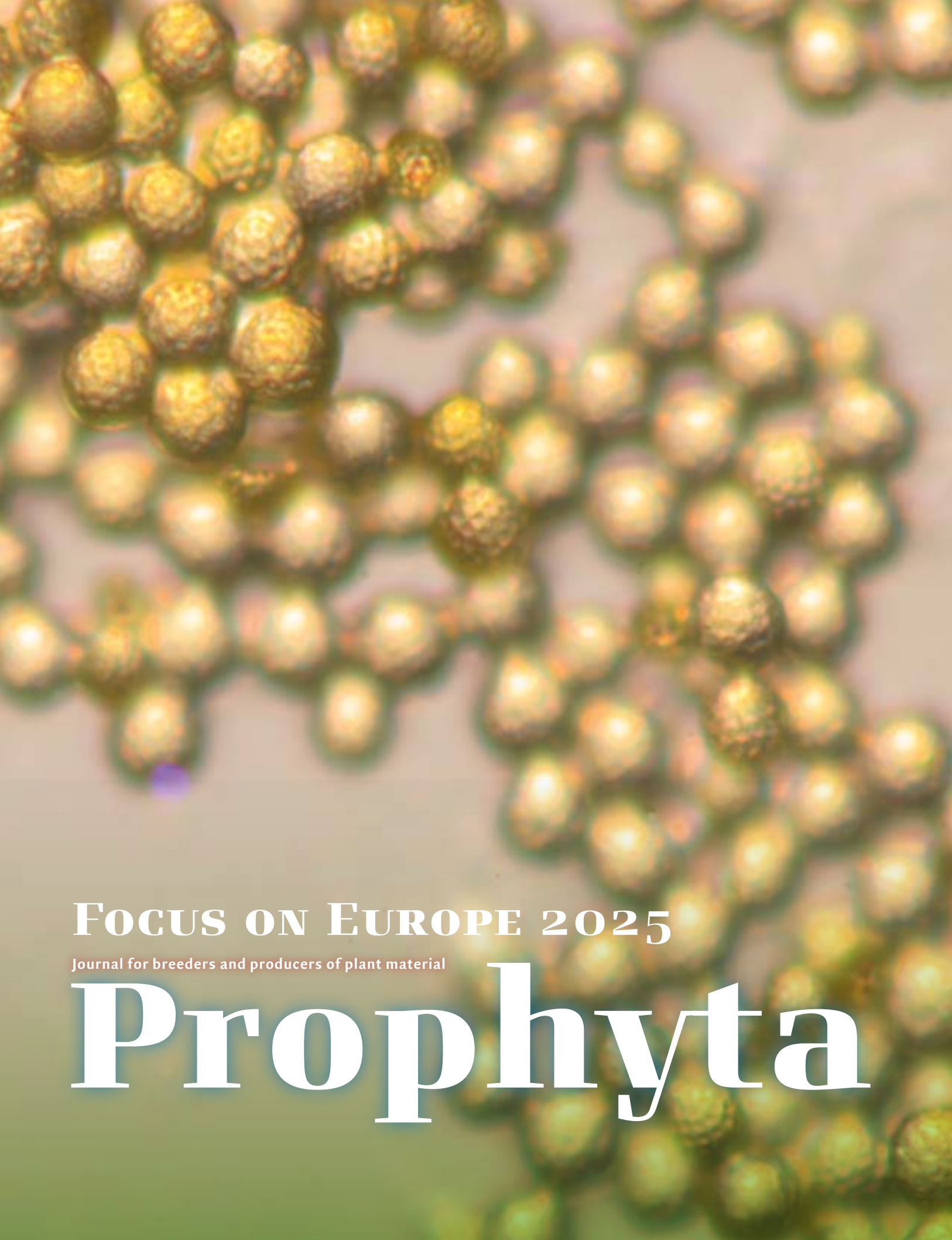

Focus on Europe 2025

Journal for breeders and producers of plant material

Prophyta

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Prophyta Focus on Europe 2025
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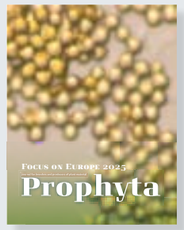

The cover features a macro shot of spinach pollen grains. The grains are magnified 112 times. Spinach is wind-pollinated. Therefore, the pollen grains are light, smooth, and aerodynamic, allowing them to easily float through the air and reach other spinach flowers.

FOCUS ON EUROPE 2025
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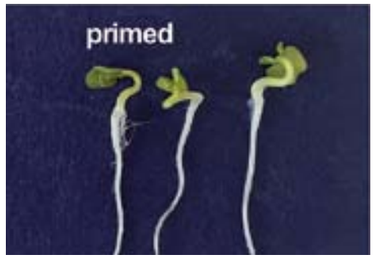

Artichoke is not a pathway

New pest lists evaluated

The assessment of the new pest lists of artichoke and alfalfa concluded that seed is not a pathway for any of the 23 regulated pests for artichoke. For alfalfa seeds, only 6 out of the 49 regulated pests are a pathway.
The ISF regulated pest list database provides scientific information on pests that are regulated on seeds with the aim of limiting regulation to those that are justified. The database is a 'living document' subject to periodic review and updates, based on feedback from users and changes in national phytosanitary regulations for seed.
More information: https://isfpestlist.worldseed.org/.

Accelerating climate-smart potatoes

Building on lessons from last year, CropXR Potato has designed a field experiment for 2025 with input from academic researchers, potato breeders, potato processors and experimental farms. The optimised design for 2025 aligns tightly to four goals: study quantify yield and quality responses to combined water and nitrogen limits; develop model-based decision support for climate-adaptive cultivation and nitrogen-efficient management; explore genetic variation in stress responses and their interactions; advance phenotyping and modelling tools that connect field data with remote sensing.
Trials are currently running at SPNA Kollumerwaard and the Rusthoeve Colijnsplaat, respectively in a northern and a southern province of the Netherlands. Twenty genotypes are grown under four nitrogen rates and three irrigation regimes. Core measurements include final biomass, tuber yield, size distribution, dry matter and nitrogen content, complemented by weekly remote sensing of canopy cover and leaf area. For ten genotypes, also the intermediate tuber biomass and size distribution are measured. Together, these coordinated trials will reveal genotype × water × nitrogen effects and deliver practical tools to sustain high yield and quality under increasingly variable seasons.
CropXR Potato is executed by industrial and academic partners within the CropXR programme and aims to contribute to climate adaptive potato cultivation and breeding.

