus. We hope to reach people without direct roots in Wageningen again by publicizing the value to society of innovative

research and the importance of these kinds of funds at a time when the government is cutting back funding.’ Companies can also use the University Fund of Wageningen to demonstrate their corporate social responsibility by contributing to research, says De Vreeze. The fund will also be making and maintaining contacts with international foundations that finance research – this is a specialist task that researchers often do not have enough time for. In a pilot for the Plant Sciences Group, this approach resulted in funding for several research projects. ‘The impact of our activities on the outside world, our social value, could be so much greater,’ says De Vreeze. ■

www.wageningenur.nl/universityfundwageningen

UNIVERSITY

Alumni recruit international students

Each year, Natalia Piñeros Arenas from Colombia gets South American students thinking about studying in Wageningen. ‘Wageningen is a fantastic university and the town is relaxed and safe.’

International alumni all over the world promote Wageningen University as an option for students. Natalia Piñeros Arenas (Leisure, Tourism and Environment, 2010) has been doing this in the Spanish-speaking countries of South America ever since 2011. ‘I visit international education fairs, give a lot of talks to organizations, universities and grant providers and keep in contact with students.’

Piñeros Arenas was asked to take on this task just before she returned to Colombia after getting her Master’s. ‘I said “yes” because I didn’t want to lose contact with Wageningen. My time studying here changed my life. Wageningen is a fantastic university and the town is relaxed and safe.’



PHOTO GUY ACKERMANS

This work also has the advantage of being easy to combine with my consultancy projects in sustainable tourism in Colombia.’

Piñeros Arenas says she enjoys the personal contacts. ‘Talented students and alumni often thank me for my help.’

NETWORKS

Wageningen alumni get together in Singapore

Kees-Jan van Wees (Agrarian Economics, 1989) and his wife Danielle van Wees (Human Nutrition) have organized the first alumni meeting in Singapore, with the support of the Alumni Office in Wageningen. Kees-Jan, who works in the country for FrieslandCampina, says the idea came when they met two other Wageningen alumni at a drinks party. ‘That basically never happens. The Dutch people in Singapore have usually studied at other universities,

partly because the financial sector and oil industry are so big here, not the primary domains of Wageningen graduates. We were curious to see whether we could find more Wageningen alumni.’ Eventually a group of six got together in June. They included the Indonesian Yemima Budirahardja, who works at the University of Singapore.

It was very informative and sociable, says Kees-Jan, even though they had not known one another in Wageningen, in part because

of the age differences. ‘You still have something in common, a shared background: the university, the town where you lived, the anecdotes.’ They will be meeting up again at the end of the year, with each person bringing along a new Singapore-Wageningen alumnus.

Wageningen University’s Alumni Office is keen to support initiatives to bring alumni together. For more info, contact alumni@wur.nl



From left to right: Jeroen Koppes, Kees-Jan van Wees, Danielle van Wees, Yemima Budirahardja, Edwin Bontebal, Joep Kleine Staarman

WAGENINGEN IN THE WORLD!

Greetings from the North Cape

Barry Beemsterboer (Food Technology, 2011) packed a copy of Wageningen World in his suitcase when he took a camper van trip round Lapland. Along with his warm Wageningen hoodie, because the North Cape can be cold even in June. It was light too: the sun never set and was already climbing again in the sky by half past midnight. Beemsterboer works as an R&D technology expert for Döhler Holland, which manufactures fruit juice concentrates and related products.



FUNDS

Old gown for a good cause

When evolutionary biologist Arjan de Visser was looking for a second-hand gown at a small academic gown factory, he found a suitable one from the 1960s: the gown that belonged to Rommert Politiek, emeritus professor of Animal Breeding, who passed away in 2014. 'He turned out to have made an agreement with the company that the person who bought the gown had to donate a sum of their own choosing to the Anne van den Ban Fund,' says De Visser, who be-

came a professor holding a personal chair at Wageningen University in March. The Anne van den Ban Fund supports students from developing countries during their studies at Wageningen University. 'I didn't know about the fund even though I did my PhD in Wageningen. But I thought it was a nice idea and I made a donation.' The heavy woollen gown was shortened slightly and given new fasteners. De Visser particularly likes the idea of giving the gown a new lease of life.



PHOTO GUY ACKERMANS

Professor Arjan Visser in the academic gown that belonged to former professor Rommert Politiek.

