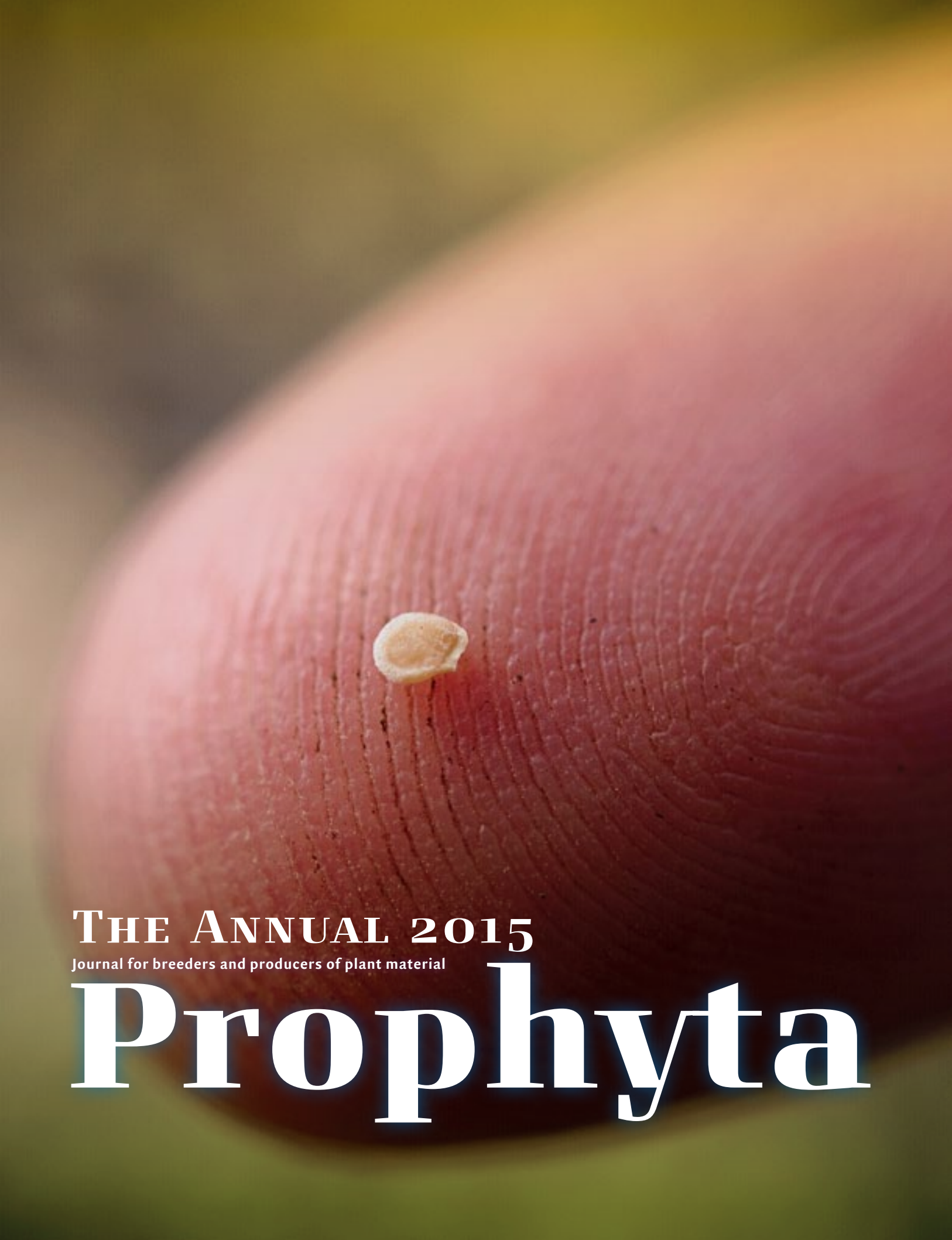


The Annual 2015

Journal for breeders and producers of plant material

Prophyta

Naktuinbouw safeguards and enhances the quality, identity and health of horticultural propagating material

INSPECTIONS

- Quality inspections
- Import inspections
- Plant Passport
- Quality-plus systems

TESTING AND RESEARCH

- Health and quality testing
- Seed analysis
- Diagnostic testing
- DNA research
- Disease resistance testing

REGISTRATION, LISTING AND PLANT BREEDERS' RIGHTS

- Research for Plant Breeders' Rights for agricultural and horticultural crops
- Description of varieties

EDUCATION

- Regular workshops and trainings
- In company workshops and trainings

naktuinbouw

Quality in Horticulture

Naktuinbouw
+31 (0)71 332 6262
info@naktuinbouw.com
www.naktuinbouw.com

LinkedIn

THE ANNUAL 2015
Journal for breeders and producers of plant material
Prophyta

CONTENTS

Prophyta – The Annual 2015
A publication of the Prophyta Foundation in co-operation with Blue Bird Publishers

EDITORIAL ADVISORY BOARD Theo Ruys, John van Ruiten and Jan Timmerman
PUBLISHER/CHIEF EDITOR Monique Krinkels
CONTRIBUTING EDITORS Richard Finkers, Robert Hall, Anke van den Hurk, Geert-Jan de Klerk, Frans Krens, Niels Louwaars, Adrie Molenaar, Radha Ranganathan, Judith de Roos, John van Ruiten, Mario van Vliet, Wynand van der Walt, Ron Wehrens and Chris van Winden
COVER PHOTOGRAPH John Voermans
SUB EDITOR Mireille McNutt
GRAPHIC DESIGN Marcel Bakker, De Ontwerperij
PRODUCTION MANAGER Hajo P. Strik
PRINTED BY Global Printing
ADDRESSES Blue Bird Publishers
VOF, Jan Kostelijklaan 16
1981 CG Velsen-Zuid
the Netherlands
PHONE +31 (0)255 521 852
FAX +31 (0)847 510 694
info@bluebirdpublishers.com
www.bluebirdpublishers.com
PROPHYTA FOUNDATION
P.O. BOX 40, 2370 AA
Roelofarendsveen
the Netherlands
PHONE +31 (0)713 326 161
FAX +31 (0)713 326 364
foundation@prophyta.org
www.prophyta.org

Seeds & Customised Services

VanDinter Semo bv is a dynamic Dutch enterprise, founded in 1914, with a century of experience in sowing seeds and currently one of the largest Dutch enterprises in production, breeding and processing of seeds, presents a broad range of products and services.

Our main activities are

- Seed production on contract of grass seeds, spinach, rape seed and all other arable crops in the Netherlands
- Seed cleaning with specialist unique equipment for cleaning all kinds of seeds
- Breeding of catch and green manure crops, like fodder radish with high levels of resistance, white mustard, brown mustard and amongst others Avena Strigosa
- Specialising in combating soil-borne diseases
- Domestic sales of forage grasses, amenity grasses, maize, cereals and green manure crops
- Seed processing by adding value through seed cleaning, seed coating or pelleting
- Also full services are offered in logistics and packaging

Please contact us at the ISF conference for more details.

VanDinter Semo bv
P.O. Box 2, 9679 ZG Scheemda
The Netherlands
Phone +31 (0)597 59 1233
Fax +31 (0) 597 59 3030
Mail info@vandintersemo.nl
URL www.vandintersemo.nl

VanDinter Semo
SEED & SERVICES

ISF proposes international standard for Plant Breeders' Rights

The International Seed Federation, CropLife International and CIOPORA have presented a joint paper proposing an International System of Co-operation (ISC) for plant breeders' rights. This ISC would build on the current UPOV system by increasing its accessibility to plant breeders worldwide and helping them to overcome the obstacles they face in securing Intellectual Property Rights in UPOV member states. According to the members of the three organisations, deviation from national application procedures, multiple language regimes, cost and time are important obstacles.

Unified procedure

An ISC would enable breeders to file PBR applications in various markets via a simplified and unified procedure, creating advantages for breeders and maximizing the effectiveness of the UPOV system. The system is not envisioned to replace local PBR laws and each jurisdiction would still maintain complete sovereignty in their application process. It is also expected that the ease of filing would increase the number of PBR applications in most, if not all, countries.

The joint proposal envisages an ISC as a means of consolidating the established national systems of PBR registration. With an electronic application form – currently being developed by UPOV – the new system will allow breeders to apply for

Children learn the truth

PBR in multiple countries in the language of their choice.

The procedure foresees the payment of a processing fee to a single bank account with the application fees paid to the national UPOV offices on filing of the ISC application in that country. These measures will increase the efficiency of obtaining PBR by reducing the red tape, and reducing breeders' expenditures on document translations and money transfers to foreign banks. Once filed, the application will enter the international system responsible for non-DUS matters – namely matters other than distinctness, uniformity and stability. This phase may be conducted by a leading examination office with expertise in respective species to ensure the uniformity of the pre-DUS procedure, including the determination of novelty. This would allow the entire system to benefit from the existing reference collections

WITH A PROMOTION CAMPAIGN, the Dutch supermarket chain Albert Heijn has taught youngsters that vegetables, herbs and fruits are not produced in a factory nor grown in the crates in which they are presented in the shop. For every 15 euro a parent spent, he or she received a so-called 'moestuintje' (literally: little kitchen garden). The gift consisted of a small container, coco peat, seeds and instructions how to grow the different products. The aim of the supermarket was to teach children in a playful manner where their food comes from and how much attention and care is needed to produce vegetables. There were 20 different crops, from cherry tomato to broccoli, parsley and woodland strawberry. In total, 44 million promotion gifts were handed out in Belgium and the Netherlands this spring. The result was that rows of children stood at the door of the shop, begging for the 'moestuintjes', as they wanted to complete their sets. The supermarket sold associated products such as the booklet, Grow & Do, and children's garden tools. On their website, they provided additional advice and answers to customers' questions. According to the reactions on Facebook and Twitter, the campaign has been a huge success.

Do as the Poles

When on holidays in Poland a few years ago, I learned that Polish villages do not have greengrocers or supermarkets selling fresh food products. For a tourist it was very hard to obtain vegetables and fruits. It took quite some time to discover that in Poland many people grow their own food and sell the remainder on markets or on the streets. After that, it was simple: just look around to see what is available and adapt your dinner plans to that.

Upon my return, the statistics proved I was right. One out of eight Poles works in agriculture and more than half of the farms produce mainly for their own use. And those who do not work in agriculture often have a kitchen garden next to their homes. The result: almost everyone is well aware where food comes from and they all realize how much work is involved in producing food.

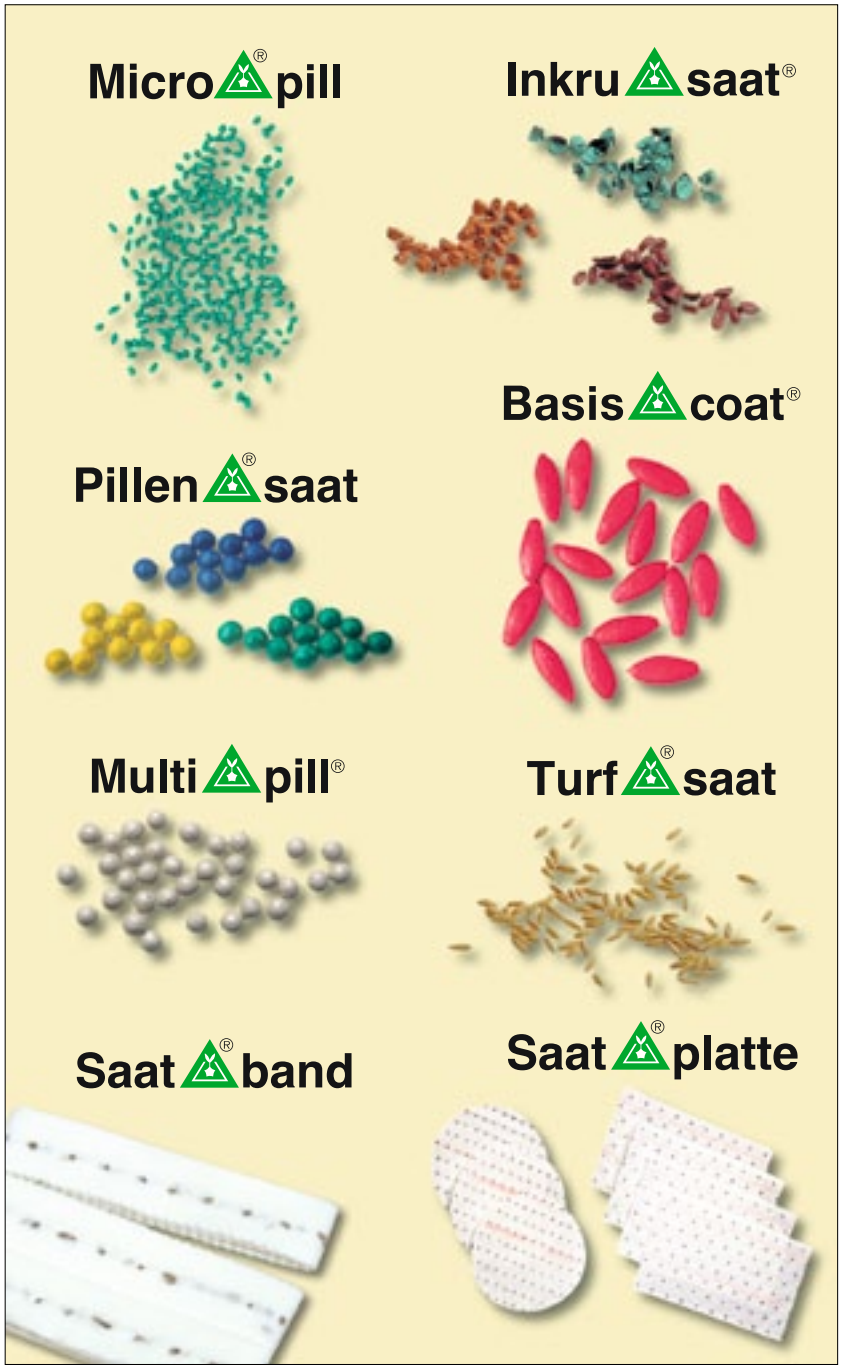
The contrast with many other Western countries is remarkable. Most people in the Netherlands, even when well educated, have no clue how exactly the stuff on their dinner plate came into being. On the other hand, these same people are highly opinionated when talking about the relationship between health and food, nature and food, and politics and food. 'Avoid gluten as it is dangerous to your brain,' state some. 'GMO's are the main cause of cancer,' claims another. 'Farmers spray massive amounts of chemicals,' knows the third one. 'Smallholders in third world countries are in the fixed grip of seed companies,' say others.

When it comes to food, most people are uncertain, lack factual knowledge and are highly impressionable by activist groups. Conveying the real story is almost impossible, especially if the agro-business has to do it all by itself. It is hard to convince laypeople if you are part of the food production chain.

The Dutch supermarket, Albert Heijn, this year came up with a simple but creative solution to counter the problem of lack of knowledge. Just give children seeds for free, let them grow vegetables in a mini garden, show them that forgetting to water your plants is disastrous, as is a sudden attack by aphids, and let them experience the effort it takes to grow your own meal. In short: do as the Poles and let people learn again that it is hard work to produce food.

Monique Krinkels

Seed at its best



SUET Saat- und Erntetechnik GmbH offers neutral and independent contractual services for all species of seeds

- Processing
- Pelleting
- Film-coating with Insecticides, Fungicides or biologically active ingredients
- Seed tapes and other seed forms also with Certification and worldwide logistics.

Our development, process installations and procedures meet the highest standards of quality, safety and environmental protection, with official authorization also for genetically modified (GM) seeds.

We also offer tailor-made

- Products for use in organic farming
- Pelleting and film-coating technology
- Coating material and suspensions

SUET®

SUET Saat- und Erntetechnik GmbH

Wir machen Saat gut!

PO Box 1780 – D-37257 Eschwege
Phone: +49 (5651) 927-5
Fax: +49 (5651) 927-324
http://www.suet.de
E-Mail: info@suet.de

JanWillem Breukink retires from Incotec

JanWillem Breukink has retired from his position on Incotec's board of directors. This decision is in accordance with the transition process which the company initiated in 2014, with the appointment of Douwe Zijp to succeed Mr. Breukink in his role as CEO. Mr. Breukink has accepted a position on Incotec's advisory board, providing advice and consultation on strategic, technical and market-oriented issues.
"JanWillem has been invaluable to the establishment and success of INCOTEC and an inspiring leader to many in the seed technology sector. Through his new advisory position and his various roles within Seed Valley, ESA and the ISF, we are fortunate that the organization will still benefit from his extensive knowledge and experience," says Bart Constandse, Chairman of the Supervisory Board.

Jury chooses six Gold Medal winners

Fleuroselect, the international organisation for the ornamental plants industry, announces six new Gold Medal awards that will be available for wholesale as of 2015 and for retail as of 2016. The Fleuroselect Gold Medal is awarded to new varieties that have been tested by Fleuroselect's expert and independent judges at trial grounds across Europe and proven to clearly supersede existing varieties in terms of breeding innovation and beauty.


Petunia x hybrida Tidal Wave Red Velour


Calamintha nepeta Marvelette Blue


Helenium autumnale Western Mixture


Echinacea purpurea Feeling Rose


Cosmos bipinnatus Xanthos


Ocimum basilicum Purple Ball

Plants armed against drought

Scientists of the University of California have developed a method with which plants can protect themselves against droughts. The genetically modified tomato and cabbage plants produce a protein that reacts to mandipropamid. This fungicide forces the plants to close their pores, so that water cannot evaporate. Normally, plants will only do that when they are almost dehydrated. They then start to produce the hormone abscisic acid that causes pore closing. "If water becomes scarce, plants stop growing to save on water," says Sean Cutler, associate professor of plant cell biology in Nature News. "As a result, they also no longer absorb carbon dioxide." The researchers genetically modified some plants to change the protein that is susceptible to abscisic acid into susceptibility to mandipropamid. If drought threatens, the plants can be sprayed in advance with the fungicide. Mandipropamid is already widely used and is barely toxic.