AI-powered Robotic Breeder GEAIR

Scientists from the Institute of Genetics and Developmental Biology (IGDB) of the Chinese Academy of Sciences have developed a new pollination system. They used gene editing to create flowers that can be easily pollinated by AI-controlled robots working round the clock. The system is named Genome Editing with Artificial-Intelligence-based Robots (GEAIR).
The team, led by Professor Xu Cao, pioneered a radical 'crop-robot co-design' strategy. Instead of solely focusing on building better robots, genetically redesign the crop itself to be robot-friendly. Using precise CRISPR-Cas9 genome editing, they targeted conserved 'B-class' MADS-box genes in tomato (GLO2) and soybean. Knocking out these genes achieved two crucial transformations simultaneously: male sterility and exserted stigmas. "Essentially, we gave the flowers a makeover for the machine age," says Professor Xu.
With the newly engineered male-sterile tomato plants bearing accessible stigmas, the team developed a mobile robot, equipped with advanced computer vision powered by deep learning algorithms. It automatically scans and identifies flowers ready for pollination, specifically recognizing the exserted stigmas. Then a precision robotic arm, guided by AI, gently positions itself and accurately deposits pollen onto the exposed stigma. The results were striking: GEAIR achieved cross-pollination efficiency comparable to skilled human technicians.
This breakthrough was detailed in the journal Cell.

Moths avoid noisy plants

Talking plants warn off moths

According to scientists from Tel Aviv University, female moths decide where to lay their eggs based on high frequency clicks emitted by plants, avoiding those that let out noisy distress signals. It is the first time auditory communication between plants and animals has been established. So far, only the plants' visual, chemical, tactile and electrical cues were known to influence insects' decisions.
The insects both hear the sounds made by plants and take them into account in decision-making.
In 2023, Professor Lilach Hadany from the School of Plant Sciences and Professor Yossi Yovel from the School of Zoology were able to record plants making ultrasonic clicking sounds.
Healthy well-watered plants emit about one click per hour, while in stressing conditions, such as drying soil, the dehydrated plants emit dozens of clicks. In this recent study, the researchers used females of the African cotton leafworm moth (*Spodoptera littoralis*) and tomato plants. The hearing sensitivity of moths that have evolved ultrasonic hearing typically falls within the 20 kHz - 60 kHz range. The moths showed a marked preference for laying their eggs on the quieter, fresh plants, as these can properly nourish their larvae.
It is, however, not proper 'communication' between plant and insect, as the sounds the plants make are not meant to convey information to the moths. As plants emit various sounds, the result of this project hints at the existence of more, currently unknown, insect-plant acoustic interactions.
The research was published on the platform eLifesciences.org; eLife is a non-profit organisation inspired by research funders and led by scientists.

Let's keep focused!

Here is my first editorial for Prophyta. It's truly an honour to take over this task from Monique Krinkels. And of course, I will try to do it at least as well as Monique, but in my own way.
I introduced myself in the previous edition. As a journalist and communication specialist, I have been associated all my life with Dutch horticulture, especially vegetables. During the last 20 years, I have been communication specialist at the vegetable breeding company Rijk Zwaan in De Lier, the Netherlands.
Now, in the role of chief editor of Prophyta, I must broaden my scope and learn about the worldwide sector of agricultural seeds: its crops, research, breeding, propagation, trade and politics.
My mission is to make Prophyta relevant for all decision makers, also in the coming decades. Not with the latest news, but certainly with the latest trends, insights and interesting information; easy to read and nice to look at.
And that will be an exciting job in these current turbulent times, with rapid changes at all levels.
In this edition articles about cooperation, social responsibility, abiotic stress tolerance and new knowledge refer to these changes.
I hope, as a sector, we can keep focused on what really is our most important goal: to feed and flower the world.
Also important for the coming years is to establish a strong network of supporting companies.
Through sponsorships and advertising, they can help ensure that Prophyta continues to be produced and distributed. I invite you to consider joining this group and supporting our initiative.

Steven van Paassen, chief editor

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Nigeria became the 80th member of UPOV

UPOV strengthens position in Africa

The African Regional Intellectual Property Organization (ARIPO) has completed its integration with the UPOV PRISMA electronic platform. This tailor-made online tool is designed to facilitate plant variety protection (PVP) applications across PVP offices worldwide. Breeders can submit applications for all crops and plant species in the Contracting Parties to ARIPO's PVP Protocol, an effort that aims to simplify and digitize the filing process in line with international standards. Earlier this year, Nigeria became the 80th member of UPOV. It signed the 1991 Act on 27 March. As Africa's most populous country and a major agricultural player, Nigeria's entry signals a broader regional trend toward formalizing plant breeders' rights systems. For UPOV, this marks continued progress in expanding global access to its framework for cooperation and harmonization

UPOV improves DUS testing

UPOV's technical working parties are experimenting with new methods to improve DUS testing. The Technical Working Party for Ornamental Plants and Forest Trees (TWO) reviewed updated testing guidelines for species like Ginkgo and Zantedeschia, while exploring how Genotyping-by-Sequencing (GbS) could support DUS testing in Hydrangea. The Technical Working Party on Testing Methods and Techniques (TWM) recently discussed high-throughput phenotyping, image-based trait analysis and the use of machine learning to improve decision-making in plant variety testing. Though still in the pilot phase, these tools could mark a turning point in how new varieties are assessed. During UPOV's annual sessions this October in Geneva, Switzerland, discussions are expected to cover new technologies for DUS examination.