NETWORKS

Alumni gathering in Museum Boerhaave

The Hague/Rotterdam alumni group will be organizing a gathering in Museum Boerhaave in Leiden on Thursday, 22 October. Executive Board President Louise Fresco will also be there. She is the guest curator of Foodtopia, an exhibition on view at the museum until January 2016. Fresco selected ten auspicious food innovations for the exhibition. Joszi Smeets, the director of Youth Food Movement, will also be speaking. Go to www.wageningenur.nl/en/alumni for information and to register. The page also has information on other alumni activities scheduled for the autumn.

REUNION

1965 and 1990 reunions

Each year, Wageningen University invites alumni back who started their degree 50 years ago or 25 years ago. This year, it is the turn of students who matriculated in 1965 or 1990. The reunion for the students from 50 years ago is on Friday, 16 October while the students from 25 years ago will have their reunion on Saturday, 31 October. Please feel free to pass on this message about the reunions to others in your year as the university does not have contact details for everyone.

www.wageningenur.nl/50yearreunion and www.wageningenur.nl/25yearreunion.

ANNIVERSARY

Debate and party for zootechnical scientists

What can livestock farmers do to help deal with the global challenges in the area of animals, people and the environment? That is the question at the heart of the meeting that the Dutch Zootechnical Association is organizing to celebrate its 85th anniversary. The anniversary programme, on 5 November in Wageningen with rounds of debates, a buffet dinner and a party, is open to anyone who is interested.

Info: www.nzvnet.nl/lustrum-2015.

Rien Bor, Marketing director for International Education at Wageningen UR, has retired. He had worked for Wageningen UR for more than 40 years, the last 15 years recruiting international students. 17 June 2015.



PHOTO GUY ACKERMANS

Rien Bor

Prof. Harro Bouwmeester, WU Horticulture 1985, professor of Plant Physiology at Wageningen UR, has been awarded an Advanced Grant of 2.5 million euros by the European Research Council (ERC) for research on signal molecules in plants. 2 July 2015.

Prof. Paul van den Brink, WU Environmental Protection (water purification) 1992, has been appointed professor holding a personal chair in Chemical Stress Ecology in the Aquatic Ecology and Water Quality Management Group. 1 June 2015.

Dr Tammo Bult, WU Zootechnics 1991 and director of IMARES Wageningen UR, has been appointed president of EFARO, a European association of directors of institutes involved in fisheries and aquaculture research. 20 June 2015.

Edo Dijkman MSc, WU Land-Use Planning Sciences 1997, has been appointed director of education for Animal Husbandry and Management of the Living Environment at the HAS University of Applied Sciences Den Bosch. 1 December 2014.

Dr Jan Dijkstra, WU Zootechnics 1987, associate professor (personal chair) and researcher in the Animal Nutrition Group at Wageningen University, has received the American

Feed Industry Association Award 2015 from the American Dairy Science Association (ADSA). 20 June 2015.

Prof. Alfred Hartemink, WU Soil and Water 1992, has been appointed head of the Department of Soil Science at the University of Wisconsin-Madison, USA. 1 July 2015.

Han Elbers MSc, WU Domestic Science 1986, has been elected chairman of the board of Alliantie Voortgezet Onderwijs, a group of secondary schools. 1 September 2015.

Maarten Hollemans MSc, WU Animal Sciences 2014, has been awarded the NZV thesis prize by the Dutch Zootechnical Association (NVZ) for his thesis. 4 June 2015.

Frank Jorna MSc, WU Zootechnics 2000, director of the Secure Feed Foundation, has been sworn in as a member of the governing committee of Wetterskip Fryslân (the water board for Friesland). 30 June 2015.

David Kleijn PhD, WU Plant Breeding 1992 and associate professor (personal chair) in the Resource Ecology Group at Wageningen University, has been appointed professor of Plant Ecology and Nature Conservation. 1 July 2015.

Prof. Arthur Mol, WU Environmental Protection (water purification) 1985, has been appointed Rector Magnificus and a member of the Executive Board. He succeeds Prof. Martin J. Kropff, who became the director general of CIMMYT in Mexico on 1 June. 28 May 2015.



PHOTO GUY ACKERMANS

Arthur Mol

Liesje Mommer PhD, (WU Biology 2000, has been awarded a Vidi grant by the Dutch Organization for Scientific Research (NWO) for research for five years. Mommer has also been appointed professor holding a personal chair in the Plant Ecology and Nature Conservation group. 1 June 2015.

Prof. Tinka Murk, WU PhD 1997, has been appointed professor of Marine Animal Ecology at Wageningen University. 15 July 2015.