AIP takes over software products of Distel

IT supplier Agri Information Partners has taken over the software products of the Distel company which filed for bankruptcy earlier this month. The products that were taken over are the plant breeding software 'Verdi' and the tissue culture management program 'Tissum'. Through this takeover, Agri Information Partners further increases its role as IT specialist for the vegetable and ornamental plant breeding industry. Recently, a new product was launched that supports product managers in their product life cycle management by keeping all information stored in one single location.

ISF | WORLD SEED CONGRESS
SEED IS LIFE
URUGUAY 2016
PUNTA DEL ESTE I 15-18 MAY

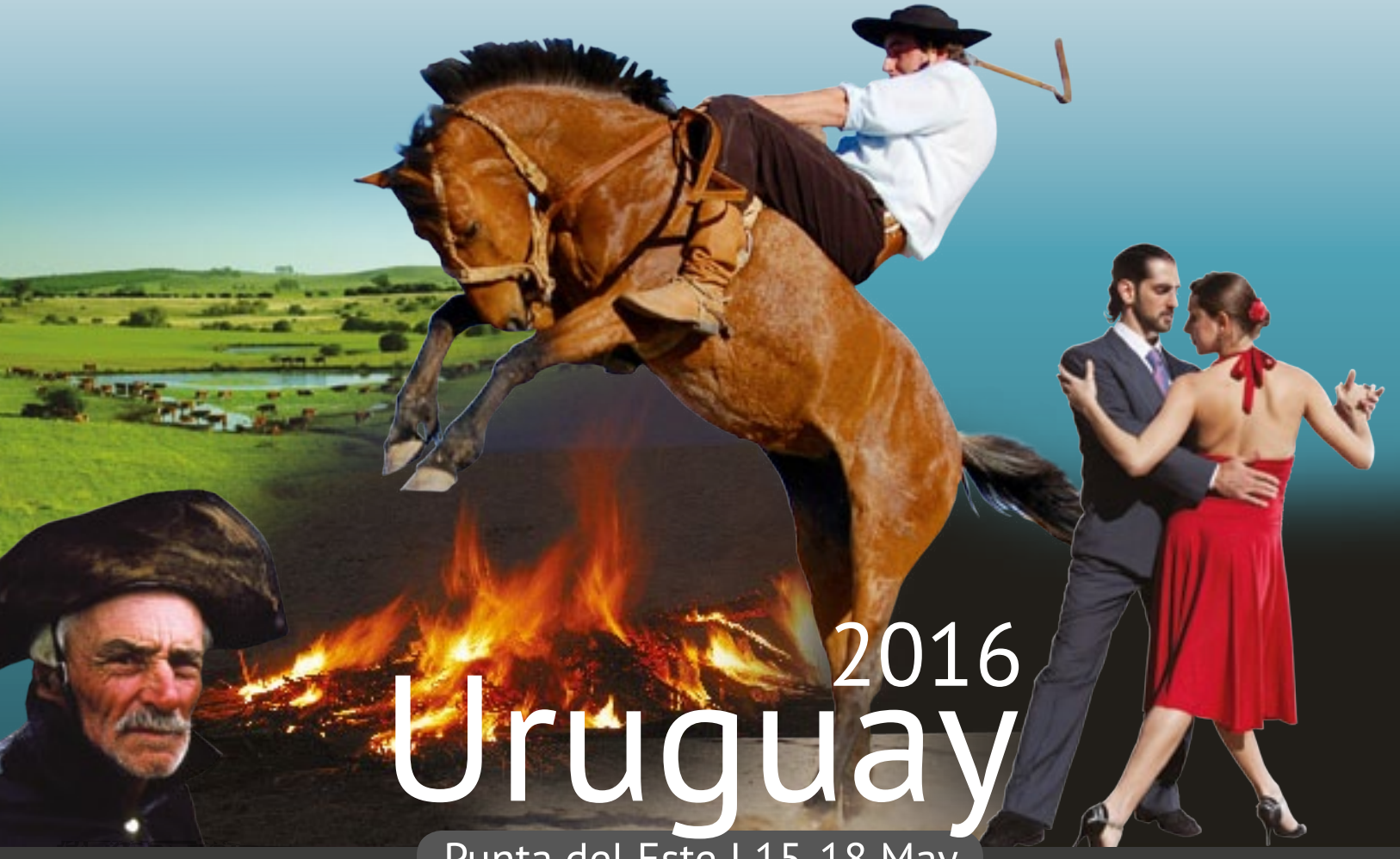
Join us in natural Uruguay!

The International Seed Federation together with the Uruguayan Seed Chamber (CUS) and the Uruguayan Plant Breeders Association (URUPOV) will be organizing and hosting the ISF World Seed Congress 2016.

The ISF World Seed Congress will take place in Punta Del Este – Uruguay, internationally recognized as one of the top resorts in the Americas and a unique natural destination at the intersection of the Rio de la Plata and the Atlantic Ocean.

Nature is an essential part of Uruguay's identity. Agriculture and farming are successfully linked to the country's economy.

Land, people, soul, spirit, traditions, food, it's all about nature! Nature is all here! Uruguay is where something natural happens every day!



2016 Uruguay

Punta del Este I 15-18 May

The Natural Way Forward in Business & Life

Main sponsor

Bayer

Organizers

ISF International Seed Federation

URUPOV SEMILLA LEGAL

CAMARA URUGUAYA DE SEMILLAS

Prophyta

SUPPORT THE FOUNDATION

The Prophyta Foundation is an independent non-profit organisation, aiming at informing interested parties worldwide about developments in e.g. plant breeder's rights, breeding techniques, genetics, biodiversity, technology, regulations, phytosanitary matters and more. Our communication methods include at present our Prophyta Annual and our website www.prophyta.org. The Foundation primarily works with volunteers, but in order to recover costs for these activities we need advertisements for our annual magazine and/or direct financial support to the Prophyta Foundation.

We greatly acknowledge the companies mentioned below for supporting Prophyta, by either advertising or donating. Please feel free to contact our secretariat (P.O. Box 40, 2370 AA Roelofarendsveen, the Netherlands, email: foundation@prophyta.org) to join membership of our distinguished group of agricultural and horticultural companies, both for further information or for donations.

ABZ Seeds	Bovenkarspel, the Netherlands	www.abz-strawberry.nl	F1-hybrid strawberries
Agri Information Partners	Wageningen, the Netherlands	www.agripartner.com	Computer software
Agro Business Solutions	Grootebroek, the Netherlands	www.agrosolutions.nl	Computer software
Agronomix	Winnipeg, Manitoba, Canada	www.agronomix.com	Computer software
Bejo Seeds	Warmenhuizen, the Netherlands	www.bejo.nl	Vegetable seeds
Corn. Bak	Assendelft, the Netherlands	www.bromelia.com	Bromeliads
De Groot en Slot	Broek op Langedijk, the Netherlands	www.degrootenslot.nl	Allium
Enza Zaden	Enkhuizen, the Netherlands	www.enzazaden.com	Vegetable seeds
Fleuroselect	Noordwijk, the Netherlands	www.fleuroselect.com	Organisation for ornamentals
Naktuinbouw	Roelofarendsveen, the Netherlands	www.naktuinbouw.nl	Inspection, varieties, testing
Nunhems	Haelen, the Netherlands	www.nunhems.com	Vegetable seeds
Rijk Zwaan	De Lier, the Netherlands	www.rijkzwaan.nl	Vegetable seeds
Suet Saat- und Erntetechnik	Eschwege, Germany	www.suet.de	Pelleting and seed coating
Syngenta Crop Protection	Basel, Switzerland	www.syngenta.com	Seed protection
Takii Europe	De Kwakel, the Netherlands	www.takii.nl	Vegetable and flower seeds
Takii & Co., Ltd.	Kyoto, Japan	www.takii.co.jp	Vegetable and flower seeds
American Takii, Inc.	Salinas, CA, USA	www.takii.com	Vegetable and flower seeds
Vandinter Semo	Scheemda, The Netherlands	www.vandintersemo.nl	Seeds and services
Wageningen UR	Wageningen, the Netherlands	www.wageningenur.nl	University, plant breeding research

Renewed acquaintance with **Poland**'s seed industry

Monique Krinkels

In 1975, the members of ISF held their yearly seed trade congress in Poznan, Poland. This year more than 1,400 seedsmen from all over the world will gather in Kraków and observe the enormous transformation that the past forty years has brought about.

The eighty members of the Polska Izba Nasienna (PIN), or Polish Seed Trade Association, look forward to the ISF Congress in Krakow. "The number of delegates from Poland at international congresses has risen these last few years", says Karol Marciniak, president of the organizing committee of the ISF World Congress 2015. More and more seeds people attend the ESA and ISF Congresses. This year's event will be an excellent opportunity for people to get to know our country and our seed industry."

Massive change

The Polish seed organization, PIN, started in the 1930s and, with an intermission during the Second World War and communism period, continued again starting from the nineties as a board that serves the interests of farmers by ensuring a constant supply of high quality seeds. "Half of the 1.6 million farms in Poland produce mainly for their own use and they almost do not purchase their seeds. That is changing however, as more and more smallholders are interested in intensifying production or in organic farming. A new market for which mainly vegetable seed companies are starting selection programmes. Breeding is still solely focussed on the commercial farmers", explains Mr. Marciniak. The Poland of 1975 differs completely from what it is today. Spring 1989 marked the end of communism and the introduction of a market economy in Poland, followed by EU-membership in 2004. "Before 1989, all Polish seed companies were state-owned. We now have fewer, but larger seed companies. And foreign companies founded subsidiaries here", he says. Most farms were privately owned during the decades of communist rule. The few former state farms have been sold or are presently leased to farmer tenants. The EU membership again brought about massive change. "In 2003, the Plant Breeders' Rights-regulations were adjusted to European standards. That gave breeding an impulse." But at the same time, it opened the door to foreign seed companies and intensified competition. "The domestic market has changed. Before we became an EU member, 80 % of the varieties were Polish. Today, more and more varieties grown in Poland are of foreign origin."

Karol Marciniak: 'The ISF Congress will be an excellent opportunity for people to get to know our country and our seed industry'

At the forefront

For several crops, Poland is among the top European producers:
NUMBER 1: apple, triticale, blackcurrant
NUMBER 2: rye, mushrooms, potatoes, bilberry
NUMBER 3: rapeseed, sugar beet
NUMBER 4: wheat

Love of nature

'Sharing Passion for Nature' is the slogan of this year's ISF Congress. A logical choice, as Poland has an abundance of nature. It has 1,469 nature reserves, among which the famous Puszcza Białowieska, the only remaining primeval forest in Europe. Besides unique wildlife, it is home to some ancient pedunculate oaks (*Quercus robur*), among which the famous 'Great Mamamuszi' with a circumference of 690 cm and a height of 34 m.

Other relatively new rules are the harmonised plant protection regulations. "It does not affect seed companies very much", says Mr. Marciniak, "but farmers have to change the way they used to work." For seed companies, the accreditation of the European Seed Treatment Assurance (ESTA) is of more importance. PIN is the first national agent in Eastern Europe and the fifth overall that can carry out this scheme. ESTA combines a number of elements to guarantee professional, high quality seed treatment applications, such as independent certification of treatment sites by accredited auditors, defined quality reference values with a uniform testing protocol, and safe use of information and respective labeling for users.

Triticale

Karol Marciniak started out in the late 1980s as a triticale breeder at Danko Hodowla Roslin Ltd., a field crop breeding company located in Choryń, near Poznan. "I did not choose triticale as I was happy to find a job, but it suited me perfectly", he explains. "It was a new crop at Danko and as it is a man-made plant it was very interesting. Triticale is a fodder crop and it combines the characteristics of wheat and rye. The wheat gives the plants high yields and improved grain quality, while the rye reduces the sensitivity to

Seeds import	Quantity (tons)	Value (million euro)
Field crops	70,090	113
Vegetable crops	915	46
Flower seed	166	3
Total	71,171	162

Seeds export		
Field crops	61,090	39
Vegetable crops	160	2
Flower seed	47	1
Total	61,297	42

Source: ISF

Over one million hectares of triticale is grown in Poland. Besides high yield and fungus tolerance, winter hardiness is an important breeding goal

With a population of 38.5 million people, a country that extends to 312,700 square kilometres and an economy in which agriculture plays a vital role, Poland is one of Europe's major producers of agricultural and horticultural products. 12.4 % of the workforce is employed in agriculture and it contributes 3.8% to the gross domestic product.

The total acreage of land under cultivation amounted to 10.4 million ha, 73.9% of which was cultivated under cereals, 9.3% industrial crops, 8.7% fodder plants, 3.4% potatoes and 2.0% pulses. According to Marek Sawicki, Minister of Agriculture and Rural Development, the exports of agricultural and food products exceeded 21 billion euros in sales value.

fungi and yields in poorer soils. Furthermore, the Polish farmers needed a variety that was winter hardy. Unfortunately, as general manager of Danko, I am no longer directly involved in breeding triticale."
His company is one of the largest in the country. "Danko started in the 1880s as a privately owned company. In the 1950s, we were nationalized and we are still state-owned, as the government owns the shares of the company. However, we are not subsidized, so we function as any other commercial company." Danko is involved in breeding cereals and fodder crops, seed production and other agricultural activities and employs over 350 people. "We produce seeds and other products on 6,300 hectares", says Mr. Marciniak.
Danko is the leading company that produces certified triticale seeds in Poland. "Today, over one million hectare of triticale is grown in my country. Besides, 30% of all wheat grown in Poland are Danko varieties." Some Danko varietiesw are multiplied to certified seeds in other European countries. "The most important companies for export are the Czech Republic, Germany, Denmark, Sweden and Belarus, but our varieties are also present in Spain and Finland."
A new crop that Danko has started to breed is soybean. "Most present varieties are from Canada and are less suitable to Polish conditions. Furthermore, most of them are either GMO's or grown in former rain forests. We are working on high productive varieties, which farmers can use to earn a living without subsidies. It looks promising", he says.

Standstill

The Russian intervention in the Crimea and the Donbass region of Ukraine has a negative influence on business. "Yes, Polish agriculture suffers greatly from the restrictive measures the EU has taken against Russia", Karol Marciniak agrees. "The exports to Russia have come to a complete standstill, but also the export to the Ukraine is under pressure, because of the financial problems that country has. Farming need peace to bloom and I hope that will soon return."

Why an **international standard** on the international movement of seed should matter to you

Radha Ranganathan

As seed for planting or sowing is frequently moved around the world, it has the potential to be exposed to exotic pests – plants, animals and pathogenic organisms – and may serve as a pathway for their unintentional introduction and spread into new environments. For this reason, many countries have phytosanitary restrictions on the movement of seed.

If you are in the seed business, it is very likely that you will have often had to deal with phytosanitary certificates. Sometimes the procedure to procure them has probably been relatively easy and at other times it has left you confused, even frustrated, as the required measures are contradictory, not technically justified and difficult to fulfil retrospectively.
The costs of compliance with contradictory and sometimes pointless requirements, missed orders due to requirements that were difficult to meet and dealing with unpredictable and foreseen situations add up. You may have asked yourself why it is so.

Specific nature of trade in seed

The challenges associated with regulating the international movement of seed, however, are distinct from the international movement of other forms of plants for planting. For instance, seed produced in one country and exported to a second for processing, testing and packing may then be re-exported to numerous other destinations over an extended period of time. At the time of production of the seed, the destination country and its import requirements may not be known, especially if there are a number of years between production and export to the final destination.
Recognising the need to address phytosanitary measures that are seed specific, a standard on the international movement of seed under the International Plant Protection Convention (IPPC) has been in preparation since July 2013. The standard is intended to provide guidance to your national plant protection organisation (or NPPO) on identifying, assessing and managing the pest risk associated with the international movement of seed.

International Standard on seed

In simple terms, a standard is an agreed way of doing something. It is a published document that sets out specifications and procedures designed to ensure products and systems are safe, reliable and consistently perform the way they were intended to. Standards are also developed and defined through a process of sharing knowledge and building consensus among technical experts. ISF was represented in the expert working group charged with drafting the standard on seed.

Dead or alive?

The seed industry places a lot of emphasis on seed health. The supply of healthy seeds is essential to help assure growers of a healthy crop. The seed industry uses preventive and hygiene measures, carries out disease inspections and pathogen control during seed production. The final decision on a seed shipment is often based on a diagnostic laboratory test.
The draft standard on seed encourages NPPOs to use molecular and serological diagnostic methods to detect pathogens in seeds and in seed production crops because these methods are generally more accurate, sensitive and specific than other methods, including inspection. The seed industry has also embraced these powerful tools and has been actively involved in their development and use for many years. In doing so, it has increased the quality of the seed available to the market place. However, in using molecular and serological diagnostic methods the presence of viable pathogens, especially quarantine pests, is not finally demonstrated. ISF's view on the use of these methods is that a 'positive' result obtained from using a molecular or serological test should be seen as a prescreening and must be followed up by a second test, ideally based on isolating the pathogen from seeds, detecting and identifying the pathogen, and finally confirming the viability and pathogenicity of the isolate by inoculation of assay plants. If, however, such a so-called classical test is not available, a confirmatory test based on different biological principles, such as a serological test (IF, DAS-ELISA) to confirm a result obtained using a molecular technique (PCR) is needed. This is especially relevant in case of seed treated or disinfected to inactivate pathogens that may be present on/inside the seed.