Next deposit to Svalbard

In October, NordGen will add a box containing 381 seed samples of important crops for the Nordic countries to the Svalbard Global Seed Vault. The new addition consists of carrot and lingonberry seeds, as well as cultivated varieties of turnips, root parsley and perennial ryegrass. Earlier this year, seed samples from 20 different genebanks were stored in the vault. Among these, over 2,000 seed samples from 19 different crops from war-torn Sudan. This country is rich in biodiversity and home to numerous crops essential to both local and global food systems, such as sorghum, pearl millet, cowpea, sesame, okra, watermelon and roselle.
Besides storing seed samples, NordGen also studies seed longevity in permafrost. In addition, the experiment investigates how seed-borne diseases survive under these conditions.
The Svalbard Global Seed Vault is the world's largest security facility for the diversity of crops conserved in genebanks. The building is owned by Norway and operated by three partners; the Norwegian Ministry of Agriculture and Food, the international organisation Crop Trust and NordGen.

Patents on NBTs threaten plant breeding

With the acceptance of New Breeding Techniques by the European Parliament, 'No Patents on Seeds'-network sees a new problem arise: patents limiting innovation. While innovations such as CRISPR-Cas are meant to speed up innovation to safeguard food security, the opposite might be the result. Traditionally, bred plant varieties cannot be patented in Europe, but varieties obtained by NBTs are a technical invention and, as such, patentable. Despite the prohibition, some 300 patents had already been granted by the end of 2024 according to the international 'No Patents on Seeds network'. At the time, approximately 700 applications were still pending with the European Patent Office. Today, hundreds of patent applications have been submitted on NBT varieties and it is to be expected that this number will be rocketing when these plants are approved for consumption. To make matters worse, companies are able to create new NBT varieties with characteristics that are already available using classical breeding techniques, thus further hampering plant breeders. According to 'No Patents on Seeds' network it is therefore necessary that the European Union addresses the patent problem.

Garlich von Essen, Secretary General & CEO of Euroseeds

An advocate for a **measured approach**

Steven van Paassen

As a Secretary General & CEO of Euroseeds, with around 100 members within a sector which is complex and characterized by a lot of diversity, and in a world with a lot of competition from a wide range of interest groups and across many, many subjects, how do you manage to reach that mission 'Grow the future together'?

This year, Euroseeds is being held in Edinburgh. This is of great importance for the UK and for Scotland. Von Essen explains: "The UK seed sector has been fully integrated into the EU's single market for seed for almost half a century. Over this time, strong ties and collaborations were developed, enabling significant and seamless movement of plant breeding material and commercial seed in both directions. These dynamics have been seriously affected, if not disrupted, as a consequence of Brexit."

Potential mutual benefits

"Nevertheless, the regulatory frameworks in both jurisdictions remain largely aligned, and there is a growing recognition that continuous interdependence is not only unavoidable but also offers potential mutual benefits to both the UK and the EU, if managed well and in a pragmatic manner," Von Essen explains.

> 'The European seed sector is still doing quite well'

In his view, the aspired, new bilateral sanitary and phytosanitary agreement offers the possibility to formalise this approach and strongly facilitate seed trade between the UK and the EU. Therefore, he hopes that this Edinburgh congress can help to advance these discussions and demonstrate the strong support from the entire Euroseeds membership, including from our UK associations, to move forward together.

Adapt and improve

The mission of this congress has a highly ambitious goal, namely to foster food security and sustainability for future generations. Asking Von Essen about his strategy for achieving this mission, he responds with: "In short: innovation, innovation, innovation! We will not win the future by just using the recipes of the past. This is true for knowledge, technologies, management – for everything.

The challenges ahead of us are well-known: feeding more than 10 billion people on less available land, in a more environmentally friendly manner and under more challenging climatic conditions. To meet these goals, we need to continuously adapt and improve, with growing knowledge and new technologies serving as essential tools to succeed."

'Unnatural' threat

Yet, paradoxically, many people in the affluent Western world embrace all kinds of technologies in every aspect of their lives except for agriculture and food, where such innovations are often perceived as an 'unnatural' threat. "I think it is part of our mission to counter this perception and showcase how these new agricultural tools contribute to shared objectives and common goals," Von Essen says.

"For instance, the professional seed sector has become more and more global and high-tech. Basically, all companies develop and test material in multiple countries and locations and collaborate with partners, and even competitors, across borders. Companies still strengthen very close customer relationships, which in fact is part of their continued success. Modern telecommunications and general digitalisation of data make it possible to keep in touch throughout growing cycles, monitor performance and provide technical advice. So, quite generally, distance becomes less of an issue, not more. Small-scale farming, however, probably will remain a challenge economically. Even though technologies may help, particularly through part-time farming models which are often used by smaller entities, the issue of economies of scale remains. At the same time, we do see a growing diversification of consumer values and consequent choices, with locality of production or other, non-quality criteria becoming more relevant. As these markets are still niches, they may offer opportunities specifically for smaller producers including their input providers, such as specialised, smaller-scale seed companies."

Access to latest technologies

Europe is a stronghold of plant breeding science and research. The Nobel Prize in 2020 awarded to Isabelle Carpentier (together with Jennifer Doudna) for their breakthrough work on gene editing is only the latest proof of this tradition of excellence. Europe is also home to many of the world's leading plant breeding and seed production companies.

Garlich von Essen: 'Innovations in agriculture and food are often perceived as an 'unnatural' threat'

On this foundation, Europe today accounts for a little over 20% of the worldwide seed market and is both a large-scale seed exporter and importer.

Von Essen: "The European seed sector is still doing quite well; but we want to further develop and improve on the base of that solid foundation and strong position! To achieve this, Europe must remain a frontrunner in science, applied research and development, and innovative products and services. That is why we are advocating so strongly for access to latest technologies, simplified rules and quicker procedures, as well as international cooperation and market access. All that is the lifeblood for the next generations of plant breeding innovations."