Reindert Nijland PhD, University of Groningen Molecular Genetics 2002, assistant professor in the Laboratory of Phytopathology at Wageningen University, has received the Van Leeuwenhoek Award for postdocs, a research award from the NVMM and KNVM microbiological societies. 14 April 2015.

Johan Osinga MSc, WU Land Development 1988, has been appointed the new provincial secretary and general manager of the province of Overijssel. 1 May 2015.

Prof. Wim van der Putten, WU Biology 1984, professor of Functional Biodiversity within the Laboratory of Nematology and head of department at the Netherlands Institute of Ecology (NIOO), has been appointed a member of the Royal Netherlands Academy of Arts and Sciences (KNAW). 13 May 2015.

Francisco Rossier PhD, WU PhD 2010, has been appointed the new director of Wageningen UR Chile. 1 July 2015.

Prof. Ruerd Ruben has been appointed professor by special appointment in Impact Analysis focusing on food security within the Development Economics Group at Wageningen University. 1 June 2015.

Prof. Ynte Schukken has been appointed professor by special appointment in the Management of Farm Animal Health from

PERSONALIA

an epidemiological perspective within the Quantitative Veterinary Epidemiology at Wageningen University. Schukken has also been appointed professor of Sectoral Organized Animal Disease Control at Utrecht University, with effect from 1 May 2015. 1 June 2015.

Gert-Jan Steeneveld PhD, (WU Soil, Water and Atmosphere 2002, has been awarded a Vidi grant by the Dutch Organization for Scientific Research (NWO) for research for five years. 1 June 2015.

Daan Swarts MSc, WU Molecular Life Sciences 2011, PhD researcher at the Laboratory of Microbiology at Wageningen University, won the Seed Prize, a research award from the NVMM and KNVM microbiological societies. 14 April 2015.

Prof. Jacques Trienekens, WU PhD 1999, professor of Supply Chain and Network Management at Wageningen University, has been appointed professor holding a personal chair. 2 July 2015.

Naiara Valcarlos MSc, WU Landscape Architecture and Planning 2014, working as a landscape architect, has received the Folkert Hellinga MSc Award 2015 from the Land & Water Network for her thesis 'Murmur of Limits'. 7 May 2015.

Dr. Bram de Vos, Delft University of Technology Physics 1985 and WU PhD 1987, has been appointed general director of the Environmental Sciences Group, one of the five science groups within Wageningen UR. 1 September 2015.

IN MEMORIAM

Mr A. Bakker MSc, WU Tropical Forestry 1954, passed away at the age of 86. 4 May 2015.

Mr R.H.J.G. Bennink MSc, WU Rural Economics 1965, passed away at the age of 75. 21 May 2015.

Mr W.A. Blokhuis PhD, WU Forestry 1956, passed away at the age of 88. 6 February 2015.

Mr H. Bos MSc, WU Zootechnics 1958, passed away at the age of 85. 24 March 2015.

Ms M.L. Bouwhuis-Hoogerwerf MSc, WU Horticulture 1964, passed away at the age of 81. 1 May 2015.

Mr T.E.J.L.W.B. de Bruin MSc, WU Tropical Plant Breeding 1952, passed away at the age of 93. 21 April 2015.

Mr A.B.H. Drielsma PhD, WU Soil and Fertilization Sciences 1965, passed away at the age of 76. 18 February 2015.

Ms J.N. Duvekot-Heringa MSc, WU Horticulture 1949, passed away at the age of 92. 31 May 2015.

Mr H.D. Frinking MSc, WU Tropical Plant Breeding 1965, passed away at the age of 79. 19 April 2014.

Mr J.J. de Graaf MSc, WU Land Development 1970, passed away at the age of 84. 4 June 2015.

Mr H. ter Haar MSc, WU Agricultural Plant Breeding 1954, passed away at the age of 87. 1 April 2015.

Mr A.J. Hendriks MSc, WU Zootechnics 1983, has passed away.

Mr L.C.M. Hermens MSc, WU Tropical

Forestry 1955, passed away at the age of 89. 19 April 2015.

Mr N. Hogenboom PhD, WU Horticulture 1965, passed away at the age of 77. 17 June 2015.

Mr K.C. Kolhoop MSc, WU Economics 1952, passed away at the age of 86. 29 March 2015.

Mr G.J. Koopman MSc, WU Land Development 1953, passed away at the age of 90. 5 June 2015.