The draft standard on the international movement of seed stresses the importance of assessing the risk associated with seed. ISF's Regulated Pest Lists for

Radha Ranganathan is director of technical affairs at the International Seed Federation, Nyon, Switzerland

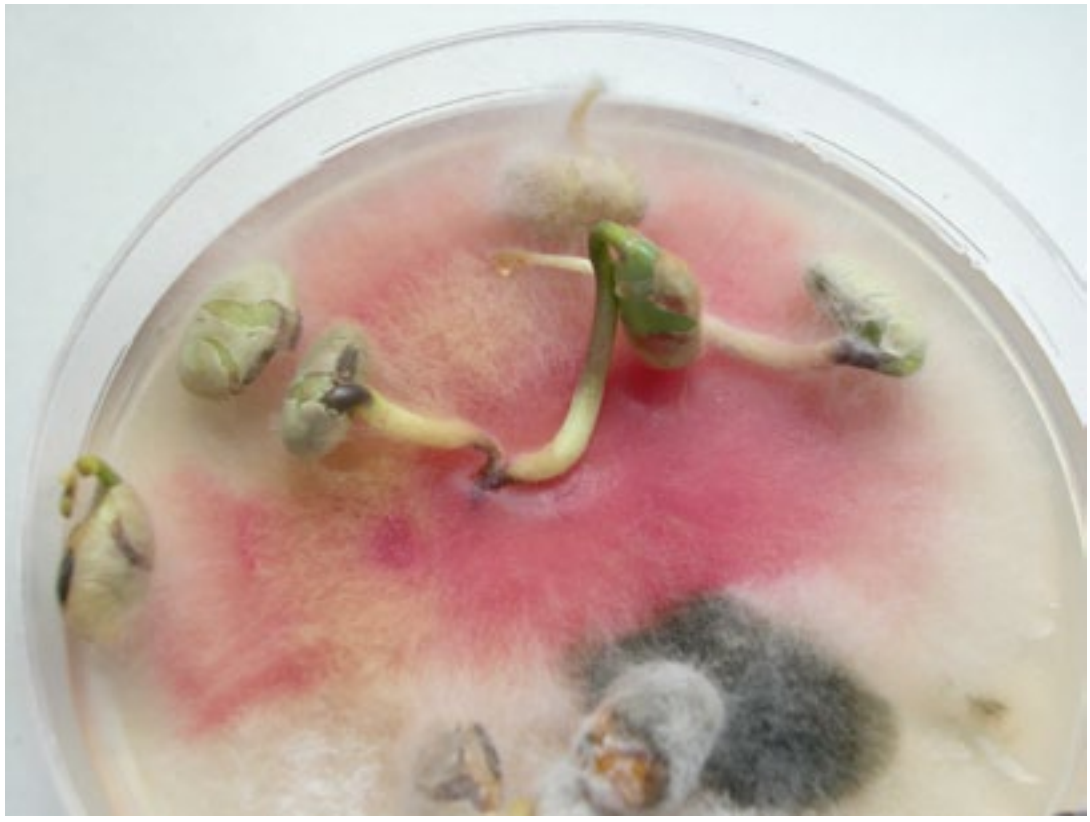


Photo: GEVES

The ISF strives for consistency in phytosanitary regulations across the world in order to facilitate the international movement of seed as well as prevent the spread of diseases for which seed is a pathway

different seed species (see http://www.worldseed.org/isf/pest_lists.html) are cited in the appendix as a useful source of information on pests for which seed can be a pathway under favourable conditions.
The standard recognises that breeding, selection and evaluation of seed is conducted internationally and that pest risk levels may vary according to the intended use or purpose of the seed (testing or destructive analysis, diagnostic test controls and other forms of laboratory testing, research and cultivation in glasshouses and growth chambers, and commercial sowing). It elaborates the specific requirements of seed such as visual seed inspection, field inspection, seed health testing (see box), sampling small lots, seed treatments and re-exports.

The road to adoption

Consensus is the preferred way to adopt standards in the IPPC. After drafting, the standard was publicly available and open to IPPC Member Countries for consultation. As ISF is an Official Observer at the IPPC, it was also invited to provide comments on the draft. Member consultation closed at the end of November 2014. A total of 1,139 comments from national and regional plant protection organisations, and ISF, were submitted. They were processed in March 2015 and a revised draft is being studied by a working group of the IPPC Standards Committee.
If all goes well, the standard could be presented to the IPPC's Contracting Parties as soon as April 2016. But if a second round of country consultation is deemed necessary, it will delay adoption until 2017. ISF is following this process very closely.

It is in the interest of the seed industry to find mechanisms that ensure the safe movement of seed in international trade in order to protect agriculture, human health and the environment. A standard must mirror current practice, be technologically up-to-date, and reflect contemporary views on safety, quality and environmental impact. The standard on seed takes the dynamics of the seed trade into account. It provides guidance on a risk assessment for seed as a pathway for entry and spread of a pest, on how to define phytosanitary measures taking into account the intended use of the seed. It highlights the importance of equivalency of phytosanitary measures and harmonisation of additional declarations so that re-export of seed is facilitated. And finally, it recognises the technical competence of the seed industry by including reference to ISF's pest list initiative and ISHI-Veg seed health tests.
Standards are voluntary and so there is no automatic legal obligation on countries to apply them. However, laws and regulations may refer to standards and even make compliance with them compulsory. Get involved in the process and, through your national seed association, show your NPPO your support for the standard on seed. If adopted, the seed industry may expect a reduction in unfounded requirements, more consistency in phytosanitary regulations across the world requirements that are adapted for smaller quantities and seeds for specific purposes. Be equally engaged in the implementation phase when your country's phytosanitary requirements for seed for planting are being reconsidered.
You are a stakeholder.

Broccoli/Tomato II case

Patents on essentially biological products to be granted

Judith de Roos

On 25th March 2015, the Enlarged Board of Appeal of the European Patent Office (EPO) clarified that the exclusion of patentability for essentially biological processes does not extend to the products that are the result of such processes. The outcome of the so-called Broccoli/Tomato II case brings the discussion about patents on plants back onto the political agenda in Europe.

Patent claims on plant characteristics that are introduced in a plant through crossing and selection are in principle possible in Europe. Two exclusions limit the patentability of plants in Europe. Article 53 (b) of the European Patent Convention (EPC) specifies that patents shall not be granted in respect of plant varieties or essentially biological processes for the production of plants. Already in 1998, in the so-called Novartis decision (G01/98), the Enlarged Board of Appeal gave its interpretation of the exclusion on plant varieties by specifying that it applies when the claimed invention is limited or directed to a specific plant variety. However, a claim that covers or embraces multiple plants or plant varieties falls outside the exclusion and is therefore permissible. This narrow interpretation meant that the exclusion in respect of plant varieties lost most of its practical meaning. Patent claims can in practice cover plant varieties.

And now, after a period of nine years since the beginning of the opposition procedures in the so-called Tomato and Broccoli cases (G1/08 and G2/07) and two different rounds of questions to the Enlarged Board of Appeal, clarity is obtained over the second exclusion and the final outcome is again a narrow interpretation. The exclusion of essentially biological processes does not cover the plants so developed.

Tomato and Broccoli I

In 2007, the first questions were put forward to the Enlarged Board of Appeal in order to clarify what kind of processes would qualify as 'essentially biological' and to what extent a process which contains steps of crossing and selection could avoid the exclusion from patentability, by including any other feature of a technical nature. In 2010, the Enlarged Board of Appeal decided that a process which is based on the sexual crossing of the whole genomes of plants, and on subsequent selection in the sense that the introduction or modification of the trait is the result of such mixing of the genes is to be considered as 'essentially biological'. This is not altered if a technical step (such as the use of molecular markers) is used in order to enable or assist the process, as long as this technical step by itself does not introduce or modify the trait in the genome of the plant. At first glance, this was perceived as a rather broad interpretation of the exclusion.

Tomato and Broccoli II

However, in 2012, new questions were put forward to the Enlarged Board of Appeal, this time with regard to the permissibility of product claims such as plants or fruits that are obtained by an 'essentially biological process'. The conclusion of the Enlarged Board of Appeal is that indeed such product claims are possible, as the exclusion has to be interpreted narrowly and thus only applies to the process claims. This is also the case if the only method that is described in the patent to obtain the claimed product is an essentially biological process. The Enlarged Board of Appeal does not find any indication in the text itself, in its history or on other grounds to decide otherwise. It is interesting to note that in the Dutch and German Patent Law, explicit exclusions have been taken up also for the products of essentially biological processes. This deviation from the text of the EPC is used by the Enlarged Board to underline the need for an explicit provision with regard to products as it cannot be presumed without. Finally, the Enlarged Board of Appeal mentions that it is aware of the various economic, social and ethical aspects in the general debate, but explains that such arguments do not fall under the judicial decision-making powers of the Enlarged Board, which is not mandated to engage in legislative policy.

Position of the breeding industry

The European Seed Association (ESA) but also national seed associations in the EU such as Plantum, BDP and UFS, have expressed their disappointment over this decision. All had hoped for a true restriction of patentability, but this decision opens the floodgate for over a hundred patent applications on native traits that had been put on hold by the European Patent Office in anticipation of the decision, as well as for many more new applications. This will seriously limit the accessibility of biological material for further breeding. Positive is that for now there is at least more legal certainty over what can or cannot be patented by the EPO.

The official position of ESA with respect to the patenting of plants is – among other principles –

Judith de Roos is legal counsellor at Plantum, Gouda, the Netherlands

Broccoli/Tomato II case

The decision on the Broccoli/Tomato II case opens the door for over a hundred patent applications on native traits that have been put on hold

the non-patentability of all material resulting from the application of essentially biological processes. Now that the courts have not been able to make this claim a reality, other ways need to be sought. Politicians have been quick to respond. Questions have already been asked by the European Parliament as to how the European Commission plans to rectify this decision through a change of law. Member countries have made an appeal to the Commission to that same effect.

It therefore remains to be seen whether this decision turns out positive for those seed companies that welcome the possibility to patent essentially biological products and do not subscribe to the positions of the different seed associations. When political pressure rises as a result of this outcome and the debate enters into the public domain, the discussion will not be about innovation alone anymore. Other voices that, for instance, reject all patenting of life forms, can be best dealt with if the seed industry is united.

What next?

The European Commission has the obligation to report on the effects of the implementation of the 1998 Biotech Directive. An expert group is assisting in that process. It is likely that both the expert group and the Commission waited for the outcome of the Broccoli-Tomato II case, as their report is long overdue. Irrespective of the outcome of this evaluation, it is likely that when it is sent to the European Parliament, more pressure will be geared towards law change. Europe already embraced the so-called limited breeders' exemption in its 'unitary patent' framework. A provision that will now most likely be implemented in those national patent laws that have not yet such a provision in place.

This extension to the research exemption allows breeders to use patented materials in further breeding, but makes the commercialization of the so bred new varieties subject to a licence when they still fall under the scope of the patent.

In the meantime, the industry itself also has a responsibility to overcome much of the uncertainty in respect of access to material. A number of major vegetable seed companies have concluded a voluntary agreement to deal with lengthy and uncertain licensing negotiations. This 'International Licensing Platform' guarantees those seeking a licence on a plant trait access under what is expected to be FRAND (Fair, Reasonable and Non-Discriminatory) terms. Finally, it may be expected that the EPO and some courts will apply a stricter interpretation of the inventive step and novelty requirements. Breeders could also be tempted to publish characteristics that they know could be found in the crop or related species in order to limit patenting of native traits.

All parties involved in questions related to the patenting of plants have been alerted by this recent outcome. It is not clear whether this decision, or the debate that it now triggers, will affect policies in other jurisdictions, but that it will have an important impact in both the short and the longer term is undeniable.

Hybrid potato proves **brain cracking** breeding goal

Monique Krinkels

16

A ship filled with 4,000 tonnes of seed potatoes, or a single tin of potato seeds? From a logistics point of view, the choice is easy. "But that is not the primary advantage," states Hein Kruyt, managing director of Solynta. "We want to create new, hybrid varieties that possess the characteristics consumers and farmers of today need," adds R&D director Pim Lindhout.

A five year old variety of Solanum lycopersicum is considered to be completely obsolete, a hundred year old variety of Solanum tuberosum on the other hand is still amply available. The famous 'Bintje' was bred in 1905 and is still popular in Belgium. This is the contradiction Hein Kruyt, Pim Lindhout, Theo Schotte and Johan Trouw observed in 2006. Their employer at the time, De Ruiter Seeds, had asked them to brainstorm on novel breeding programmes. "Creating a hybrid potato might seem unconventional, but we believed from the onset that it is possible," says Hein Kruyt, managing director of Solynta. "That is why we chose to continue with the project after Monsanto took over the vegetable activities of De Ruiter Seeds in 2008. After a management buy-out, the potato breeding programme was ours and the four of us started the company Solynta."

Many advantages

Seeds offer many advantages above the traditional seed potato. Most diseases are not seed-borne, so the farmers can start with clean propagation material. Furthermore, the need for pesticides and fungicides will decrease significantly. "The cost of late blight in the EU alone is estimated at one billion euro annually," according to Hein Kruyt. "Furthermore, the yields will increase, partly because of the increased homogeneity, but also because of the heterosis effect. It will boost the output by 20%," he anticipates. Anno 2015 the work is still not completed. "But we hope to have the first real field trial later this year," Pim Lindhout, director R&D says. The main problem is creating homozygote parental lines. Most wild potato species are diploid, however the plant is known to have a wide variety of ploidy levels, including triploids, tetraploids, pentaploids and even hexaploids. Commercially cultivated potatoes are usually tetraploids, i.e. have four sets of twelve chromosomes. To complicate matters, this ploidy level is not the result of genome doubling, it has four interchangeable genes at each locus.
"Another obstacle is that most potatoes are not self-fertile, a prerequisite to create homozygote parental lines. Luckily for us, Wageningen University had started to breed diploid potatoes. They identified a wild species that contained a gene that made self-fertilisation possible."

Major changes

Until the early 1990s, most potatoes were grown and consumed in Europe, North America and countries of the former Soviet Union. Since then, there has been a dramatic increase in potato production and demand in Asia, Africa and Latin America, where output rose from less than 30 million tonnes in the early 1960s to more than 165 million tonnes in 2007. FAO data show that in 2005, for the first time, the developing world's potato production exceeded that of the developed world. China is now the biggest potato producer, and almost a third of all potatoes are harvested in China and India.

Source: FAO

The significance of potatoes

Potato ranks third on the list of most important food crops in the world. In terms of human consumption, it is only preceded by rice and wheat.

A zillion people worldwide eat potatoes. For those who still believe that China is a noodles and rice country, it ranks number one on the list of potato consumers with nearly 48 million tonnes per year. If it comes to consumption per person, Belarus is the winner with 180 kilos, followed by Kyrgyzstan and Ukraine. Global total crop production exceeds 300 million metric tonnes.

Potatoes can grow from sea level up to 4,700 meters above sea level, from southern Chile to Greenland.

More than half of the global potato production comes from developing countries.

One hectare of potato can yield two to four times the food quantity of grain crops.

Potatoes produce more food per unit of water than any other major crop and are up to seven times more efficient in using water than cereals.

Potatoes are produced in over 100 countries worldwide.

Source: Centro Internacional de la Papa and FAO

Swift reproduction

So far, potato is vegetatively propagated. A seed potato produces on average 10 new tubers, which will be genetic clones of the mother plant. Potato plants produce flowers and berries that contain 100-400 seeds.

Lightweight

From the end of September until the end of February, the harbour of Beverwijk, the Netherlands, is the largest harbour specialised in seed potato export. Last year 121,000 tonnes was shipped to foreign countries all over the world either on pallets or in refrigerated containers. For 1 hectare of potatoes, either 2,500 kilo of seed potatoes are needed, or 30 grams of true potato seeds.

The sources Pim Lindhout can use for breeding are nearly unlimited. There are over 180 wild potato species, and the Centro Internacional de la Papa (international potato centre) in Lima, Peru, has 7,000 potato accessions of wild, native and improved varieties in its gene bank. In the Andes, more than 4,000 varieties of edible potatoes can be found. “Furthermore, the genetic distance between one and another potato chromosome is three times as much as that between human and chimpanzee,” he adds. “One potato variety has more genetic diversity than all tomatoes together.”

Adding resistances

Traditionally, many new varieties were mutants found by farmers in their fields. Cross breeding is an arduous task, as the likelihood that the desired traits can be found in the offspring is exceptionally small, due to the enormous number of genes. In general, one new cultivar is selected from 100,000 seedlings after five to ten years of testing. “That is why it is so important to create hybrids,” explains Hein Kruyt. “Today, if you want to breed a new variety to add resistance against a disease, it takes at least two decades before it can be commercialised. With hybrids, the new variety can be on the market within two years. Furthermore, it will be easier to add several resistance genes into one variety, to make sure the disease does not overcome a specific resistance. Phytophthora is still a major threat to potato growers and this water mould needs to be fought off by the plant through stacked resistances, using the multiple defence mechanisms of the plant. Hybrid breeding makes this possible.”

“And we will be able to introduce new traits quickly to other types of potato,” adds Pim Lindhout. “Where tomato has ‘only’ about one hundred product-market combinations, potato has ten times as many.”

Not finished yet

The work on creating homozygote parental lines has not been finished yet. Creating hybrids after 500 years of vegetative reproduction is a brain cracking experience. “Since 2012, we have been promising inbred lines that are 90% homozygote, but the plants suffered from inbreeding depression,” says Pim Lindhout. “That slowed down the progress we made. I believe we have overcome that problem by now. We hope to have our first variety in 2019. Our goal is to mail the first tins with true potato seed by 2020.”

Communication With Society

Will society embrace **smart breeding?**

Niels Louwaars

Public opinion about plant breeding is quite non-existent. Yet, through our democratically elected national governments, the public decides on all kinds of regulations that affect plant breeding. Most notorious today are the debates about regulating novel plant breeding methods.

The European Union has been deliberating for almost a decade now whether a number of breeding methods should be considered to fall under the definition of 'genetic modification' and if so whether they should be regulated for food, feed and environmental safety. Why does that take so long? Are civil servants and politicians afraid to have public opinion against them? The effect is that breeders are unable to tap into the opportunities that the new knowledge of molecular biology provides and that society does not reap any rewards from the better or cheaper products that could be developed with the help of this knowledge. Breeders find this hard to understand, but fail to communicate that.