Rarely a 'one size fits all'

Change and innovation are the only constants in technology development and, quite generally, in history. AI, big data processing, breeding techniques – these are all tools that will impact the way companies work, the way products will be developed and the way farmers will use them in the end. Von Essen: "These technologies are not objectives in themselves; rather, they serve to help achieve broader goals, such as greater nutrient use efficiency, improved tolerance to adverse climatic conditions or resistance to pests and diseases. A key advantage is that many of these tools are accessible to companies of all sizes, often without requiring large-scale upfront investment in infrastructure. So, provided we are smart when setting the rules for their use, they could actually support the diversity of the sector, triggering new collaboration and cooperation and even stimulate the creation of specialised companies."

And that can be of great benefit, because the seed sector is complex and characterized by a lot of diversity. Company sizes, structures, business models, markets and the crops they work with often vary greatly, and so do their needs and concerns regarding specific regulatory measures or policies. "The simple truth is," Von Essen says, "that there is rarely a 'one size fits all' approach. At the same time, a common market inevitably requires some principles and common standards if it is supposed to work and establish fair competition and market access for everybody. Again, this requires differentiation where necessary, beneficial and still fair, as well as harmonization wherever possible for the same reasons."

Von Essen gives an example: "The rules for variety registration and seed marketing differ between agricultural and vegetable species. Yet the underlying objectives are the same: ensure proper identity of each product, demonstrate practical performance in the field and highest seed quality levels, and safeguard seed and plant health through phytosanitary standards. Despite the diversity, all companies rely on suitable policies that support innovation and provide functioning global market access rules and

‘Food security is the basic precondition for overall security’

standards. In conclusion, the fundamental commonalities far outweigh the differences.”

Willingness to explain

With around 100 members, Von Essen believes that Euroseeds truly can speak with one unified European voice. “Euroseeds has a well-established governance structure in place that allows us to take positions on virtually any subject within our competence or interest, as defined in our statutes, rules of procedure and terms of reference.” Von Essen continues: “Naturally, unanimous agreement from all members on such positions is not always possible but, as in any membership-based association, it does require very broad support from a large majority as well as the principal willingness to explain differences or minority positions; only then can we be truly effective.”

Euroseeds main role is that of the representative voice of the entire European plant breeding and seed marketing industry vis-à-vis the responsible political and administrative bodies and procedures of the European Union. Von Essen: “Clearly, our messages will depend on the individual audience and subject matter. But what is common is underlining the relevance of plant breeding innovation. Already today, a good two-thirds of all productivity progress in crop production (and often, consequently, also in animal production) can be attributed to genetic progress through breeding. In view of the limitations of other inputs, such as fertilizers or crop protection products as well as available land, this share is expected to and must grow even further in the future. Food security is the basic precondition for overall security. It cannot be compromised. So plant breeding truly plays a very fundamental role for our common peaceful and prosperous future.”
Euroseeds, on the one hand, often has a guaranteed place at the table as a registered stakeholder with EU and international institutions. So Euroseeds is automatically consulted on issues affecting the industry. Yet they are also listened to because of the specific expertise and experience that they bring to discussions. “Factual knowledge of the subject matter is key to be considered a useful contributor to formal and, more importantly, informal discussions.”

“Formal consultations are a ‘must’ for most general EU processes, but further informal discussions are a ‘may’ that you need to earn,” says Von Essen. However, there is no simple way to express the Euroseeds message effectively into today’s world. “Ideally,” Von Essen explains, “the goal is to make people listen, understand, agree and then act accordingly. But we must also realise that there is a lot of competition from a wide range of interest groups and across many, many subjects for the attention of policy makers and media. Sometimes, there are strong beliefs, or entrenched positions cannot be shifted, irrespective of how good your arguments or how professional and catchy your communication is. Still, making people listen, maybe sparking genuine interest, is the first crucial step.”

We prevailed

As a successful example, Von Essen mentions the Euroseeds campaign to bring the EU’s regulatory approach to gene editing back to the policy agenda following the devastating 2018 ruling by the European Court of Justice. “Through strong motivation and expertise, as well as dedicated resources, we built a broad coalition of support with shared objectives and clear common messaging. And despite significant opposition, we prevailed. The last chapter of this success story still needs to be written as negotiations on a new regulation are in the final phase now. But I am confident that we’re in for a happy ending!”

Growing knowledge and new technologies are essential tools to success

We are all witnessing the trend of a growing renationalisation of politics, both abroad and in Europe itself. This is quite different from what most of us have been used to in the past. Globalisation is viewed less as an opportunity and more as a threat to existing structures, established business models and dearly-held opinions. Von Essen is worried about this trend. “Specifically in agriculture and food, this perception seems to be disconnected from reality,” he says. “The obvious global nature of the food supplies in our modern diets, with year-round availability of almost any kind of produce, contrasts sharply with the negative reception of any trade agreement, e.g. like Mercosur, between the EU and a third country that also includes agriculture and food. Similarly, the popular demand of ‘seed sovereignty’ is quite misleading when we look at the origin of our popular foods, of which most actually don’t come from Europe, but from other parts of the world.

In all these discussions, Euroseeds aims to be a voice of reason and advocate for a measured approach. Cooperation and collaboration generally work faster and deliver better results at lower cost than doing everything alone, specifically over a longer period of time. That is maybe not so popular in discussions today, but it remains true, and we keep stating that.”

Leave happy with a smile

Von Essen hopes to again provide our guests with a high-quality venue and organisation, with interesting updates as well as in-depth discussions of key policy and regulatory developments, with a comprehensive exhibition that successfully connects service providers with seed companies, and, with the InnovAction Stage, a first look at the exciting new technologies that may shape the sector in the coming years.
“Bringing together nearly 1,500 seed professionals from Europe and around the world, year after year, is a testament to our success. If our guests leave happy and with a smile, we’re happy, too. But nothing is so good that it can’t be improved further!
So if there is a message I’d like to leave, it would be a call to all our members and colleagues who join us in Edinburgh: tell us what you liked but also tell us what we can do even better or should maybe add to the next edition in Valencia in 2026. We want to be true to our Euroseeds motto and ‘grow the future together’ and we appreciate both your continued loyalty and support as well as your ideas and feedback!”