Mr J. Luitjes PhD, WU Tropical Forestry 1947, passed away at the age of 98. 10 June 2015.

Mr M. Miedema MSc, WU Agricultural Plant Breeding 1957, passed away at the age of 81. 10 March 2015.

Mr T.A.J. van Oosterhout MSc, WU Economics of Agriculture and the Environment 2001, passed away at the age of 38. 20 March 2015.

Ms M.G. Ootjers MSc, WU Forestry 1976, passed away at the age of 69. 16 May 2015.

Mr J.H. Peltjes MSc, WU Zootechnics 1961, passed away at the age of 80. 1 June 2015.

Ms L.M.J. Peters-van der Burgt MSc, WU Food Technology 1999, passed away at the age of 38. 22 July 2015.

Mr L. Razoux Schultz MSc, WU Tropical Plant Breeding 1955, passed away at the age of 89. 27 May 2015.

Mr J.M.G. Roebroek MSc, WU Agricultural Plant Breeding 1955, passed away at the age of 90. 20 April 2015.

Mr M.W. Sabelis PhD, WU Phytopathology 1975, passed away at the age of 65. 7 January 2015.

Mr A.B. Schopman MSc, WU Agricultural Plant Breeding 1947, has passed away.

Mr E.H.D. Smit PhD, WU Tropical Plant

Breeding 1961, passed away at the age of 87. 16 December 2014.

Mr G.V. Spanjaard MSc, WU Agricultural Plant Breeding 1974, passed away at the age of 66. 20 March 2015.

Prof. J.H.J. Spiertz, WU Agricultural Plant Breeding 1967, passed away at the age of 74. 21 May 2015.

Mr L.S. Spithost PhD, WU Agricultural Plant Breeding 1956, passed away at the age of 89. 20 April 2015.

Mr F. Stienstra MSc, WU Tropical Rural Economics 1951, passed away at the age of 91. 13 April 2015.

Mr J.P. Thijssse MSc, WU Agricultural Plant Breeding 1956, has passed away.

Mr J.M.H. Timmers MSc, WU Rural Sociology of the Western Regions 1963, has passed away.

Ms P.E. Tjon-Kon-Joe MSc, WU Food Technology 1988, passed away at the age of 52. 1 February 2014.

Mr L. Troost MSc, WU Agricultural Plant Breeding 1947, passed away at the age of 94. 6 May 2015.

Mr A.H. Ubbens-van Veen MSc, WU Agricultural Plant Breeding 1945, passed away at the age of 93. 16 October 2010.

Mr H.N.F. Vermeulen MSc, WU Landscape Architecture 1981, passed away at the age of 65. 3 August 2012.

Mr F.V.J.M. Voncken MSc, WU Tropical Land Development 1962, passed away at the age of 81. 9 April 2015.

Mr W.J. van der Wal MSc, WU Agricultural Plant Breeding 1948, passed away at the age of 96. 13 July 2015.



KLV gives new impetus to public debate



Anniversary symposium KLV 2011 'How to feed our world?'
Photo: Guy Ackermans

Wageningen alumni are socially engaged and like to discuss current issues with each other. Alumni Association KLV is responding to the wishes of its members and will give the Wageningen debate a new impetus. This autumn the first 'KLV Impetus' activity will take place.

"One important reason why alumni are members of KLV is what we refer to as 'the Wageningen feeling': a mix of idealism and sustainability that focuses on the added value for society", says KLV board member Jannemarie de Jonge. KLV has held numerous discussions with its members to determine the pathway towards KLV2020. A clear wish that emerged from this process was the desire to become more involved in the public debate. And with that Wageningen feeling in mind this is hardly surprising thinks Jannemarie. "But another important factor that played a role in this was the very positive response to our anniversary symposium in 2011. That style of meeting generated an appetite for more."

New forms of discussion

Consequently the board committed itself to writing a policy memorandum entitled 'Public dialogue and debate'. The policy memorandum was submitted to KLV members at the AGM in June and the responses to it were positive. KLV will now start with two new activities. The first is a regular (probably biannual) congress in the style of the anniversary symposium. The second is KLV Impetus, an activity that will directly respond to current issues.

KLV Impetus - which will start later this year - is a new formula. The concept: to realise an in-depth discussion about a current issue within four weeks. That could

take place anywhere in the Netherlands. For example, a debate about the earthquake issue could take place in Loppersum, suggests Jannemarie. And with this approach KLV Impetus would also distinguish itself from other KLV meetings. "The 'Wereldlezingen', for example, always take place in Wageningen, are organised much further in advance, and are always about topics that we can anticipate beforehand."