Lack of knowledge

Despite the current hype of cooking programmes all over the world, consumers know very little about the origin of the products that they use in their fancy kitchens. Those who do know that food is produced by farmers, often have no clue about the crops that produce these products. Plant breeding has been the realm of specialists, working at the beginning of the agricultural value chains, focusing on farmers, and in some instances processors, but in most cases far away from the consumer. Consumers meet the products of breeding in their local supermarket. Corn breeders do not communicate with pork consumers, and cotton breeders do not talk to those wearing jeans – why should they?

The trouble is that because we never communicated with the end users of our breeding work, the public opinion about plant breeders is either non-existent, or – in the worst case – as people who juggle with genes, who perform all kinds of unnatural treatments to the beautiful plants that have been given to humanity. The fact that plant breeders perform crosses between plants may be accepted because that is similar to what bees do, but please do not tell them that we have to emasculate the mother plant, because that may be considered cruelty. A case in point is the current debate in Germany about banning CMS, the cytoplasmic male sterility that allows us to make hybrids of oilseed rape, cabbages and sunflower. Did we ever tell society that plant breeding is basically an extension of normal evolution; that creating (bio-)diversity is the starting point of plant breeding, and that selection for adaptation to local growing conditions is not fundamentally different from natural selection? And did we ever tell society that plant breeding contributes to sustainable agriculture through our focus on disease resistances, to adaptation to climate change through tolerance to drought and salt, and to product quality and diversity for consumers? If we have not, we made a serious mistake, because without such basic understanding of what we do, it is virtually impossible to explain why our new smart breeding methods are worth looking at and why excessive regulation backfires exactly on the values that society so dearly supports.

Smart breeding

These days, we want society to accept smart breeding techniques such as targeted mutagenesis techniques, reverse breeding, and cis-genesis because they make plant breeding more efficient and effective or because they create additional diversity from which we can select. Initially, these were called New Breeding Techniques (NBTs) but since they are not new anymore and because we realise that the word 'technique' already creates shivers with some, we

Niels Louwaars is managing director of Plantum, Gouda, the Netherlands

Despite the current hype of cooking programmes, consumers know very little about the origin of the products that they use in their fancy kitchens

'The trouble is that we never communicated with the end users of our breeding work. Cotton breeders do not talk to those wearing jeans' , says Niels Louwaars

need to use different words.
Regulation is based on assessments of possible risk, and that is fully acceptable. We do not want to produce varieties that pose specific risks in the field or in the food chain. Both companies and public institutions therefore promote research to see whether risks could be expected. This is complex research, because a technology in itself may be risk-free, but how to prove that the products from such technologies are completely safe?
Of course we all know that risk-free does not exist. We all drive cars and fly in planes even though we know that people die from driving cars or flying in planes. We also accept the use of new technologies in medicine, as they are meant to cure us and make us live longer. Yet, do we accept any risk when it involves crops and food, and if so what kind of risks can we accept and which ones not? Basically, sufficient research should be able to provide an answer, unless the precautionary principle is interpreted as 'do not use it until you know it is proven to be safe'. By the way, that attitude is not the same as the 'if in doubt, pull it out' principle of rogueing high generation seed fields.

Communicating breeding

There are several chain links between breeders and consumers, and consumers are voters who influence politics. If we want politics to understand the benefits of breeding methods, we should not forget to reach out to the consumers. Since we are science driven – there is no sector spending more on R&D than the breeding sector – we tend to explain how these new breeding methods work.
We get excited by the ever smarter generations of targeted mutagenesis, but we fail to understand that the man in the street may not have a positive attitude to the word 'mutant' let alone a man-made mutant. The first thoughts will drift towards the strange creatures of the 'X-Men' movies or to intellectual disabled people in our neighbourhood. And man-made mutants remind us of – yes, there he is again – Frankenstein. The bottom line, in my view, is that it is impossible to explain smart breeding methods when people have no basic understanding of plant breeding.
In the Netherlands, we are therefore working with the national organisation of biology teachers to bring plants – and a bit of plant breeding – back in the biology curriculums of secondary schools; companies are supporting a prize for the best biology teacher, and a group of Plantum-members in the region north of Amsterdam, dubbed 'Seed Valley', have managed to get a good article in the local edition of the National Geographic Magazine. We hope it will be picked up elsewhere. All these actions – and we need many more – are needed to create a basic understanding of what we do, and hopefully that will give us some credit in the long run.

Explaining the benefits

So, explaining only the techniques will therefore not do the job. The next step is explaining the benefits of plant breeding, the need to have a filled toolbox in order to achieve such benefits and that that toolbox is needed also to deal with future challenges. This appears to be a better entry point, especially when we can show that we have been adding tools to our box over the last 200 years, every time based on increased understanding of heredity, chemical structures and life functions.
Telling that story may be more difficult, but even that is not enough. Communication is not the same as explaining, it cannot consist of sending only. Communication can only take place when there is also a willingness to receive. When we want society to understand what we are doing, we should be willing to understand why the (wo)man in the street, the (wo)man in the supermarket and the (wo)man in the voting booth, find our stories positive, challenging or scary. That means that we have to dare to involve ourselves in the public debate, and not just to tell our story and to defend our point of view. Involving means to listen to both arguments and emotions, and take them seriously. It is not easy for a technical person, which a breeder is, to deal with the latter, but also emotions are real.
We have a complex task ahead.

Overcoming the drawbacks of **patenting**

Chris van Winden

Discussion about patents on biological material has been going on in the Netherlands for several years and also more and more in Europe. Not only in society, but also in politics, it has become a source of heated debate whether or not 'living matter' should be patentable. The members of the International Licensing Platform Vegetable use the advantages of patents and have overcome the drawbacks.

Proponents of patents claim that this will stimulate innovation, knowledge sharing and continued investment in research and development. On the other hand, opponents argue that such patents could block breeding if other breeders would not be offered a licence against reasonable conditions. Last November, the International Licensing Platform Vegetable was launched. The official seat of the association is in The Hague, the Netherlands. The main objective of this platform is to guarantee worldwide access to patents that cover biological material.

Agree to disagree

The possibility of patenting inventions (plant traits, for example) which concern plants is confirmed in directive 98/44 EC, provided that the technical feasibility of the invention is not confined to a particular plant variety.

Discussions in politics and society still continue, but more than 4½ years ago, the vegetable breeding sector took an initiative and started discussions and negotiations with the aim of finding a reasonable system for getting access to patents. Eleven breeding companies were involved in the establishment of ILP Vegetable. These companies are, in alphabetical order, Agrisemen, Bayer Crop Science (Nunhems), Bejo Zaden, Enza Zaden, Holland-Select, Limagrain Vegetable Seeds, Limgroup, Pop Vriend, Rijk Zwaan, Syngenta and Takii. So this group of companies comprises both listed companies and family-owned companies from several countries in the world.

The start of the discussion soon resulted in the conclusion: we agree to disagree. After passing that point, constructive and intensive discussions and negotiations took place with the aim of establishing an easy way for vegetable breeders to license the traits they need at fair and reasonable cost. Several solutions were discussed, always taking into account the EU antitrust rules. To safeguard the process for antitrust aspects, all meetings were attended by a lawyer, specialized in antitrust matters. Also, the final result of four years of discussion was assessed against the EU and US antitrust laws, with the main conclusion that ILP Vegetable does not constitute a problem under the antitrust laws of the EU and the US.

Chris van Winden is managing director of ILP Vegetable and secretary of the board, www.ilp-vegetable.org.

Advantageous to all breeders

"For Rijk Zwaan, the ILP Vegetable organisation means that we have quick and guaranteed access to biological material that other members have patented. The results will be that our breeding gains pace, costs will be lower and efficiency will increase. Unfortunately, not all vegetable breeding companies have joined so far, new members are certainly welcome. The organisation is advantageous for large as well as small breeding companies. As all important decisions have to be made unanimously, no one has to fear being overpowered.

All our patents that might restrict access to biological material of vegetables have been registered by ILP Vegetable. So far no licences have been given or acquired, as the organisation only started in November last year, but we already use the system to obtain access to each other's patented varieties in the USA."

Ben Tax, *managing director Rijk Zwaan*

The members of the International Licensing Platform Vegetables have found an easy way for vegetable breeders to license the traits they need at fair and reasonable cost

We share Johan's ambition

to surprise consumers time after time

Johan Solleveld comes from a tomato-growing family and has been involved in variety development at Rijk Zwaan for over 30 years. Thanks to his extensive experience, and to the fact that he really speaks the growers' language, he knows exactly what to look out for when selecting new tomatoes. Over the years, Johan has gained an ever-greater appreciation of the tomato's versatility and potential. He knows that nature can sometimes have surprises in store, and how important it is to remain open to the resulting opportunities. In close collaboration both with colleagues and customers, he strives to make a valuable contribution to creating tasty new products every day.

It is Johan's ambition to surprise consumers time after time. Rijk Zwaan - a global specialist in vegetable breeding - shares this ambition. We are working together towards a healthy future. Learn more at **rijkzwaan.com**.

Sharing a healthy future

RIJK ZWAAN

It has been a long road

"It is important that access to biological material is guaranteed for all breeders, that is why Limgroup took part in this initiative from the start. It has been a long road, but it has led to this result. Because of ILP Vegetable, the member companies are assured that biological material remains available for breeding and research. That does not mean, however, that the discussions have stopped. Breeders' exemption remains important for the sector. Limgroup, not only active in vegetable species, does not own any patents at the moment, but even so it is good to have a structure beforehand. And conversely, we might be able to use patents for characteristics that are not specific for a certain species."
Pierre Lavrijsen, *research manager Limgroup*

Baseball arbitration method

In September last year, the ILP Vegetable licensing system was concluded in the meeting of the Steering Committee and the association ILP Vegetable was incorporated in November. The system is very innovative, simple and transparent. If a member of ILP Vegetable wants to take a licence for a protected trait of a fellow member, he starts bilateral negotiations. These negotiations can lead to a licence agreement. This agreement can be based on the so-called Standard Licence Agreement: a standard agreement provided by ILP Vegetable, but it may also deviate from the Standard Licence Agreement, provided that both parties agree.
In the event that negotiations do not lead to an agreement within three months after the start, the case can be submitted to independent experts. The method of decision-making by the experts is based on the so-called 'Baseball arbitration method'. Both members submit their licence fee proposal to the secretary of ILP Vegetable, along with all the arguments why they think that their proposal is reasonable. This could be a proposal for a royalty percentage or a lump sum. After receiving figures from both members, the secretary exchanges the two proposals between the two members involved with the possibility of coming to an agreement within three weeks.
If no agreement can be reached, members are in the hands of the independent experts. These independent experts will choose the most reasonable proposal and then a Standard Licence Agreement, including the chosen proposal, will be executed. This system will force both parties to propose reasonable positions, because an unreasonable position will be rejected in favour of a more reasonable proposal. Furthermore, the cost for the baseball arbitration must be paid by the member whose proposal has not been selected by the independent experts.

Experts

The group of seven independent experts (Expert Committee) consists of completely independent people with expertise in the field of intellectual property rights, business economics, vegetable seed market, plant science and accountancy. The independent experts, appointed by the General Meeting of the association, are of different nationalities (US, United Kingdom/South Africa, Germany and the Netherlands). For each case, the group of independent experts is divided into an initial board and an objection board. Members involved in a baseball procedure may file a request for revision against the decision of the initial board. The objection board shall solely perform a formal review of the baseball procedure, but shall not revisit the substantive facts of the decision of the initial board.

ICT specialists in Seed Business

- Combination of innovation and no-nonsense
- Flexible tailor made solutions
- Global market leader in Breeding Software

Agri Information Partners

Agri Information Partners supports your business

E-Brida; top of the bill Breeding Software

mercado

Mercado; effective Variety Development

Join the next generation breeders!

Agri Information Partners B.V. PO box 251, 6700 AG Wageningen, The Netherlands
P: +31 (0)317 - 47 13 00, E: info@agripartner.nl, internet: www.ebrida.com, www.agripartner.nl

Continuing existing practice

"ILP Vegetable is a unique platform that creates a balance between stimulating innovation on the one hand, and providing access to biological material on the other hand. This platform guarantees sharing knowledge as well as investing in high quality research and development. The aim is to create new plant characteristics from which growers and consumers will profit. So far, about 120 patents have become available to the members.
Syngenta will make all its patents on vegetable characteristics (the so-called native traits) available to the other members of ILP Vegetable against reasonable prices and transparent conditions. Conversely, Syngenta will have access to the patents belonging to other members. ILP Vegetable is based on a practice that several companies used to allow access to innovations. Syngenta, for example, already had their own licensing system through www.traitability.com. It ensured that companies could easily and transparently obtain licences on plant characteristics.
The worldwide extent of ILP Vegetable has already led to an important development: the members of ILP Vegetable have agreed that each of them is allowed to freely use varieties that are protected by variety patents – a type of patent that exists in the US. That means that ILP Vegetable-members in the US can use vegetable plant varieties that are protected by a variety patent in the same way as plant varieties that are protected by plant breeders' rights.
ILP Vegetable has only recently been founded, in November 2014. Eleven companies, who together cover more than half of the world market of vegetable seeds, have started ILP Vegetable, but it is open to new members, whether companies, research institutes or universities and independent of whether they own patents or not. It is an open platform that will welcome new members.
Syngenta expects that, in the near future, new members will join ILP Vegetable. We hope that especially universities and research institutes will participate, to make the results of their findings available to the market in order to valorise their efforts and finance further research."
Michael Kester, *director Benelux Syngenta*

In the system, a Most Favoured Nation (MFN) percentage is incorporated. This means that the MFN percentage, consisting of the lowest royalty percentage included in one or more Standard License Agreements regarding the same patent, is available for all other members of ILP Vegetable under the conditions of the Standard Licence Agreement.
In the ILP Vegetable system, rules are also concluded for patents on plant varieties as such (variety patents) as these are available in the US. Each member can use varieties owned by other members, which are protected by a variety patent, under certain conditions. These conditions are: a member intending to breed with a protected variety has to notify the patentee member that he intends to start breeding with the protected variety. Furthermore, a newly bred variety must be sufficiently different from the protected variety.
Today in vegetable breeding, patented traits do not concern GM-traits. In the event of GM- traits would become commercially relevant for the global vegetable market, the members of ILP Vegetable shall negotiate a comparable system as agreed under ILP Vegetable for non-GM material.

Patent register

A patent register has been composed that, except for the variety patents, contains all the patents of the members involving biological material for breeding vegetable varieties and all patents of the members related to the commercialization of such new vegetable varieties. At the first General Meeting of the association, it was decided that this register will be publicly available. This patent register will be published on the ILP Vegetable website.
An important aspect of the association is the possibility for other companies, institutes and universities to become members of the association, regardless of whether they own patents or not.
Within the association, there are small members (less than 100 employees), medium members (between 100-500 employees) and large members (500 or more employees). For these memberships, different levels of annual contribution fees exist and subsequently different levels of voting rights.

In search of excellent **flavour**

Monique Krinkels

In 1993, the demand for Dutch tomatoes showed a sharp decline. The reason: the flavour was not up to the consumers' taste. The Germans even sarcastically called the Dutch produce 'Wasser Bombe' (water bomb), to emphasise the problem. Since then, Wageningen UR GreenhouseHorticulture has developed a method to screen the flavour level of the fruits. It enables breeders to incorporate taste as a major breeding goal.

The research to improve flavour of fruits and vegetables is not restricted to tomato. Since the nineties, pepper, cucumber, strawberry, asparagus, cabbage, sprout, pumpkin, melon, beet, carrot, kale, hot pepper and aubergine have been added to the list. Consumer panels, expert panels and various measuring instruments are used to decide which varieties should be used in breeding lines and which ones should definitely be discarded.

Describing flavours

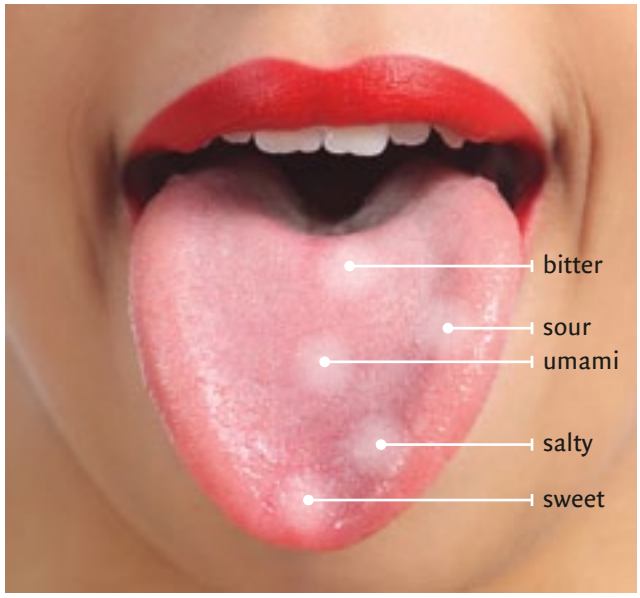
Two times a week, five adults enter the premises of Wageningen UR in Bleiswijk, the Netherlands, where the flavour research takes place. They are part of the consumer panel of in total 250 people. "Their task is to decide which fruits and vegetables have a nice flavour and which do not. They take their seats in individual white cubicles in a quiet environment to ensure the assessors can fully focus on the taste when small portions of the fruits and vegetables are being served. They express their (dis)liking in a 1-100 scale", explains Wouter Verkerke, researcher at the taste lab of Wageningen UR Greenhouse Horticulture.
Members of the consumer panel are ordinary consumers. Their tasting abilities are no more than average. The only requirement is that they are able to distinguish sweet, salt, sour and bitter. "The expert panel takes it one step further. They are able to distinguish and describe the different flavours that are combined in a product, thus clarifying why the consumer panel likes or dislikes a certain variety. They have learned a vocabulary in which they can discuss flavour. While the consumer panel sits in a separate cubicle with as little distraction as possible, the members of the expert panel have a roundtable discussion on the terminology before tasting the samples."
So far, the consumer and expert panels both consist of male and female adults. The demand for a panel of children reviewing fruits and vegetables is negligible. "A pity", Verkerke says, "probably it is believed that children are not the ones that choose in a supermarket. However, as they have a sweeter tooth than their parents, they might be stimulated to eat more fruit and vegetables if the Brix degree is somewhat higher."
During the last decade, the demand for taste research sky-rocketed. "And the tasting ability of humans is limited. After having eaten a certain amount of tomato, they cannot discern differences anymore. On the other hand, breeders want to be sure from the start that the taste of the tomatoes meets the prerequisites. They enter over a hundred different samples of their breeding lines for flavour testing."
Twenty years ago, Verkerke and his team started to develop the tomato flavour model. It was calibrated again four years ago. "We wanted a method of establishing the flavour of tomatoes objectively," he says. "By measuring the Brix-degree*, the sweetness of the product is established. Together with the acidity and the juice percentage, it gives a good impression of how the taste will be perceived. In addition, we measure the firmness of the fruit flesh to establish the texture."
The total of all measurements are entered into an algorithm that accurately predicts how the panel would react to the tomato sample. "Because the outcome is a number between zero and hundred, the results are easily comparable. But the model cannot fully replace a panel. It gives a quick overview of the differences in a group of samples."