From potatoes to **golf courses**

John van Ruiten

Scotland, land of whisky, kilts, bagpipes, haggis, myths and legends. And so much more. Time to take a closer look at this country with a focus on agricultural and horticultural aspects. As the second largest producer of seed potatoes in Europe, the biggest exporter of whisky, possessing a beautiful natural landscape and wildlife and home to hundreds of excellent golf courses, the country is a jewel within the United Kingdom.

Scotland offers iconic castles on isolated landmarks, mysterious lakes ("lochs"), vast areas of unpopulated land and the Highland Games with very traditional sports. The oldest tree of the British Isles, the Fortingall Yew (a Taxus baccata), certainly over 5,000 years of age, is growing in Perthshire. There is always a lot of talk about its weather: pretty changeable and "four seasons in one day" is not an exception. There is a lot of rainfall in the western Highlands; up to 4,500 millimeters, four times as much as in the eastern part of the country. And in the summertime, connected to the rain, all those midges in the western part.

Inventors of the steam engine James Watt, the telephone Alexander Graham Bell, and penicillin Alexander Fleming were all Scottish. The famous Encyclopedia Brittanica (before the internet era and the rise of Wikipedia, it was the biggest and most famous knowledge book on the globe) was first published in 1768 in Edinburgh! And then their food: "tatties and haggis", "neeps and tatties", "mince and tatties" and "Cullen skink" are national dishes for the real Scotsmen. Tatties are (mashed) potatoes, neeps are turnips, mince is meat (often in stovies/stew with sausages, minced meat and spices) and Cullen skink is a thick soup made of smoked haddock, potatoes and onions. And then haggis, made as a stew of the intestines (heart, liver and lungs) of sheep together with suet (fat), oatmeal, spices and salt (for recipes see many internet sites). A feast meal for some, a terrible, even disgusting dish for others. You have to eat it in Scotland. Export to the US, for example, is not allowed because of veterinary reasons. Nowadays also vegetarian haggis is an option!

Whisky

Water of life ('uisge beatha' in Gaelic) is certainly one of the cores of the Scottish economy and a way of life. More than 130 distilleries produce up to an estimated 700 million litres. The significance is great: more than 66,000 people work in this industry. The annual production value is over 6 billion Euros, of which 85% is exported all over the world. And it is still growing. Huge investments are made in this industry. It is by far the biggest valuable commodity in the UK. There are different types of Scotch whisky, made from malted grains (mostly barley) and corn. Coming from single distilleries or blended. All of them have a minimum of 3 years maturing in wooden oak barrels and containing a (legal) minimum of 40% alcohol by volume. The Scottish are proud of their national drink: each year on 18th May they celebrate World Whisky Day and many local whisky festivals are organized.

Agriculture: most of the agricultural land is used for rough grazing and livestock farming, sheep and cattle in hilly and mountainous regions. Arable land (600,000 hectares), predominantly in the eastern part, is used 80% for cereals (spring barley, oats, rye). 15 % of the country is forested. Scottish agriculture employs 1.5% of the total workforce.

Potato has been the people's number one food for over 200 years. The potato blight, that caused the Great Famine in Ireland, also came to Scotland one year later, in 1846, but did not have that devastating effect on the population, although many Scots also emigrated and moved to the USA. Potatoes are now grown on roughly 30,000 hectares. In October, the Scots have "Tattie Holidays", a local tradition. Children in the 1930s did not have to go to school in order to help harvest the potatoes. And despite the introduction of potato harvesters, the one-week holiday has remained...

A very specific product from Scotland is soft fruit such as strawberries, raspberries, blueberries and blackberries. Both propagating material (also tissue cultured) and fresh produce are big products. Mainly produced on the east coast with good weather conditions. Famous berry varieties such as Ben Nevis, Ben Sarek, Ben Lomond, Ben Hope (all blackcurrants) come from the Scottish Crops Research Institute.

Ir. J.E.M. van Ruiten is the treasurer of the Prophyta Foundation, Leiden, the Netherlands, johnvanruiten@prophyta.org

Golf courses and grasses

Was the game of golf invented by the Scottish? Certainly yes, if you ask that question there, although the Dutch claim that "kolf" was played in their country earlier. It is recorded that in the early 15th century in St. Andrews, there were already games of golf. The city of St. Andrews definitely is the birthplace and the world capital of golf. It has 12 golf courses, of which the "Royal and Ancient Golf Club" is the oldest and most famous club, playing the 18 holes on their "Grand Old Lady" links course.

Primarily for the greens and fairway, fine fescues (Festuca species, mainly rubra) are used. Fescue is well suited to the cool and windy, rainy weather and sandy soil. This type of grass is indigenous to Scotland. Overseeding is done with browntop bentgrass (Agrostis spp). The rough is mainly sown in with ryegrass (Lolium spp) and native species. Scotland and the whole UK are an important producer of various grass seeds. The climate is well suited . Over 6,000 hectares of grass seeds are produced, mainly to be used in the country itself.

Seed potatoes

As a very northern country, Scotland has excellent conditions for producing healthy seed potatoes, well known for their good virus-free health status, SASA certified. Around 400 growers produce on average 12,000 hectares annually with an amount of 275,000 tonnes, of which circa 100,000 tonnes are exported to many countries worldwide. Egypt (almost 50%), Morocco, Saudi Arabia and Thailand are the important markets. After Brexit, the EU export market (that previously amounted to 20% of export) has gone. And because of political trade reasons, there is at present no phytosanitary agreement between the UK and the EU to mutually accept certified seed potatoes on their respective markets. Negotiations are underway but there no indication yet that an agreement will be signed soon.

Nowadays also vegetarian haggis is an option

Cygnet PB Ltd.