Cross-fertilisation between generations

How will you ensure that KLV Impetus will be interesting for all members? "To start with we want to work more with social media and video clips. We might even

use a livestream so that a meeting can be followed anywhere. We will also look for ways to make the activity more interesting for younger members and students, for example, by making a topic or how it is presented provocative and exciting. Young KLV does a lot, especially in the area of improving skills. So they are most definitely involved in the association, but they have their own programme. And in the public debate we want to encourage a cross-fertilisation between generations: how does the new generation view the subject and what do members of the older generation think about it based on their experience? The older members in particular, have indicated that they find such cross-fertilisation useful. This activity could therefore provide the opportunity for an interesting dialogue.”

Topics for and through members

Jannemarie hopes that members will also be willing to suggest topics. “If somebody says: I think this is a good topic then the staff at our office are available to organise it. So it is for and through our members.” Which issues will we discuss? “Issues like animal diseases or food safety will probably be on the agenda. However, there could also be a debate about the call by the Netherlands Organisation for Scientific Research (NWO) for members of the public to submit topics for scientific research. That call received more than 10,000 responses. It is a typical example of the interaction between knowledge and society. And I think it would be interesting to discuss how you as an alumnus can deal with this. Such a debate would be a direct response to a current issue, would demonstrate how approaches change, and would provide plenty of material for a discussion about how you can respond to the issue.”

Congress is mainly about meeting each other

The second new activity, the congress, has not been elaborated to the same extent yet but it should be organised within two

years. It will have a very different setup from KLV Impetus. “The congress will reach far more members than KLV Impetus. If 15 people come to a KLV Impetus meeting then you can have a really good session, especially if you also transmit this via livestream. At a congress, however, there is a far greater emphasis on meeting each other, exchanging ideas and interaction. Furthermore, a whole day provides far more opportunities to elaborate a theme than a KLV Impetus debate. And it allows the use of many more different formats.”

Listening to members

KLV Impetus and the congress are concrete outcomes of the new course of KLV. “Due to the cooperation with, for example, the Alumni Relations & Funds Department of Wageningen University it is important that KLV chooses a clearer profile: where does the added value for our members lie? Dialogue and interaction emerged as important elements for all of our members and so these now form one of our main pillars. We can see that dialogue in a growing number of areas. For example, Louise Fresco, President of the Executive Board of Wageningen University, called for more public dialogue during the opening of the academic year 2014/2015. Therefore the university is also searching for ways of realising a stronger public debate. This is a widely supported wish and so we are working hard to realise concrete activities in this area as soon as possible.”



Jannemarie de Jonge.
Photo: Wouter Jan Strietman

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)

24 September

SKOV seminar ‘EU and Dutch policy in Sub-Saharan Agriculture. *Refugees, peace and development policy*’

24 September

Science Café - Sports and nutrition

13 October

Young KLV - CV writing course

15 October

Kennisnetwerk Milieu - Symposium Ecosystem Accounting

16 October

Reunion, Wageningen University invites the alumni who began studying 50 years ago (1965)

22 October

Science Café - Novel antibiotics

31 October

Reunion, Wageningen University invites the alumni who began studying 25 years ago (1990)

18 November

Young KLV - CV writing course

26 November

Science Café - Sports and nutrition

26 November

Young KLV - To do a PhD, pleasure or burden?

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



PHOTO: JORIS VAN ALPHEN

Expedition to a cradle of evolution in Malaysia

Dozens of researchers from Belgium, Malaysia and the Netherlands discovered 160 new species in two weeks of exploring on the Gunung Kinabalu, a 4095 metre-high mountain in Malaysian Borneo. The Kinabalu is a cradle of evolution, as the researchers' publication this summer in *Nature* makes clear. On its slopes and summit live thousands of species of plants, animals and

fungi found nowhere else in the world. The researchers discovered that the unique species are younger than the mountain itself and that they have evolved from ancestors that already preferred cold conditions. Lisa Becking, marine biologist at Marine Animal Ecology, Wageningen UR, was on the team. She is actually a coral reef specialist but she loves working with

terrestrial biologists who share her interest in the processes underlying biodiversity. So Naturalis Biodiversity Center in Leiden asked if she would help organize an expedition to Borneo. Becking is worried about the unique species on the mountain. 'Our study shows that these specialized flora and fauna do not easily adapt to a drastically changing climate.'
 Info: lisa.becking@wur.nl