More than 'yummy'

Most consumers do not go beyond 'tasty' or 'not very tasty' when describing the flavour of a fruit or vegetable. The expert panel, however, does not stop at 'yummy'. When you hear these sensory specialists talking about a tomato, it is like observing a wine tasting event with its colourful vocabulary. Does this variety have 'a grass-like aroma with a floral tinge', 'the sweetness of brier', 'an earthy, musty aftertaste', is it ' fruity' or 'smoky', does it leave 'a sense of roughness in the mouth', does it 'tingle the tongue', or - in an exceptionally bad case - does it have 'the smell of wet dog'?

From 10,000 to 2,000 taste buds

Jacques Baart, oral surgeon at VU University Medical Center, Amsterdam, the Netherlands, explains the physics of tasting: "There is no accounting for taste, the saying goes. It underlines that taste remains a subjective topic. The flavour of our food is defined mostly by what we see, smell and taste. The 'bite' of the food also plays a role in the perception of savour. Blindfolded and with a clothes peg on the nose, a piece of onion can easily be confused with an apple wedge."
Tasting happens within the mouth, in particular with the taste buds of the tongue. People can discriminate sweet, salty, sour and bitter. Umami is the fifth known element of taste perception; it means savoury or meaty. "Food in the mouth first is scanned and chewed, which gives an impression of the bite and mixes the food with saliva.



Without saliva we would not be able to taste. The flavours in the food, the so-called tastants, dissolve into the saliva and enter the taste buds." In the base of these buds, free nerve ends can be found. They are most sensitive, from the front of the tongue to the throat, for sweet, salty, sour and bitter. "The transport of information on these flavours from the mouth to the brain is rather complex. At first the information goes with the chorda tympani or lingual nerve of the tongue. Halfway, it shifts to the facial nerve and in the brain it splits to cover a relatively large part of the cortex. The latter emphasises the importance of taste during human evolution."
When very young, children are not able to distinguish flavours except for bitter. The latter flavour is a natural warning against poisonous or overripe food. After six months, when they become toddlers, children learn to taste and preferences are developed. "Epidemiological research learns that sweet is the favourite taste of young people all over the world. Only later in life do they learn to appreciate bitter, as during their lifetime the preference for sweet, salty, sour, bitter and umami changes."
The older a person gets, the less sensitive the taste buds become and also the number of taste buds decreases. Above age sixty, first salty and sweet tastes are lost, followed by bitter and sour. Of the 10,000 taste buds a baby starts with, only 2,000 remain when he reaches old age. Medicines also influence the ability to discern flavours; especially chemotherapy is infamous in that regard. When the treatment has ended, the taste buds will, however, be restored

In white cubicles, with as little distraction as possible, panel members chew at least twenty times on the sample to ensure the taste and aftertaste are fully perceived

Verkerke and his team have extended the knowledge they gained from the tomato model to other crops. The sweet pepper model has just been finished, as has the one for Galia melon and strawberries has just been started. "As we learned what to look for as parameters in the model, the speed in which we develop new models has increased."

New developments

However trustworthy the panels and the models are, some products defy the results. The snack tomato, small tomatoes sold in a plastic cup, for instance is a huge success in the supermarket, but the model slightly underestimates the flavour level. "We plan more research on these fruits," Verkerke says. "They are attractive, small and ready to eat but according to our panel, the fruit flesh is too firm and not sweet enough. We think this discrepancy might be related to the circumstances in which these tomatoes are evaluated by our panel. In real eating situations, when competing with peanuts or potato crisps, their crunchiness might be an advantage. That is why we are now developing a new type of panel testing: with evoked context. If we have the panel members imagine they are sitting on a couch watching television while eating snack tomatoes, their conclusions might be different."

* One degree Brix is 1 gram of sucrose in 100 grams of solution

Big data analysis solves complicated puzzle

Robert Hall, Richard Finkers and Ron Wehrens

According to the FAO, crops will need to yield twice as much with half the input for us to still be able to feed the rapidly growing world population in 2050. This goal is attainable if we make good use of available big data from the various omics approaches, say biologists, mathematicians and breeders from Wageningen University and Research Centre.

Feeding the eight to perhaps ten billion mouths expected on the earth by 2050 will be no easy task. The available land is becoming more saline – in Southern Europe, for instance – or hotter – as in Australia. At the same time, the availability of inputs such as clean water and phosphates is declining. We are therefore faced with a complicated puzzle containing innumerable pieces.

The instructions on how to solve this conundrum lie in part with the genomes of the different crops. Genes can provide the key to food cultivation, despite the increasing heat, salinity, drought and soil impoverishment. But how will we isolate these instructions? The answer lies in multidisciplinary plant breeding.

Knowledge discovery

Some of the clues on how to solve the world food puzzle may well have already been found without us realising it. A breeder looking for the unknown relationship between factor A (a certain property in the roots of a plant, say) and factor D (the amount of nutrients required by the plant) can carry out targeted experiments to test nutrient consumption. However, it may well be that steps B and C, which complete the relationship between A and D, have already been described somewhere in the literature. It might even be contained in literature which has nothing whatsoever to do with the relevant plant varieties as such. Instead of carrying out an experiment to find out the relationship between A and D, one can also look to see if A-B, B-C and C-D have perhaps already been known for some time.

This process of knowledge discovery and data mining is increasingly used in research by Wageningen UR. This is partly because practical experiments are expensive and time-consuming, but also because the mathematical methods and information technology that make this data mining possible are becoming increasingly more sophisticated.

This technological progress is made possible, among other things, by scientists from different research groups, institutes, countries and disciplines enhancing their research results by better linking databases with each other and making standing agreements with each other to this effect. When data is made FAIR – Findable, Accessible, Interoperable and Re-useable – searching and comparing becomes easier, and a greater impact can be realised from both current and previous research.

In addition to existing findings being better used, the yield of new research can also be enhanced considerably. In particular, the increasing stream of experiments in the fields of genomics, metabolomics and other modern 'omics' nowadays generates an enormous flow of data. However, there is still no proportional flow of answers. By formulating new experiments in a smart way, we can better combine the vast mass of results from omics experiments with advanced mathematics and statistics. This will allow all this data to generate more and more useful information, such as finding out which genes in a particular cultivar are responsible for its nutrient needs.

Broad application, wide impact

Recent Wageningen UR successes from a multi-omics approach cover a broad range of topics. In rice, ca 200 progeny from a cross between a high yield / low quality variety with a low yield / high quality one were first subjected to genotyping by sequencing. Metabolomics analyses were performed to determine grain biochemical composition, while human sensory analyses assessed grain quality. Using these data together with agronomic evaluations under standard and drought conditions in advanced correlation analyses, it has been possible to identify a number of individual lines which combine high yield and high quality. They also contain an important Quantitative Trait Locus (QTL) for yield under drought. Such lines are immediate candidates for becoming a new sustainable rice variety.

In tomato, combining data from taste panel analysis of fruits from a wide range of genotypes, multiple metabolomics analyses, gene expression (transcriptomics) analyses and genome mining followed up by reverse genetics, has made it possible to correlate and identify both QTLs and individual genes determining good and bad taste attributes. Such information can be directly used by breeders to breed for quality.

Professor Robert Hall is Deputy Manager Bioscience and Professor of Plant Metabolomics at Wageningen UR, Richard Finkers is a bioinformatician at Wageningen UR Plant Breeding, and Ron Wehrens is Manager Biometris and a senior scientist at Bioscience at Wageningen UR, Wageningen, the Netherlands

Photo: Yvar Pel

When we make optimal use of big data from the various omics approaches, in combination with biological data, e.g. from N-use efficiency, we may be able to greatly enhance food production while reducing the use of resources at the same time

Technology is not the only area in which progress has been made. The ancient art of mathematics is also alive and kicking and moving with the times. Developments here lie mainly in the increasing opportunities to find crucial associations from a limited amount of comparisons. If, for example, we wish to determine the relationship between the yield of a crop and some given input variables, such as nitrogen or temperature levels, we know that this connection must have a certain form. If, however, the sample consists of a single measurement from one given cultivar, this leads to a seemingly impossible mathematical task, which determines just a clear line based on a single point.
This issue can be solved if biologists and mathematicians together define the right boundary conditions. When experimental biologists can tell that one of the variables is a concentration of a certain substance, for instance, the fact that this can, by definition, never be negative already limits the number of possibilities for the mathematicians. The growing amount of information in publicly accessible databases also plays an increasingly important role in the framing of the detected relationships within a biological perspective.

Breeding in silico

In the early days of genomics, research was somewhat limited by options for analysis in the laboratory. Advances in technology have made it very tempting simply to analyse everything. After all, it costs almost nothing and is very fast. By involving mathematics and statistics in this work at an early stage, it is possible to ensure that precisely-defined and relevant questions are asked, leading to answers that can be interpreted clearly.
The potential benefits of this combination of omics and statistics are enormous. As soon as breeders can link a gene to a property, there is no longer a need to wait for the hybrid to grow to maturity. The properties of the crop can already be observed in the seedling. The real process of breeding is thus brought closer to the drawing board than the field or greenhouse. Meanwhile, part of the breeding work is no longer carried out in situ, but rather in silico, as it were: in the computer.
The outcomes provided by genomics, proteomics and metabolomics can teach us which relationships or rules within the genes of a plant determine how salt tolerance, drought resistance or other required properties can be stimulated. This means that we can already discover on the drawing board how to attain a desired new cultivar in as few steps as possible. The better existing knowledge is used, the more it will be possible to start solving the complicated puzzle of the world food production already on the drawing board. Projects which focus on both fundamental and applied research targets increasingly need to take into account that it is only by grouping different types of expertise within multidisciplinary approaches that we will be able to make major steps towards our long-term crop improvement goals.

Rules are one thing, **implementation** is something else

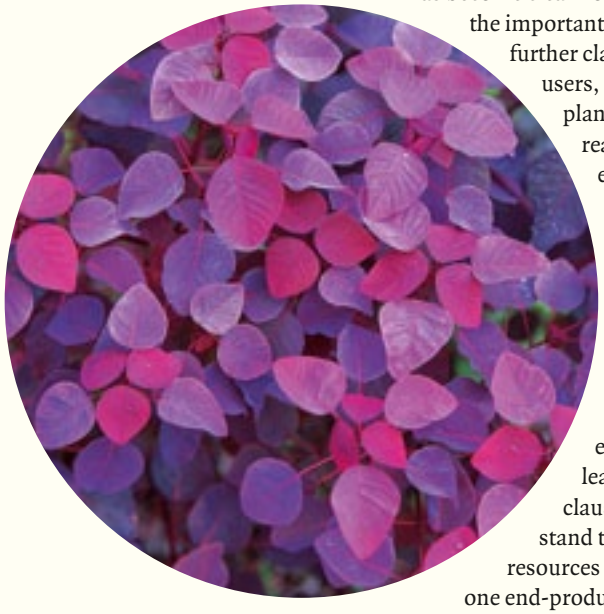
Anke van den Hurk

The EU wanted to give a signal to the rest of the world by implementing the Nagoya Protocol on access and benefit sharing as soon as possible. The EU legislation focuses on the compliance elements for users of the Nagoya Protocol. Access and benefit sharing rules are left to the member states.

'Due diligence' by the users of genetic resources is a key element of the EU legislation. This means that, for those species falling within the scope of the legislation, users have to be able to demonstrate that they have the right to use the genetic resources and have an agreement to arrange benefit sharing if required by the provider. So, in other words, the user of genetic resources has to prove that he is allowed to use them. The authorization should be demonstrated with relevant documents.

Clarification

Even though the EU legislation was adopted, it has become clear now, that most of the important articles need further clarification. The users, including the plant breeders, already warned at an early stage that the implementation of compliance is not an easy matter and should not negatively influence the breeders' exemption, lead to perpetual clauses and understand that more genetic resources may be used for one end-product. Moreover, it should be realized that compliance with legislation that does not exist is impossible. In most countries, access and benefit sharing rules are lacking or not practically workable. In the meantime, officials in the European Commission, as well as in member states, do realize that further explanation of the legislation is required before users of genetic resources can really be made accountable for their due diligence. Therefore, guidance will be developed in time to come. The breeding sector is of the opinion that at least on the following elements of the legislation, guidance should be provided. First of all, clarity should be obtained on the scope. Moreover, the UPOV breeding exemption should not be affected by the definition of the scope. Therefore, varieties that have been/are or will be commercially available should be excluded from the scope. In addition, genetic resources that were already available in ex situ collections before 12 October 2014 should be left outside the scope.



Guidance

To further understand the scope, it is important that the definition of utilization is elaborated, as utilization implies research and development. The breeding sector is of the opinion that the use of genetic resources as comparers in field trials or as tester for resistance, as well as for the screening of genetic resources, should not fall into that definition, as it is only research, but not development.
Secondly, some expectation and limitations need to be defined with regard to 'due diligence' to make the system workable and avoid too burdensome administrative measures. In this regard, it should be realized that in many countries, it is not possible to get the necessary Prior Informed Consent (PIC) and Mutually Agreed Terms (MAT).
Lastly, further guidance is required on the process with checkpoints, the information that should be provided in that regard, and the monitoring of the users by officials.
So the due diligence obligations and other requirements in the EU legislation may seem relatively simple, but they are not in practice. While developing guidance, needs for all types of companies should be considered and probably be focused on those of the smallest ones. If they can follow the procedures, it will also be manageable for medium-sized and large companies.

Anke van den Hurk is deputy director at Plantum, Gouda, the Netherlands

The First Extra-Terrestrial Crop

Mars colonists will grow **fresh food**

Which plant species will be the first to germinate on Mars? That is the question Jack van Loon, gravity specialist at the European Space Research and Technology Centre in Noordwijk, the Netherlands, and his team will have to answer in the coming years. Together with Maria Helena Carvalho, plant researcher at the University of Porto, Portugal, he coaches a group of Spanish and Portuguese students whose proposal for an experiment won a contest of the Mars One-project.

Monique Krinkels

If someone were to predict that in ten years' time the first human colony on Mars will be founded, most people might start to laugh. The same happened when John F. Kennedy announced on 25 May 1961 that within a decade a man would land on the moon. Only eight years later, on 20 July 1969, Neil Armstrong made his 'giant leap for mankind' on the surface of the moon.
The non-profit organisation Mars One (see www.mars-one.com for more information) plans to send crews of four people at a time every two years on a one-way trip to Mars. Some people deem it unethical to send people on a mission, without the ability to return. On the other hand, history has known many explorers who left home for good, to start new settlements on far away continents.

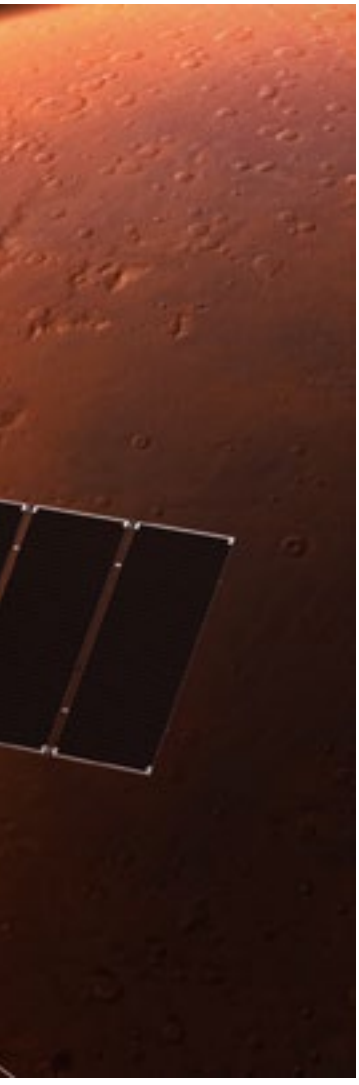
Lander missions

The first manned mission should depart in 2026, according to the latest schedule. The selection of candidates has already started. From the initial 202,586 applicants, only 100 – 50 men and 50 women – will continue phase 3 of the astronaut selection process and even fewer will continue with the subsequent training programme. The final goal is to build an extensive settlement on Mars with earth-like conditions, where the crews will be living for the rest of their lives.
Sending food supplies from the Earth to Mars will be extremely costly and time-consuming. Therefore, one of the requirements for the project to succeed is to develop a way in which the Mars colonists can produce their own food. Besides living and working areas, the settlement will contain a 'plant production unit' where the colonists will grow greenery.
To prepare for the arrival of the colonists, a number of unmanned lander missions will be launched.