The largest breeder and producer of seed potatoes in the UK/Scotland is Cygnet PB, located in Tayside in the centre of the arable area. Cygnet is one of the companies in the Alexander Harley Seeds Group (also cereals, fodder crops and pulses). In 1999, Cygnet took over the genetics of the breeding programme at PBI Cambridge, which was privatised under Thatcher in 1984. The most important varieties, of the more than 40 varieties they produce, are now Kingsman (for either fresh or processing consumption) and Elland (a multipurpose variety similar to Maris Piper). Cygnet produces 45,000 tonnes of seed potatoes annually on 1,500 hectares, exported to 40 countries. The start of the certified potatoes is with high grade minitubers. Doug Harley, managing director: "Scotland produces the healthiest seed potatoes in the world." Harley is not very optimistic about a quick general agreement with the EU, considering all the different topics, although he very much hopes that there will be one for seed potatoes. He thinks that the EU market (which was previously to over 20 different member states) needs Scottish seed potatoes for sustainable production, and that former clients will come back once the possibilities are there again. Breeding is done traditionally. No new breeding techniques have been applied yet. The UK Precision Breeding Act has come into force, but the use of these techniques is not allowed in Scotland. Harley thinks that CRISPR Cas could be of help to breed quicker new traits in the tetraploid complex genome of potato. Most important breeding goals are heat stress tolerance and drought resistance. Phytophthora infestans is less of a problem in the markets where their varieties are grown. Cygnet varieties can be propagated under licence in other countries. Harley: "We are in favour of using a licensing system where the growers of ware potatoes also need a licence including for FSS." BIPO (the Breeders' Intellectual Property Office in the UK was set up to collect royalties from farmers) is taking care of that.

R&D Director Guus Heselmans

Move to the climate, **before the climate** moves to you

Steven van Paassen

Although skepticism still exists here and there, scientific measurements show that the climate is changing; average temperatures and extreme weather events are increasing. But it is not just the numbers that indicate this. In practice, we are almost daily confronted with regional climate disasters: wildfires due to drought, storms, floods, erosion, snow in the desert and salinization. A vision of Guus Heselmans, R&D Director at Meijer Potato.

"We are noticing that market demand for climate-resistant varieties is rapidly increasing. The urgency is to breed varieties that also are resistant to drought, heat, excessive rainfall and salinization. We are making progress, but we are far from finished because the genetic puzzle is very complex," says Guus Heselmans, R&D Director at Meijer Potato. Heselmans confirms this. "And it cannot be stressed enough: if we, as breeders, do not continue to act sufficiently on abiotic stress tolerance, this will have significant long-term consequences for global food supply."

'The oven of Europe'

Many breeding companies in global agriculture and horticulture are actively seeking climate-resistant varieties to better withstand abiotic stress. Successes have been reported in China and India. This is also

'If we, as breeders, do not continue to act sufficiently on abiotic stress tolerance, this will have significant long-term consequences for global food supply'

the case at potato breeder Meijer Potato, a Dutch family business that has been active in the potato chain for more than 100 years. Meijer Potato saw the first signals of climate change at the end of the 1990s and started a targeted breeding programme for potatoes at that time.
Around 2000, Meijer Potato set up the first major variety trials for this purpose in the area around Seville, Spain. "This region is called 'the oven of Europe' because it gets extremely hot during the last months of the growing season. A perfect place to find candidate varieties and parent lines that are tolerant to heat and climate shocks."

Set of factors

Finding and introducing disease resistance, such as to Phytophthora infestans, has become easier with current knowledge and techniques. Improving abiotic stress tolerance and climate resilience is a different story. It often does not concern a single gene or trait, but rather a whole set of genes involved in tolerance to drought, waterlogging, heat and salinization. Heselmans: "It is very difficult to find the right genetics for an abiotic stress trait from the potato gene pool. The challenge is to discover the right relationships between genes and stress factors, and to apply them in a targeted breeding programme. DNA marker techniques can unfortunately only be used to a limited extent for this, whereas we use them extensively for disease resistance."

At home and on location

Heselmans sees solving this puzzle as a combination of breeding work at home base Rilland and testing on external sites under abiotic stress factors. That is why Heselmans claims: "Move to the climate well before the climate moves to you." In other words, as a breeder, you must seek out difficult conditions to select the right genetics there.
"Close to home, you have everything well under control," says Heselmans. "In Rilland, we have a well-equipped laboratory, well-organized trial fields, the right expertise and the right people. We also have extensive drought, salt, and nitrogen efficiency trials on our breeding material in Zeeland. These trials provide a lot of support, but in Zeeland, you don't have a worldwide stress climate, so to make the right selections for this, we get on a plane."

"You then take the selected material to a representative location with prevailing climate stress conditions. There, you select the best candidates based on phenotype, the measurable result of the trial. For potatoes, this means, for example, selecting against undesirable reactions in crop and tubers, such as poor yield, deformities, premature sprouting, or small tubers versus normal growth. The better the phenotyping, the better you can select the right genetics and use them in breeding research in Rilland. These field trials are therefore extremely important. They are large, multi-year trials under good - meaning difficult - climate conditions."

Guus Heselmans is focused on abiotic stress in potatoes

Which variety should you choose?

"We have made great progress; our range is becoming stronger against drought, salinization and heat, but we're not there yet," says Heselmans. "And the urgency for cultivation is only increasing. In many regions of the world, the climate is becoming increasingly extreme on various fronts. Growers are finding it increasingly difficult to grow quality food crops on a sound economic basis. We see a rapidly increasing demand for more climate-resistant varieties.
But then the question arises: which variety should you choose? As a grower, you don't know which climate problem will dominate next year, so which trait you will need most. Maybe it will be a very dry year. Then you want a variety that is resistant to above-average drought. But will you also have sufficient yield if it doesn't turn out to be a dry year? In short, a very complex puzzle for all of us."