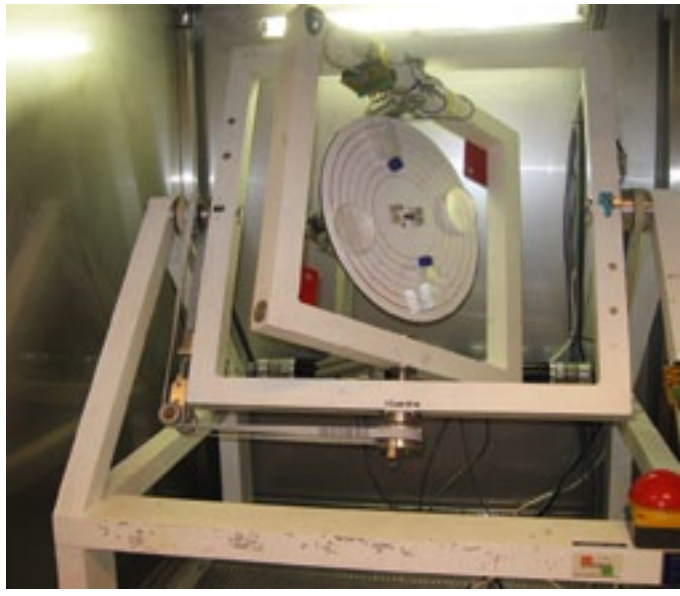
Number one

Does your variety have the necessary characteristics to become the first plant ever to be grown on another planet? Send a short description why this particular variety is an eligible candidate to: Prophyta, feedthemartians@prophyta.org. The most suitable plants will be further tested by Jack van Loon and his team. The best variety will germinate 80 million kilometres from Earth.

The seed project is an initiative of four students from the Integrated Masters on Bioengineering at FEUP/ Institute of Biomedical Sciences Abel Salazar (ICBAS) from the University of Porto and two PhD students from MIT Portugal and the Center of Biological Investigations, University of Madrid. It was chosen out of a long list of proposals from all over the world.



According to schedule the first Mars colonists will depart in 2026



Using the Random Positioning Machine (RPM) at the European Space Research and Technology Centre microgravity is simulated. The instrument provides continuous random change in orientation relative to the gravity vector of an accommodated biological experiment. The use of the RPM generates effects comparable to the effects of true microgravity when the changes in direction are faster than the object's response time to gravity

The first one, scheduled for 2020, will conduct several experiments, later ones will transport cargo to the planet. The project plan with which the Spanish and Portuguese students won the Mars One University Competition is one of the experiments. The students believe that "plants are one of the key solutions to contribute to the settlement of a human extraterrestrial base due to their photosynthetic capacity to create oxygen and food and resistance to adverse environments." Their mission is to have seeds germinate on Mars in 2020.

Low gravitation

It stands to reason to choose an edible plant species for the experiment. "After a trip of seven to eight months with nothing to eat but freeze-dried astronaut food, a fresh salad might be a real treat", says Jack van Loon. "If we are to test whether food can be produced on Mars, we might as well start with a tasty vegetable."
Most of the conditions in which the plants have to grow are artificial. There will be sufficient oxygen and carbon dioxide in the air, the temperature will have an adequate level, water and nutrients will be provided and if there is no direct sunlight available, LED lights will be applied.
The main challenge will be to overcome the problem of gravitation on Mars. "In an earlier experiment in the International Space Station, ISS, astronaut Andre Kuipers showed that in weightless conditions, rocket leaf plants were oriented towards the light. In the absence of light, the roots and stem grew in all directions. Maybe one third of gravitation is, however, sufficient for a plant to distinguish up from down." Other effects low gravitation may have, are problems with the water supply, as water will move more slowly downwards to the roots. And inside the plants, the transport of carbon dioxide and oxygen is difficult, hampering the growth and the evaporation of water. He expects that species that contain starch will show better growth on Mars. "But we can test that in our centrifuge. In this apparatus, we can simulate conditions from weightlessness to a gravitation of 99 times that on Earth."

Conditions on Mars

Position	**the 4th planet of our solar system, between Earth and Jupiter.**
Size	**a diameter of 6,794 km (53 % of Earth)**
Gravitation	**0.39 times that of Earth**
Atmosphere	**less than 1 % that of Earth, 95.32 % CO_2, 2.7 % nitrogen, 1.6% argon, 0.13% oxygen**
Temperature	**between -87°C to +27°C on the equator**
Day length	**24 hours and 37 minutes (a sol)**
Year	**669 sols (= 687 Earth days)**

Variety protection

Unlike historic explorers, the colonists will not have to cope with lawlessness when they arrive at their new home. The United Nations Office for Outer Space Affairs is responsible for an international treaty that has governed human interference in the universe since the mid-sixties. "It is, for instance, forbidden to pollute the universe or other planets. At ESTEC, we have a room to sterilise equipment, before it is shipped to the International Space Station. It is important that the seeds, the container and the growth medium are germ free", explains Jack van Loon.
There are no regulations protecting a variety in outer space. However, as the plants will not grow to maturity and there are no people around, chances of variety theft are minuscule. As a matter of fact, the experiment has to be conducted in a 10 cm box. Thus, there will be little more than the first stages of growth.

Timing

Whether the Mars One project will succeed in sending the first group of people to Mars in 2026, he remains uncertain. Jack van Loon: "High-tech projects have a tendency to deferral. On the other hand, these types of endeavours might just as well be advanced rather than delayed. Whatever happens, in 2020 an unmanned Mars lander will be carrying seeds on board."

Pollination and fertilisation **research revisited**

Frans Krens

Plant breeding revolves around improving existing varieties in order that they cope better with changing growing conditions and consumer demands. The availability of sufficient genetic variation is crucial. Once the genetic variation present within a crop species becomes too low or is exhausted, breeders turn to related species or genera harbouring the desired novel traits.

Mobilising genetic information from other species (even related ones) by interspecific crosses is often not so easy. In taxonomic classification, a species represents the largest group of organisms capable of interbreeding and producing viable and fertile offspring. This means, by definition, that you can expect problems when trying to produce interspecific hybrids.

Interspecific hybridisation

Fortunately, nature provides possibilities for stretching the boundaries identified by man. Natural hybridisations between species as defined by humans do occur. And, of course, man also has some tricks up his sleeve in overcoming species barriers for sexual reproduction. Pollination and fertilisation research in the past has identified pre- and post-fertilisation barriers. Pre-fertilisation barriers inhibit successful pollination and prevent the formation of a zygote. Post-fertilisation barriers interfere with the outgrowth of a zygote or embryo into a viable seed capable of germination and plant formation. Miscommunication between embryo and endosperm could be a reason for this. The hybrid plant might ultimately prove to be sterile, preventing further introgression of the novel traits into the genome of the recipient parent. How can we solve or circumvent these various problems?

Know your plant material

Knowledge of all kinds of aspects related to the recipient plant species can be of major importance. However, it is clear that not all of this information is always (still) available. The more that is known, the better an estimation of the chances for success can be made. It all starts with knowledge of the geographical locations where the original species can be found and the climatological conditions there. For example, cold nights, lots of rain, or the presence of certain insects can determine the time of flowering and shedding pollen and pollination success, respectively. Information on the pedigree of the recipient variety, on self-incompatibility, on the level of relatedness of varieties within the species and on the phylogeny among the other species within the genus might come in handy. Intraspecific crosses can act as a benchmark for a normal fertilisation process and can be used for comparison. Finally, knowledge at the ploidy level and of chromosome numbers and DNA content should preferably be acquired.

With all the available information to hand, a breeder can start to perform some tests. Pollen viability can be assayed from all potential variety or wild relative parents that are earmarked to be part of an interspecific breeding scheme involving several reciprocal crosses. Viability tests can be based on staining protocols or on germination on artificial media. Viability rates can be established from pollen obtained from plants grown under variable conditions. In addition, there are protocols for monitoring pollen tube growth and whether or not ovaries are reached. More difficult – but feasible using microscopical techniques – is the checking of zygote formation and embryo growth. Using these techniques it can be important to determine the precise moment of developmental arrest of the embryo, together with the condition of the endosperm.

Some tricks to overcome barriers

Should pollen tube growth be prematurely arrested and tubes fail to reach the ovaries for fertilisation, styles can be cut and pollen administered to the cut surface to shorten the distance that the tubes have to overcome. This works in species with sufficiently long and sturdy styles to allow this delicate handling and cutting, such as lily. The grafted style is another trick that can be tried with these species. Here, the style of the pollen donor plant is grafted onto the recipient species after removal of the style. Pollen will germinate on the familiar stigma and grow into the familiar style, passing through the transition zone and reaching the ovaries. This has been done in lily. When continued growth of the embryo is the main bottleneck instead of pollination, possibilities can be explored to isolate and culture ovaries, ovules or even embryos. This culture takes place on artificial media under sterile conditions and is called embryo rescue.

Hybrid nature determination

Once putative hybrid plants have been obtained, their true hybrid nature needs to be confirmed. This can be done by checking the phenotype and all kinds of morphological traits. In addition, cytogenetical tools such as determining DNA content by Flow CytoMetry

Dr. Frans Krens is research group leader at Wageningen UR Plant Breeding, Wageningen, the Netherlands

Insect resistance would be a valuable trait in other Allium species

(FCM), performing chromosome counts or chromosome painting (GISH) can be applied. A powerful tool is the use of molecular markers to establish hybrid character. Both AFLPs and SSR markers have been used for this. The morphological traits and molecular markers can both be subjected to statistical analysis tools to identify the occurrence of groups within the parents and progeny and their mutual relatedness. Different hybrids will be generated with different genetic and morphological profiles. All should be checked for presence of the trait of interest and maintenance of important determining features from the recipient parent.

Hybrid fertility

Hybrid plants may themselves not be directly suitable for further commercialisation. Repeated backcrosses with the recipient parent might be required in order to introgress the novel trait coming from the wild relative into the genome of a cultivated variety, recovering all the beneficial traits of that variety. To be able to do this, the hybrids need to be fertile. Problems might arise here too, based, for example, on ploidy level differences between the parents. In case of a cross between a diploid and a tetraploid, the triploid offspring is likely to be sterile. Chromosome doubling by colchicine or oryzalin treatment could provide the solution, and the occurrence of 2n-gametes can also contribute to success in further breeding. This phenomenon and its induction is the subject of ongoing research. Recombination between sister-chromatids is a necessary process for introgression. Recombination and parameters or mechanisms to control or stimulate it are interesting topics for research.

Interspecific crosses are successfully made in many Wageningen UR Plant Breeding research projects. The hybridisations are often quite easy in specific crops and do not require any special measures, for instance in potato, tomato, brassica and lettuce. This does not necessarily hold true for all desired combinations of species, however. Programmes are also running in crops where interspecific hybridisations are more difficult and involve more interesting in-depth research into mechanisms. Here in nearly all combinations, pollen viability is routinely checked prior to pollinations. The cut-style and grafted-style methods have been developed in lily. In lily, tulip and allium, ovary rescue or ovule rescue are applied. Embryo development using microscopy has been performed in campanula and 2n-gametes induction used to restore fertility in lily. Molecular markers are developed and used in multiple species and our quantitative genetics group routinely uses statistical tools suitable for hybrid screening, too. Wageningen UR Plant Breeding can offer practical and applied help in identifying obstacles and/or carry out more fundamental research into underlying mechanisms via collaborative and contract research.

Africa awakes as new **food basket**

Wynand van der Walt

The 15th African Seed Trade Association (AFSTA) Congress, held in Victoria Falls, Zimbabwe, on 3-5 March 2015, was, to say the least, another resounding success for the African seed industry. It brought together 327 delegates from 19 African and 20 European, Asian and North American countries.

The congress took place against the background of a sterling performance by AFSTA over 15 years and the milieu of awakening of Africa as new food basket for the world, quality seeds being a primary input for food production. Africa remains the only continent with large areas of available land for food production; yet, food and nutritional insecurity persist in the continent. Population growth to 2050 will see an additional several billion mouths to feed, an estimated half of these in Africa. Presently, the continent imports some US$ 25 billion of foodstuff (African Development Bank Report). There is no technical reason why Africa cannot export US$ 25 billion to become another food basket for the planet.

Agricultural potential

It was an appropriate time to take serious stock of our agricultural potential, evaluate progress made and build upon new opportunities. Trade barriers between states have caused inadequate intra-Africa trade. This has already started to turn around despite regulatory obstacles, some countries being member of more than one trade block, disparities in development, inadequate funding, and certain parties that attack every step forward that Africa makes in progress. The UNCTADstat database shows how intra-African trade increased from $ 32 billion in 2000 to $ 130 billion in 2011.

Good quality seeds, adapted to apt environments, are the point of departure in sustainable agriculture. Justin Rakotoarisaona, AFSTA Secretary-General, says: "The 2008 international food price crisis forced international development communities, governments and businesses to look at developing regions, particularly Africa. AFSTA, through its new African Seed Magazine seeks to put seed at the heart of development." AFSTA has provided assistance and guidance in seed law harmonization in all four regions, and still does.

Southern Africa

Seed harmonization initiative, under Southern African Development Community (SADC), gained real momentum in the past decade, with ministerial agreements reached in 2005 on three objectives: crop variety testing, seed certification and quarantine/phytosanitary measures. These were in line with previous SADC Agreements, Declarations and Treaties. In 2009, details were spelled out in the SADC booklet: 'Technical Agreements on Harmonization of Seed Regulations in the SADC Region'. It made provision for (a) shorter time for testing a new variety (including DUS and VCU). Once released in two countries, it will be accepted in member states and the variety owner may apply for listing in the SADC Variety Catalogue; landraces can be listed too. GM varieties? Not yet. (b) a SADC Seed Certification and Quality Assurance System with seed classes identified; and (c) a list of quarantine and phytosanitary seed-borne pathogens identified.

Progress is that the initial pathogen list for 29 crop species has been re-examined more than once. Ten member states signed the SADC MoU in June 2013, which came into force on 7 July 2013. Variety testing, seed certification and quarantine/phytosanitary lists now need to be implemented. South African government experts have been involved, so is the national seed secretariat SANSOR, while the Official Seed Testing Station has been active over decades in presenting ISTA training workshops for SADC states. Personal feedback held that very few breeders have applied for placing varieties on the SADC Catalogue, probably as PVP progress is slow, and GM varieties have not yet been touched.

North Africa

Riadh Gabsi of the Tunisian Seed Trade Association, presented a survey at the AFSTA Congress which covered Egypt, which is member of ISTA and OECD seed schemes, all seeds having to be catalogued and certified; Algeria produces 200,000 MT of certified cereal seed listed on the national catalogue and has variety protection, both elements regulated under official Decrees. The Moroccan seed trade is likewise regulated under Decrees which include variety protection. In Libya, the industry is handled under Law 9 of 1428 and Resolution 215 of 1429. Tunisia has been a member of UPOV since 2003, its ISTA accreditation is in the process of being restored and has applied for OECD seed schemes approval. Inter-region seed trade amounts to €0.5 million.

Harmonization is planned by preparatory discussions with seed administrators and professionals who can

Wynand van der Walt is ag-industry consultant in biotechnology, IPR, and seeds, Pretoria, South Africa

The author acknowledges valuable assistance provided by Justin Rakotoarisaona and Daniel Aghan of AFSTA

Good quality seeds, adapted to apt environments, are the point of departure in sustainable agriculture

Justin Rakotoarisaona, AFSTA Secretary-General: 'The 2008 international food price crisis forced international development communities, governments and businesses to look at developing regions, particularly Africa.'

drive a harmonization project, and establishing a steering committee for this project.

Eastern and Southern Africa

The Common Market for East and Southern Africa (COMESA) regional block of 19 member states (from Egypt to Zambia) drafted a comprehensive strategic plan to scale down trade barriers and harmonize trade regulations. The task to extend this to seed laws and regulations came from a directive at a meeting of Agricultural Ministers in 2008. To put this into effect, the Alliance for Commodity Trade in Eastern and Southern Africa was established with a Seed Harmonization Program as a project. A sub-part was to develop a process to facilitate adoption and movement of GM seed, as well as emergency commodity food relief shipments that contain GM commingled grains. Following extensive consultations from 2010 to 2012, draft regulations on seed were approved by the Agricultural Ministers in September 2013 and endorsed by the Council of Ministers in February 2014 (Source: COMESA-ACTESA document on seed law harmonization).

Four objectives were envisaged: ensure that national seed laws harmonize with the COMESA regulations, ensure that all stakeholders are sensitized, monitor and measure improvement during implementation, and support COMESA member states to produce country-preferred seed. An eight-point plan was drafted to guide the review team. (Source: COMESA-ACTESA Terms of Reference Review guidelines).

GM seed and commodity grain are being handled by ACTESA biotech desk under Dr Getashew Belay. The Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) also played a part in implementation of the framework that called for a central Genetic Risk Assessment Committee, which assesses GM biosafety applications forwarded by national authorities to the Committee. The recommendation(s) on approval or rejection of the application will then be sent to the national authorities for implementation, subject to national subsidiarity. The GM biosafety framework was also adopted late in 2014.

West Africa

In 2002, the Economic Community for West Africa States (ECOWAS) and other bodies took steps to facilitate trade in their region, one element being seed law harmonization. This required participation by stakeholders, capacity building, and a step-by-step process, starting with analysing national seed industries and regulations, then drafting harmonized regulations, and adoption of policies. Technical issues were: seed quality assurance, variety release process, plant quarantine/phytosanitary requirements, plant variety protection, and biosafety. The objectives were to increase access to high-quality seed by farmers, promote private enterprises, provide diverse germplasm, and increase employment.

Key factors

In summary, two factors need more support for harmonization to become more effective: harmonized seed testing laboratories and plant variety protection. ISTA lists only ten African countries as members, while UPOV lists four African members, and OAPI, the African Office for Intellectual Property, with its 17 member states having joined in 2014. AFSTA proposed approaching ARIPO, the African Regional Intellectual Property Office, to follow OAPI's example.

Why apple shoots grow rapidly and **tulip shoots** grow slowly

Geert-Jan de Klerk

Tulip growth in vitro is seriously impaired by inferior transport in the shoots. As a result, tulip cannot be micropropagated commercially using conventional means. In contrast, apple shoots show high transport and are easily micropropagated

Adequate nutrition is a major prerequisite for optimal growth. Tissue culture media contain satisfactory amounts of inorganic and organic nutrients. However, as discussed in previous issues of Prophyta, poor transport of nutrients within explants after uptake is a major bottleneck in organ culture in vitro and negatively influences growth.

Vascular bundles

Solutes (compounds dissolved in water) can be translocated in two ways, by diffusion and by convection via water flow. Diffusion is only effective for small distances (the level of cells). For transport of solutes over larger distances (the level of organs) plants use water flow in xylem and phloem. However, the water flows in both xylem and phloem depend on driving forces that are seriously impaired by the tissue culture conditions.

In plants growing ex vitro, water flow in the xylem is brought about by root pressure and transpiration by the leaves. In shoot cultures in vitro, there are usually no roots, so root pressure does not occur. Moreover, transpiration is expected to be very low because of the very high humidity (close to 100%). Transpiration in vitro has been measured only once or twice and was found to be a few percent of transpiration ex vitro. It is doubtful whether the strongly reduced flow in vitro is sufficient. Below it will be argued that in the case of apple transpiration is sufficient (but may still be far from optimal) but in the case of tulip insufficient.

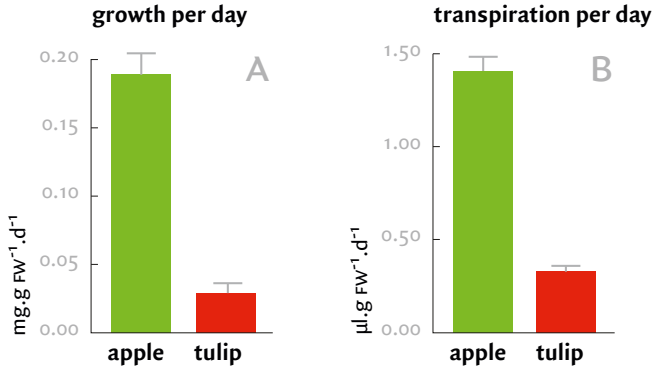
The main driving force of water flow in the phloem is accumulation of sucrose in the intricate network of 'collection phloem' in the leaves. This results in high osmotic pressure by which water enters into the phloem from surrounding tissues. The sucrose is produced by photosynthesis. At the sink site, the opposite occurs and water leaves the phloem. The water flow in the phloem originates from the difference in pressure between source and sink. However, in tissue culture the tissue that is in close contact with the medium has no collection-phloem so there is no or only little accumulation of sucrose in the phloem.

	I Water transpired by shoots (µl·g FW-1·d-1)	II Sucrose moved upwards in shoot in transpired water (µl·g FW-1·d-1)	III Estimated amount sucrose used for growth (µl·g FW-1·d-1)	IV Measured FW increase (µl·g FW-1·d-1)
Apple	1.38	41.5	21	19
Tulip	0.31	9.4	5	3

The experiment presented in this box shows that the weight increases of apple and tulip shoots in tissue culture closely correspond to the volumes of transpiration stream. The growth of shoots in tissue culture depends on the amount of nutrients taken up from the medium and transported upwards by the transpiration stream in the xylem. So the amounts of transported nutrients depend on the volumes of transpired water (measurements in Column 1). The amounts of nutrients that are transported can be calculated from the volumes of transpired water because during the first days of culture there is an open connection between medium and vascular tubes so that the concentration of nutrients is the same in the xylem and in the medium (figures in Column 2). Sucrose is used fifty-fifty for energy and as building block (estimations from other experiments). Sucrose accounts for almost all of the dry weight (DW) increase since the contribution of inorganics to the DW is small (ca. 10%). The expected DW increase can therefore be calculated (shown in Column 3) and compared with the observed DW increase (in Column 4). The expected and measured values are close to one another demonstrating that maximum growth in vitro can indeed be calculated from the volume of transpired water. (Note that 1 µl water weighs 1000 µg.)

Dr. Geert-Jan de Klerk is researcher at Wageningen University and Research Center, Wageningen, the Netherlands

Closed stomata in tulip



Moreover, photosynthesis is low.
The occurrence of these obstacles is deduced from physiological reasoning and they seem to render transport in shoots, so also growth, impossible. Nevertheless, shoot cultures of many crops do flourish in vitro. Apparently these crops have somehow solved the problems. The most likely way out is that sucrose arrives in the leaves via the limited transpiration stream, diffuses to the collection phloem, accumulates in the phloem, causes overpressure and flow in the phloem, and is transported to the site of growth. Thus, the extent of transpiration determines the amount of fresh weight (FW) increase. We examined whether this hypothesis holds by comparing transpiration and growth in apple shoots that grow satisfactorily in vitro and tulip shoots that grow slowly.

How to measure transpiration

The measurement of transpiration is crucial. A shoot was weighed and placed in an Eppendorf tube with nutrient medium. The whole (tube + medium + shoot) was weighed and placed in a container with medium. After 1, 3 or 5 days, the wholes and the individual shoots were weighed again. The loss of weight of the whole was taken as the volume of water that had been transpired. This measurement is similar to the mass potometer measurements used in ecophysiology. Some decades back it was published by the Debergh group in Ghent that tissue-cultured plants show considerable transpiration and that the transpired water is taken up from the headspace into the medium by condensation. To avoid condensation into the medium in the Eppendorf tubes, the lid was closed, a hole was made in the lid and the shoot was put through this hole. The paper by the Debergh group was in general sparing with information and did not include calculations about the rate of transpiration.

Apple and tulip

Apple shoots (6w old, ca. 2 cm) and tulip shoots (10w old, ca. 2 cm) were weighed and placed in Eppendorf tubes with medium as described in the previous section. The Eppendorf tubes with shoots were also weighed and kept in normal tissue culture containers stuck into the medium. After 1, 3 or 5 days and the weight decreases of the Eppendorf tubes + medium +

ABS

Agro Business Solutions

Planning

Quality

Reporting

Off-line apps

Production

Inventory

Processing

Sales

Software solutions

for field crops, vegetables & flowers

Agro Business Solutions

Het Voert 9 • 1613 KL Grootebroek • The Netherlands • www.agrosolutions.nl

RIJK ZWAAN

EAST WEST SEED GROUP

KIEFT SEEDS

SOUTH PACIFIC SEEDS

UNIVERSAL

TAKII USA

VILMORIN

Explant with regenerated shoots

shoots were determined and the shoots were weighed individually. For 1, 3 and 5 days, the data calculated per 24h were similar. Both growth (FW increase) and transpiration were 4-6 times higher in apple than in tulip (see Table in box).
According to our working hypothesis, the volume of liquid that is transpired determines the µg FW increase. The cut surfaces were still very fresh, so no or only little wound tissue had been formed. The concentration of nutrients was therefore the same in medium and xylem. The sucrose taken up will be used as energy (so converted to CO_2) or as building block (so bringing about FW increase). From studies with other crops, it can be deduced that about 50% of the sucrose is used as building block. When calculations are made (see box), the measured FW increases are close to the expected calculated increases.

General importance?

What is actually shown by the calculations is that growth is determined by the amount of sucrose transported upwards in the shoot by the transpiration stream. As this is related to general laws of physics, it will apply for all species. Initially, the nutritional composition of the translocated liquid will be the same as in the medium. After some days, wound tissue will be formed which alters the contact between shoots and medium. In initial experiments we observed that in apple (that forms callus abundantly) the rate of transpiration is not altered by the callus. So the rate of water uptake seems not to be modified by the wounding tissue. It has been published that uptake of the auxin is decreased considerably by the wounding tissue and the same may hold for other medium ingredients.
Shoots may also form roots. Many tissue culturalists have observed that in a container with shoots on rooting medium, the rooted shoots often display most growth. A possible explanation is that these shoots are the most vigorous and therefore show highest growth and also highest rooting. Considering the results published here, it is more likely that the roots ensure increased transport of nutrients in the shoots by root pressure. We have observed that in rooted shoots the transpiration was about twice as high as in non-rooted shoots. Since twice as much sucrose is translocated, growth is expected to be much higher.

Low transpiration by tulip shoots

Why do tulip shoots transpire so little in comparison with apple shoots? First, the volume-surface ratio is large as tulip shoots are cylindrical and apple shoots have flat thin leaves. Note that desert plants have cylindrical and/or spherical structures. Second, tulip shoots have a very thick wax layer on their surface, much thicker than other plants. Finally, we observed that the stomata were closed (photo) and that the number of stomata was reduced.

Concluding remarks

We have shown that the transpiration stream determines the amount of nutrients that reach the growing areas and thereby the extent of FW increase. Therefore, a plant with poor transpiration, like tulip, grows much slower than one with high transpiration. The decisive effect of the extent of transpiration applies for most plants growing in tissue culture. The limitation of growth by poor transpiration can be overcome. An obvious way is to shorten the distance between medium and growing area. This is probably the reason for the improved growth for plant material floating in liquid medium where a large part of the surface of the plant material may contribute to uptake even though the cuticle is relatively impermeable.

NAL will introduce optional **plug and play**

Adrie Molenaar

Naktuinbouw is busy developing new modules (extensions) for the NAL-system. The objective of the optional plug and play is to link the NAL-system more closely to systems of foreign NPPOs, like the United States Department of Agriculture (USDA) Process Verified Program. Because NAL is about market access for seeds. The umbrella for all the modules is what you can call a 'Verification Program for Seed Production and Marketing'.

Until now, the scope of NAL is about sampling and laboratory testing for seed analysis (such as germination, usable plug tests and purity) and seed-/plant health (for bacteria, fungi, viroids and viruses). Naktuinbouw wants to adapt the NAL-system in such a way that it will remain fit for the future.

Be prepared

Since it is likely that the European Union will formulate new plant health and control laws in 2015, Naktuinbouw is already busy making more modules for the NAL-system, in close connection with the companies. New conditions in this matter will also be based upon the drafts of the EU PRM laws that were voted down, because it is likely that the relevant and important elements therein will come into force somehow, sooner or later. Better to be prepared and be ready!
Aspects that are regarded as important are seed-/plant health (quarantine as well as quality diseases/pathogens), varietal trueness, varietal purity, quality aspects (like noxious weeds) and tracking & tracing. Companies will remain responsible themselves, as they are today.
Because NPPOs want to take results of field inspection into account more and more, Naktuinbouw started with the module 'Accredited Field Inspection'. Representatives of almost all NAL participants were present during this first meeting at Naktuinbouw last January. The starting point, as well as the draft requirements, were discussed. Important aspects that were discussed were: risk-based control of the process, the inspector (training, qualification, back up, proficiency test), the inspection and audit regulations (how often checked, by whom, when, consequences if out of tolerances).

Exploration

2015 will be an exploratory year. Companies can implement these new requirements already during the coming year: carry out a risk analysis, determine control measures and monitor these; internally (e.g. by internal audits) or even externally (companies can ask Naktuinbouw for external audits). This to gain experience: to see what is relevant and what is feasible (or not). However, Naktuinbouw will offer training as well - this will not be a mandatory truck system. If there are also good alternatives which we can rely on, these will be evaluated to see if they can be approved.

New accreditations for NAL

Recently, two companies have obtained accreditation for Naktuinbouw Accredited Laboratories (NAL): Sakata in Japan and Monsanto in USA, on top of the 14 previously accredited companies. If you ask them why they have chosen the NAL-system, Sakata states: "In order to keep up with the borderless seed trade, Sakata Seed chose to be accredited as NAL to enhance the prestige of the reliability of its seed health quality." Monsanto points out: "We have chosen to obtain NAL accreditation to complement seed health testing capabilities already in place at the Monsanto location in Bergschenhoek, the Netherlands. This will allow for efficiency gains and operational excellence in product advancement, as well as help to drive business continuity for the Monsanto vegetable pipeline."

As of April 2015, the following companies are NAL-accredited:

- Bejo Zaden, Warmenhuizen (NL)
- Enza Zaden Seed Operations, Enkhuizen (NL)
- Germains Seed Technology Group, Aalten (NL)
- Hazera Seeds, Berurim (IL)
- Hazera Seeds, Made (NL)
- Incotec Europe, Enkhuizen (NL)
- Monsanto Holland, Bergschenhoek (NL)
- Monsanto Vegetable Seeds, a division of Monsanto
- Company in Woodland, CA (USA)
- Nunhems Netherlands, Haelen (NL)
- Nunhems USA, Brooks ID and Parma OR (USA)
- Rijk Zwaan Production, De Lier(NL)
- Sakata Seed Corporation, Yokohama (J)
- Sakata Vegetables Europe, Uchaud (F)
- Syngenta Seeds, Enkhuizen (NL)
- Takii Europe, De Kwakel (NL)
- Vilmorin, La Ménitré (F)

It is expected that another three vegetable seed companies will join the NAL-system later this year.

Adrie Molenaar is international systems manager at Naktuinbouw, Roelofarendsveen, the Netherlands

Naktuinbouw started with the module 'Accredited Field Inspection'

The experiences with the 'Accredited Field Inspection' trial will be evaluated with the platform (participants from the meeting last January) at the end of 2015, which probably will lead to an adapted set of requirements. That will be brought to the board of Naktuinbouw. It is expected to have a set of requirements ready for accreditation from 2016 on. But even after that, Naktuinbouw will keep a keen eye on regulatory developments in Brussels.

Harmonisation

Naktuinbouw will harmonise the Naktuinbouw Quality Management System (QMS)-requirements. These will be roughly in line with the present requirements in NAL, but will become an essential foundation in other systems as well. Making it possible that where a company, for instance, has an accreditation for ASLN, NAL and Naktuinbouw Elite, that there is no need to conduct three QMS-audits, but only one.
Other modules that are going to be developed are, for example, 'Accredited sampler' (sampling is very important; one can have a very good laboratory, but if the sample is poor, the result will be poor as well; NPPOs are very reluctant to depend on samples taken by company samplers: Naktuinbouw will build in several aspects to strengthen the system), a 'Verification program identity' (to make sure the variety is true to type and pure) and 'Accredited risk analysis'. In the end, it will not be each individual module that counts, but the total will be more than the sum of the parts.

Co-operation

Representatives of USDA-APHIS/National Seed Health System (NSHS) will be present during one of the upcoming NAL audits in the USA, to see how NAL audits are conducted and to see if and how it will be possible to work together in this matter. Ideas to be further discussed are appointing NSHS auditors to conduct NAL audits in the USA (where they already conduct NSHS audits) and to carry out joint protocol reviews (this will lead to a situation of mutual recognition).
NAL is also aligning with other NPPOs, like DA of Australia. In December 2014, two representatives of the DA of Australia came to Naktuinbouw to audit the implementation of the NAL-DA protocol (formerly known as NAL-AQIS protocol). They said they have got a good snapshot of the process and valued it overall as a good system. Their observations led to improvement of both the protocol as well as the

FarMore® today

Expect More™ tomorrow

FarMore® Technology

syngenta®

Monitoring results

Naktuinbouw monitors the performance of the NAL-accredited companies by annual external audits and NAL proficiency tests. Especially the latter is valued as most important by the participants, because it often leads to further improvement. NAL proficiency tests are open for voluntary participation by other labs as well.
Indirect monitoring takes place by following official notifications by National Plant Protection Organizations (NPPOs). There were no notifications related to an accreditation for NAL during 2014.
The monitoring as a whole provides confirmation that the companies are in control regarding the processes which they have brought under NAL-accreditation.

Program NAL Proficiency tests 2015-2017

	pathogen	crop	method
2015-1	CGMMV / SQMV	cucurbits	ELISA
2015-2	Phoma lingam	cabbage	blotter
2015-3	Xhc	carrot	dilution plating
2015-4	Cmm	tomato	dilution plating
2015-5	Tobamo	tomato/pepper	bioassay
2016-1	Alternaria	carrot	blotter
2016-2	Pspisi	pea	dilution plating
2016-3	LMV	lettuce seeds	ELISA
2016-4	Pspor	leek	dilution plating
2016-5	Tobamo	tomato/pepper	ELISA
2017-1	Xcc	cabbage treated	dilution plating
2017-2	PepMV	tomato	ELISA
2017-3	Fungus (to be determined later)	-	-
2017-4	LMV	lettuce seedlings	ELISA
2017-5	CGMMV / SQMV	cucurbits	ELISA

Bacterial canker is a serious tomato disease caused by Clavibacter michiganensis subsp. michiganensis (Cmm)

audit regulations. There are now four participants approved for shipping seeds to Australia without further testing at the point of entry: Bejo, Rijk Zwaan, Monsanto and ENZA. A fifth company is about to become approved.

Position statement

In March, the board of Naktuinbouw discussed the desired improvement of NAL and ALSN. The idea is to ensure that there will be a minimal flow (critical mass) of samples to Naktuinbouw laboratories, to keep knowledge and skills of technicians at Naktuinbouw laboratories to an appropriate level. Also the number of audits by technical experts of Naktuinbouw laboratories will be increased.
Where now once in an accreditation cycle of 3 years a laboratory is audited by a technical expert of Naktuinbouw laboratories, this will be increased to 2 times per cycle from 2016 on.
Before accreditation can be granted for a new method, the laboratory must first be audited by an expert of Naktuinbouw laboratories.

In 2014, Naktuinbouw organized a platform meeting, with all kind of workshops related to the field of international systems of Naktuinbouw, ASLN, NAL and Naktuinbouw Elite. This was valued very highly by the participants.
In the coming year, Naktuinbouw will organize different meetings again to enable participants (and other interested) to discuss various items with their counterparts from other companies, like: the NAL – DA protocol, internal auditing, evaluation of seedlings, internal ring tests, training, risk analysis and field inspection. Block the afternoon of 30 June 2015 in your agenda.

NAL co-ordination

Due to the increase in the number of (international) participants, there are more and more questions to be answered and work to be done regarding protocol review (the '4-eyes-principle'), auditing laboratories and proficiency testing. A researcher in vegetable seeds from the R&D team at Naktuinbouw laboratories is going to assist the NAL-bureau with this.

Phytosanitary **yes**, quality and identity **no**

John van Ruiten

Based on a huge amount of comments and opposition from many stakeholders - mainly in the field of NGO's on environmental issues, organic growers and amateur gardeners – the European Parliament decided to stop redrafting the quality and identity rules for seeds and plants. The EU Commission, Council and Parliament will, however, certainly continue to create a new stronger plant health regime.