GxExM

The ideal variety with all desired traits does not exist; the breeder cannot solve everything. Heselmans therefore advocates a more holistic approach. The approach should be broader than just genetics. He refers to the formula GxExM.
G stands for genetics, or a solution for robustness at the genetic level. This provides knowledge about how your variety responds to certain abiotic stress or combinations thereof. E stands for environment. How well can you estimate how the climate, soil or groundwater will change, both in the short and long term? Genetics and environment are in continuous interaction. If this interaction is known and can be managed during the growing season, we come to M. This stands for management, which means that with the right genetic and environmental data, you can increasingly predict the cultivation environment and the behaviour of a variety. In this way, you can intervene in advance with the right variety choice and cultivation technique, instead of measuring the current situation and evaluating the consequences afterward.
Heselmans: "Increasingly, I see understanding and controlling the triangle of G, E and M as a critical success factor in the future cultivation of food crops."

Cooperation is a must

Increasingly, understanding and controlling the triangle of G, E and M cannot be done by a company alone, Heselmans states. "Just look at the field trials on location. These trials are large and complex; carrying them out, collecting all the data, processing that data; this can be done better and more efficiently in collaboration with partners, alongside the business sector and in combination with research institutes and universities."
He refers to the project Holland Innovative Potato

A potato heatstress trial field in Andalucia

'Increasingly, I see understanding and controlling the triangle of G, E and M as a critical success factor in the future cultivation of food crops.'

(HIP). This is a public-private partnership between Dutch potato breeding and processing companies, knowledge institutions and government, aimed at providing a future-proof potato sector through innovation in breeding and production systems. HIP is now a satellite programme within CropXR, a Dutch institute devoted to developing more climate-resistant crops through innovative 'smart breeding'. Partners include leading Dutch research groups and internationally renowned, Netherlands-based plant breeding companies that jointly develop innovative methods to make a wide range of crops extra resilient.

Speed is increasing

Heselmans: "These are examples of knowledge platforms where multidisciplinary work is carried out, knowledge is exchanged and results - partly public - are shared. This increases knowledge about abiotic stress, which also accelerates the speed with which solutions are found. And that is urgently needed because our future range of food crops must be increasingly resistant to ever more extreme conditions. A growing number of people in this world depend on this."

SMT 2026

#WEEK39 SEED MEETS TECHNOLOGY

Seed meets Technology is THE trade fair for companies active in the seed sector, with over 50 exhibitors, demo fields with the newest varieties and a strong program with lectures. Interested in participating or meeting fellow professionals in the industry? Contact us. Hope to see you in #week39

Soil Health Indicator

Using soil analysis to select **seed variety**

Choosing which variety, location and time to plant are decisions that can be made easier by using soil analysis data. However, the complex nature of soils is something that needs to be translated for growers to help them make these decisions. Soil specialist, Aran Reijneveld from Eurofins Agro suggests that the Soil Health Indicator report offers growers the opportunity to consider all aspects of soil health before selecting which crop and variety to plant.

Nasser El Ghazouani

Soil testing is relevant to several United Nations Sustainable Development Goals (UN-SDGs 1, 2, 3, 6, 12, 13 and 15) and can be a way to improve the sustainability of food production and land management. Selecting a seed variety that will perform well depends on first understanding the growing conditions it will be planted into. "Understanding the chemical, biological and chemical composition of soil is a significant part of planning which seed variety to select and which fields to choose. However, further consideration can be given to essential nutrients, the water holding capacity of the soil, its structure and the presence of potential contaminants such as heavy metals," says Dr. Reijneveld from Eurofins Agro. Plant species have evolved to use different combinations of climate and soil conditions to thrive conditions. Some will be better planted in heavy clay-like soils whilst others prefer a sandy loam. Combining plant characteristics, strengths and weaknesses with soil health indicators is a more strategic approach to growing a high yielding and sustainable crop.

"Inputs can be used to provide more plant available nutrients. However, this can be a costly strategy, and money can be saved by first understanding what the soil offers to a particular crop. Therefore, if planting a water thirsty crop, it is beneficial to look at soil water holding capacity and soil structure. Similarly, some crops are sensitive to contaminates and soil analysis will identify an imbalance that could threaten plant health," Reijneveld says.

Salt or sodium analysis is a new feature of the Soil Health Indicator report. This is beneficial to managing soil in coastal areas or in climates that suffer drought conditions but is also relevant to soils with no uptake and no leaching because salt concentrations can become detrimental to crops. Another new feature of the report is the identification of bio available metals such as nickel, aluminium and lead which are both harmful to the plant and can compromise the food chain.

"An example would be too much aluminium which can affect root development, causing roots to break recurrently. Additionally, high levels of harmful metals such as cadmium can leave a crop unsuitable for human consumption," says Dr Reijneveld. He suggests that growers can use soil analysis to help make the difficult decision of which seed to plant, where and when, by using Soil Health Indicator. We have a report that provides values for soil carbon and the soil's ability to store carbon, the physical characteristics including soil compositions, structure and density, and the biodiversity of soil along with essential nutrients and potential contaminants. This provides the data needed to offer crop-based guidelines based on individual crops such as potatoes, wheat or silage maize, and helps to offer soil-based guidance for growers to select the best seeds for their soil," he concludes.

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Social Responsibility – **Burden or Benefit**?

Niels Louwaars

Corporate social responsibility is increasingly debated. Not surprisingly, because corporate social responsibility [CSR] is important for the 'license to produce' of a company or organisation. Responsibility is acted upon either as an inherently felt need by entrepreneurs, or as a necessity forced upon them by either the market or regulation. Since the company is affected by the public image of the sector within which it operates, it is also an important issue for the relevant sector organisations, such as Euroseeds and ISF, to think about its collective CSR-conduct.

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Companies are legal persons and persons have a morality, a knowledge of the principles of good and bad and that this governs their behaviour. But even if one of the first 'inventors' of the concept of legal person, Pope Innocent IV in the 13th century, considered such 'persona ficta' not to have a soul, companies are led by natural persons who cannot escape that exception. Morality is rational, according to Locke and Kant, but is also inherently normative. We may have doubt about the moral standards of Gordon Gekko in the 1987 film "Wall Street", nor with certain public persons today, but a scientific rating does not exist. Hobbes (17th century), who believed that people are naturally selfish, considered that morality is concerned with promoting people to live together in peace and harmony, for example to form a society. Without appropriate norms, codes and laws, society would end up in total chaos.