In May 2013, the European Commission published proposals for renewal of legislation relevant for the plant sector. The proposals consisted of three new basic regulations for plant reproductive material (PRM), plant health (PH) and official controls (OC). In 2013 and 2014, intensive discussions and many meetings were held to assess if the proposals were in line with the wishes and desires of Member States, stakeholder organisations and European Parliament. In Prophyta's Annual 2014, a detailed overview of points of content of these proposals was published.

More complex

Last year, it became clear that there is a broad basis for improving and developing Plant Health rules into a new Regulation. For plant reproductive material, however, the situation turned out to be much more complex. Governments of Member States intensively discussed the proposal and, by majority, they felt that many improvements were to be made before they could be in a position to accept the new PRM regulation. The European Parliament was not satisfied with that and decided to fully reject the PRM proposal.
As far as the redrafting of the Official Controls is concerned, the debate on the scope of this Regulation is still ongoing.
Apart from the question if these uniform official control rules will also be applicable to quality regulations for seeds and plants (quite a number of Member States feel that they should not!), the discussion is mainly focusing on the question whether the EU has to apply comparable tariffs for registrations and controls throughout the Union. Many MS have the opinion that the question if and how to charge tariffs to operators is a matter to be decided in individual MS and not on a Union level. And also, it is noticeable that for a plant health background, there are other thoughts on effective control systems than in the Veterinary sector. It is feared that one uniform Control Regulation might lead to too tight a control model, not fitting well enough with the phytosanitary needs of both authorities and industry.

New Commission

In November 2014, the new European Commission was formed. One of the main issues and programme points of the new Commission is to very critically review the necessity of creating new legislation. This is a main task for vice chairman of the Commission, Frans Timmermans.
As a result, in December 2014, the Commission published a long list of 86 draft legislation proposals that were to be stopped. On that list the draft PRM Regulation was also mentioned. In March 2015, after consultation with European Parliament and Member States, it was decided finally to stop the process of creating one new EU PRM Regulation for the marketing and quality and identity requirements for all agricultural and horticultural species.
Consequently, this decision means that the EU and its Member States

Brief history

Two years ago, the European Commission launched proposals for a complete renewal of both the seed legislation and the plant health legislation of the European Union. The suggested renewal was being regarded as necessary because the seed legislation that now exists in the EU is built around twelve different directives for various crop groups and is, in some respects, outdated. In the field of plant health, it is considered that the present legislation in the EU is insufficient to adequately protect against incoming quarantine diseases and there is a lack of harmonization in phytosanitary approaches (e.g. plant passporting, inspections, notifications) in the 28 Member States. Furthermore, the number of regulated harmful organisms is enormously high (over 300) and that means that an evaluation on necessity and new prioritisation on these harmful organisms is needed to improve inspection and measurements. Unfortunately, it has proven to be extremely difficult to come up with renewed PRM legislation that is to the satisfaction of all groups involved in the societal debate on seeds. As a result, the EU Member States have to continue with the old existing legislation that is less adjusted to the needs and desires of niche and other alternative markets and does not have specific features for preserving biodiversity. Not harmonised, not modernised, but traditional, solid and very differentiated for various crops.

Ir. John van Ruiten is director of Naktuinbouw, Roelofarendsveen, the Netherlands

have to continue with the 'old' existing twelve Directives that regulate the marketing of seeds and plants. The EU Commission has expressed its willingness to start a step-by-step approach in adjusting these twelve Directives to modern times, both from a legal/comitology background but also on some technical issues and requirements in annexes. It is expected that this approach can start as soon as the renewed Plant Health and Control Regulation are adopted, which is estimated to occur by 2016 (probably close to the end of that year).

Plant health

How are requirements for diseases in seeds/plants going to be regulated? The new Plant Health Regulation is changing the policy on many phytosanitary issues. First of all, in the future, a tighter system for allowing material to be imported in the EU will be developed. For certain items - it has yet to be decided which ones - the requirement is debated to only allow imports from new sources (countries from which there have not been recent EU introductions of plant products) after a PRA (pest risk analysis) has been done.
Secondly, the EU wants to clearly decide which plant pests and diseases will be on the list of quarantine diseases. To be placed on that new EU list, the disease must not be (widely) present in the EU and there must be an active policy to eradicate that disease. For some quarantine diseases, this will not be the case in the whole EU, but only in certain Zona Protecta. A long list of existing quarantine diseases (68) is currently being reviewed. These diseases now have the status 'quarantine', but many of them occur in the EU widely and some of them might be transferred to the status RNQP (regulated non quarantine pest). If this happens, it will lead to new norms/tolerances for these diseases, especially for relevant seeds and plants marketed (and imported) in the EU. A list of the most important diseases that are currently reviewed is presented in the table. Many of them are relevant for seeds and plants of fruits, vegetables and ornamentals.

Quality diseases

An interesting point to be decided is whether a number of so-called quality diseases (regulated in marketing certification schemes) will remain regulated in the old marketing directive or, alternatively, that quality disease is going to be transferred to the new RNQP-regime in the Plant Health Regulation. All in all, this year the EU legislators will have a lot of issues to be specified and finalized. It is expected that by the end of 2016, the new package of PH Regulation and Control Regulation will be ready for adoption.

Twitter – Facebook – Blog – YouTube

Digital crossroads help build your brand

Mario van Vliet

Whoever does not use Twitter or Facebook has quite some explaining to do, so it seems. But do those social media actually have added value, for example in communication with the agricultural sector or consumers? "Certainly", say some seed companies. "You can spread your message widely using them."

Social media has taken off rapidly. Twitter, Facebook, YouTube, blogs, LinkedIn, they have become indispensable. What initially seemed like a fun, hip pastime for a small group has become a phenomenal means of communication. No business that takes itself seriously dares to neglect social media. At least, so it seems.

#GirlsDay 7 out of 10 girls are interested in #science. Only 2 out of 10 will pursue it as a career @Bayer4Crops

Social media is in fact for many companies a complex phenomenon. For example, just having a Twitter account or just starting a blog, that is not enough: that account must also be maintained. That takes time, good ideas, discipline, a good strategy and enthusiasm. A cocktail which is difficult to mix.
Apparently that also applies to a number of companies in the seed industry. Some seed companies indicated that they did not want to contribute to this article. That happens with some embarrassment, because whoever does not use Twitter, Facebook, blogs or YouTube, has some explaining to do. "We are a very modern company, but we do not use social media. Maybe later", explains a seed company. Fortunately, there are plenty of companies that do want to contribute. Monsanto, for example. Spokesman Mark Buckingham: "We want to be present in places where people talk about us."

Same old questions, new platform

Companies like Monsanto have basically two groups with whom they want to communicate: agricultural clients and society. And with both groups communicating via social media is playing an increasingly important role, says Buckingham. "Furthermore, the use of social media continues to grow."
Approximately three years ago, Monsanto started to

10yrs and up to 10 mio invested in a new potato variety… How to protect what you #breed? @HZPC

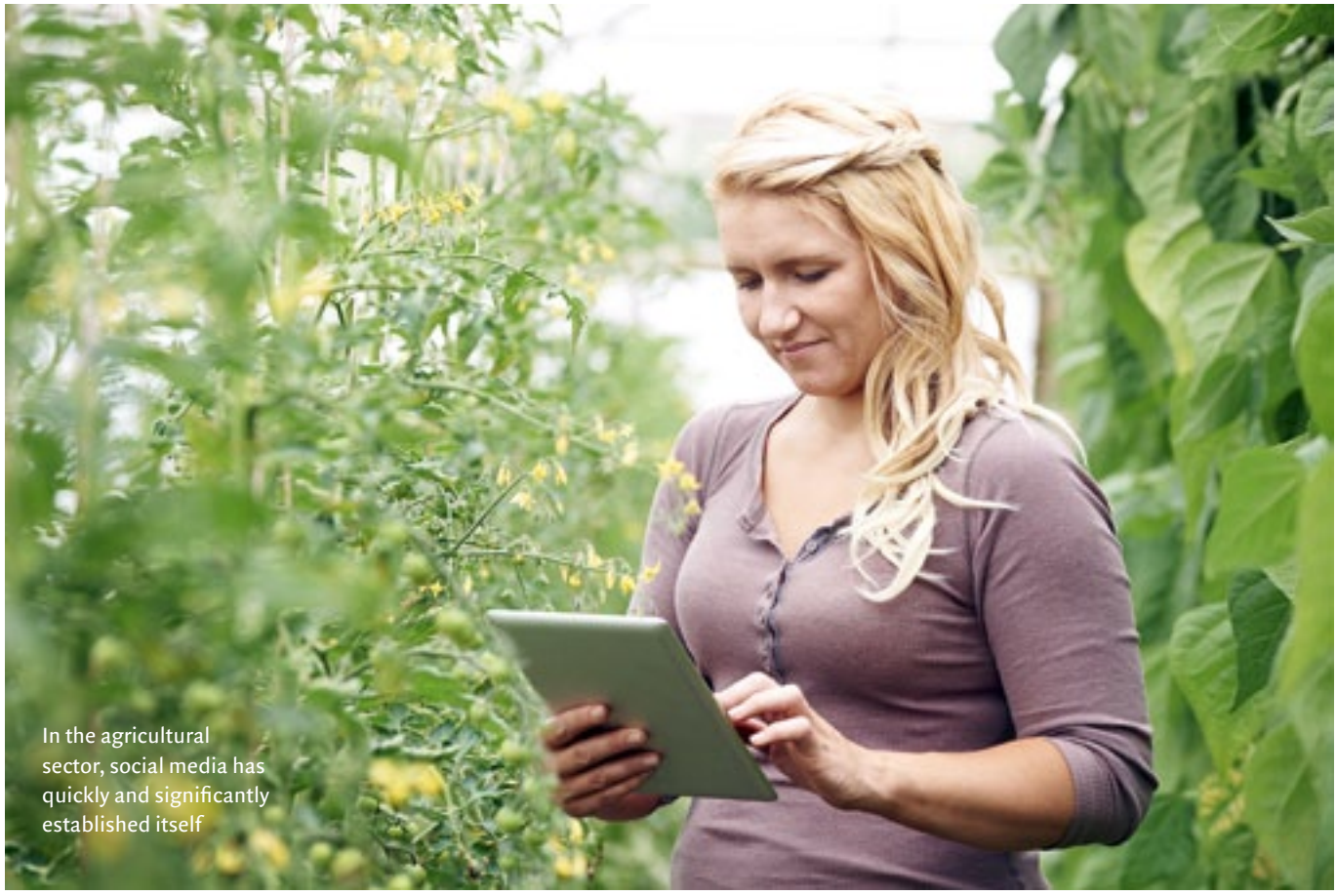
communicate via Twitter, initially mainly with the agricultural sector. "In the agricultural sector, social media has quickly and significantly established itself. How come? I think that the agricultural sector is accustomed to sharing information, for example by solving problems together."
In addition to Twitter, Monsanto now uses a number of other social media platforms, such as YouTube, Facebook, LinkedIn and blogs. Furthermore, it recently launched a special website for consumers: discover.monsanto.com. Through this website, consumers can read blogs, get in touch with the people behind Monsanto and share information with friends and acquaintances. The theme of the website is 'Be part of the conversation'.
With this website, Monsanto wants to tell consumers, citizens and civil organizations what it is working on, and why. Buckingham: "It is nothing new that

#Cumulus #Asparagus for the 4th time in a row 'the tastiest asparagus of Brabant' #BejoZaden

questions are being asked of a company. Only the way in which that happens is new. Social media gives consumers a new platform to ask questions. And that

Bejo Zaden: 'Twitter attracts the attention of the trade press'

Bejo started using social media about three years ago, tell Jurgen van Baar and Daniëlle Bruin. Together they manage (with the help of the Hootsuite programme) the social media accounts of Bejo. Van Baar: "We use social media primarily for spreading news about, for example, products or scholarships. We used to also do that before via email, but social media is much faster. Moreover, we receive increasing customer responses to those messages."
The use of social media within Bejo is therefore growing, and continues to grow, also in the many branches abroad. Facebook, Twitter and LinkedIn are the most commonly used platforms. "Those are established channels, also in our industry. We currently have no plans for other channels, but we are keeping an eye on the new channels and trends. Hence, we are looking to see if and how we can use Pinterest. That is a very visual medium, and therefore suitable, for example, for pictures of recipes of our concepts and hence for reaching consumers."
Van Baar and Bruin are the driving forces at Bejo when it comes to social media. Many colleagues first waited to see the outcome, but now also the Bejo representatives are tweeting. And they are enthusiastic. Bruin: "One is naturally more active than the other. But they see, for example, that tweeting can deliver much more. And so the trade press regularly picks up a message from our representatives."



In the agricultural sector, social media has quickly and significantly established itself

Bayer CropScience Vegetable Seeds: 'Through social media, we reach a greater potential'

"With social media, you reach the sphere of influence of your customers", says Uwe Dijkshoorn of Bayer CropScience Vegetable Seeds. Traditional communication methods can be plainly directed: with a good mailing list you can send each customer exactly the right message. That is different with social media, because your potential reach is very much greater. For example, with a message on Twitter or Facebook you not only reach customers, but also educators, consultants and companies who are not yet customers, says Dijkshoorn. "Through LinkedIn you reach other connections again. Our business page is followed by business services and especially the unemployed."

Bayer CropScience Vegetable Seeds is active on Facebook, Twitter, LinkedIn and YouTube. "With regard to the selection of social media, we follow our customers. Visibility with that target audience is an important aim. Furthermore, we hope to direct CropScience people to the Nunhems websites for further traffic. It is therefore a strategic interaction between social media and traditional communications. Most of the questions we receive do come via the websites."

"Thus social media offers communication opportunities and you must translate these in your internal organization", says Dijkshoorn. "With social media, you become much more transparent. Take Facebook: if someone posts a message about your business, everyone can see it. That is why the use of social media has to be well organized. And you have to make employees aware that messages on social media will not disappear. What you post, stays there."

HZPC: 'Our new website will become a digital crossroads'

"Social media cannot be ignored", says Annemarie Blitterswijk of HZPC. "Because people look for you on Facebook or search your name on Twitter. Then it is better to be there, if only to prevent anyone else from opening an account with your company name."

That sounds as if the use of social media is an enforced choice, but for now it is an important part of the communication strategy of HZPC focused on the new digital possibilities. "We share a lot of content via Facebook, Twitter and YouTube, such as articles from our digital magazine Inzpire. We want to be as widely visible to our target groups. We particularly use LinkedIn to share vacancies and to interest potential employees in our business."

HZPC is currently working on a new website. It follows the same vein as social media. Blitterswijk: "The new site will become a real digital crossroads. It will be very visual, with lots of photos and infographics, and shorter texts. Interesting content which is easily shared via social media. Thereby we spread our message wide and generate traffic back to our website again."

All those investments need to be recovered. "The trouble with a lot of communication methods is that the investment rarely translates back into direct sales. However, it has everything to do with building your brand, even in a business-to-business environment. This also applies to social media. But with social media, it is possible to measure your reach and better direct your communication. You notice much earlier, for example, when your target audience is interested in a certain product. Through social media you can work on your communication strategy much more consciously."

Beautiful #Barenbrug grass on a beautiful day @reddevils training pitch

is why we want to be there. We want to take part in the interaction and show that we are developing innovative products for the agricultural sector."

Transparent and authentic

But using social media takes time, lots of time. Even a big company like Monsanto must therefore make choices. "With social media, you have to respond quickly to what is happening. The time aspect is crucial. Hence, discover.monsanto.com for Europe is only available in French. Organizing the same for other languages would take too much time."

But time is not the only reason why the use of social media can be complicated, admits Buckingham. In social media anyone can say anything about you. And what is sensible in such a situation? Doing nothing is not an option, as was discovered by computer manufacturer Dell in 2005. The company ignored a critical blog by Jeff Jarvis. It should not have done that. Critical Dell consumers then riled one another. Soon after, stock prices fell by about half and Dell had to drastically adapt its communication strategy.

Responding to critical messages on social media is the best option, Buckingham from Monsanto also recognizes. "In many cases, someone has the wrong impression about what we are doing, and we can demonstrate what is really going on. But if one of our staff gets involved in such a discussion, then he or she must make clear that they are a Monsanto employee. That is why, on my own Twitter account, it also clearly shows that I work for Monsanto. You have to be transparent. Moreover, there are also consumers and customers who support us. They often participate in such discussions. We do not ask them to do that: they do so spontaneously. And that is a good thing. Because the most important thing in social media is that the message is authentic."

Barenbrug: 'We portray ourselves as experts in the area of grass'

"The content that you post on social media must be real, authentic. We have 110 years of expertise in grass, we are big in grass, we are grass. So we have a clear proposal, which is the starting point of everything that we do on social media", says Paul van den Berg of Barenbrug."We are active on Twitter, YouTube and Facebook. Social media is an integral part of our communications strategy."

About 80% of sales at Barenbrug comes from the sale of grass seeds. The most important customer groups are dairy farmers, as well as managers of golf courses, sports fields and public green spaces. Those different target audiences go well together on social media, says Van den Berg. "If you are seen as an expert in one sector, it helps in other sectors upon which you are focussing. And we get no complaints from, for example, Twitter followers that a message was not meant for them." Barenbrug has a corporate account on Twitter. That account is managed by a social media manager, but in addition there are about twenty employees 'from the shop floor' who tweet with a personal Barenbrug account. "We have provided those colleagues with training, but do not force them to tweet."

Vegetable seeds for professionals

That's bejo quality ▸ **bejo.com**

Bejo Zaden B.V.
Trambaan 1
1749 CZ Warmenhuizen
T + 31 (0) 226 - 39 61 62
E info@bejo.com

180th anniversary
Creating Tomorrow Today

Creating Tomorrow Today

TAKII SEED: HIGH QUALITY, RELIABLE, INNOVATIVE

TAKII & CO., LTD.
Kyoto, Japan
http://www.takiiseed.com

AMERICAN TAKII, INC.
Salinas, California, USA
http://www.takii.com

TAKII EUROPE B.V.
De Kwakel, The Netherlands
http://www.takii.eu