Forced to be part of society

Natural persons can shy away from any dealings with society, becoming totally self-sufficient in some remote place and live as hermits. Companies, by definition, cannot be hermits. They are forced to be part of society if only because their products must find their way to a market and the company staff are natural persons operating in society in a variety of ways.
In management theory, the importance of society is a central point in the Rhenish Model, or Rhineland (or Social) Capitalism. In this model, an enterprise must serve different stakeholders in a balanced way: those delivering the production factors land, labour and capital, and consumers and society at large that use its products. Enterprises are 'helped' in this effort by laws that form the basis of the welfare state, but it stresses moral behaviour of legal persons towards the society within which they operate – and increasingly including the planet as well. It builds upon individual entrepreneurs taking responsibility for their workers, recognising the inhumane situations during the industrial revolution, building housing and insurance schemes, and parks for the larger society.

Gekko behaviour

One could argue that such schemes are good for a healthy work force, but moral behaviour was definitely part of that - companies are asked to do more than legally required. This contradicts (the simplest interpretation of) the writings of Adam Smith, which forms the basis of the Anglo-Saxon Model, leading to a unilateral focus by company management on the factor capital, the shareholders. In extremo, this leads to Gekko behaviour of managers, maximising profits at the expense of others, seeking loopholes in the law (or putting it aside altogether) and, as a result, relying increasingly on legal support.

Weighed on their governance

So, companies as (legal) persons are to behave as persons, as social beings, which is expressed in more recent terms: having a positive attitude towards Corporate Social Responsibility. That could be due to intrinsic values of the management, shared by the workforce, or largely because it determines their 'license to produce'. Alongside the quality of their products, companies are weighed on their governance, their norms and standards, and the ways they act on them. Independent of the emerging legal requirements, such as the Corporate Sustainability Reporting and Due Diligence directives of the European Union, there is thus a great degree of business-rationality in giving CSR due attention in the boardroom and expressing it to society.
This can, however, be an uphill battle. There appears to be a general distrust in society about the responsibility levels of companies. That emerged back in the industrial revolution, mostly because of the exploitation of labourers, followed by pollution by certain industries from the 1960s onwards and financial misconduct earlier this century. This widely felt unease in society is increasingly translated into policies and law - in Europe into the CSR-laws at the cost of an excessive administrative burden for all companies involved, but disproportionally felt by smaller entrepreneurs.

> 'It is important for practical issues to be responsible and to show it'

Show it

Such distrust also affects the seed sector, even though I dare say that this sector has a better image

Persons have a morality, a knowledge of the principles of good and bad

than average, particularly if it can rightfully claim to contribute to more sustainable production: reduced use of agrochemicals, adaptation to climate change and nutritional security where it is most needed. Critique is mainly limited to discussions about technology (GMO) and the role of the (few) large companies in the sector.
So, alongside moral standards, it is important for practical issues to be responsible and to show it, both from a product marketing perspective and for attracting and keeping the right staff. The latter is increasingly important for seed companies, where they compete among themselves in the brains market, but also with, for example, the pharma and AI sectors. Also for the seed sector, as a collective, it is important, because we need regulations that support innovation and (international) trade and a positive image is essential to connect with policy makers.

Show it, live it

A highly visible show of responsibility is investing in charity. Sponsoring the local sports club, the local food bank for the needy, a music festival or art museum, or development projects abroad can be (made) visible both to the larger public and also to the company's employees (as a human-resource-management tool). These actions can be totally separated from the business organization, or linked in one way or another. Providing a new pitch for the football club (for a grass seed company), donations of vegetable seeds for a school farm, or donations of pot plants to an elders' home by an ornamental breeder may provide a visible connection between the products thus shared and the core business of the company.

For supporting or building registered charities, an explicit separation of the activity with the business can be legally enforced, or it may create significant tax-advantages. A sector-related Foundation states in relation to Charity laws in its home country: "(company) products have the potential to make impact to sustainably improve lives. In any cases where (these) are used, we ensure they are used only for wider public benefit and not to create a commercial advantage." Other corporate foundations have less-specific policies. Due separation of charitable projects from the business reduces potential questions about the charitable objectives, including allegations of 'greenwashing'.

Less responsibility can undermine

Even though such charitable projects can be made very visible, I consider that true CSR starts in the business itself, starting with a safe work

There is a great degree of business-rationality in giving CSR due attention

environment for the staff both at physical and mental levels, transparent HRM procedures, and being responsible and reliable towards suppliers and customers, quality conscious and, indeed, respecting the intellectual property of others. It is not only what companies themselves do in their operation, but also their partners in the value chain. Seed companies may find it difficult to take responsibility with respect to avoiding child labour in their upstream supply, and the safe handling of treated seed downstream. Even though they may not be able to fully control such risks, less responsible conduct by their business partners, either intentionally or not, can undermine the responsibility-label of the company, irrespective of the number of charitable projects.

Collective CSR?

Also, associations like ISF and Euroseeds are legal entities. So, is the (legal) person responsibility valid for them as well? I would certainly concur. Associations need to be seen by their network in government and politics as responsible entities, and in addition, since they represent their members, it is important for associations that the members act responsibly. Trust comes on foot and leaves on horseback, as a Dutch proverb says. Bad behaviour by a single member can also create internal tensions that undermine the association. Misconduct (towards society) by even one member may challenge the credibility of the sector as a whole. Associations do not have their members on a string, so upholding a code of conduct for their members is the least they can do in support of an effective representation.

Projects on behalf of members

So, should associations also be involved in charitable activities? Where individual companies or entrepreneurs, such as Bill Gates, may have accumulated financial resources that they can invest in projects for the good of society, industry associations themselves do not, as their budgets are established by the members. Still, there could be an argument to develop policies on CSR projects that are external to the core business of the associations. Apart from strengthening the image of the sector, associations could also facilitate charitable activities on behalf of their members.

Pooling contributions

For example, this is the case with ISF which intends to get involved in international projects on behalf of members who themselves do not have the reach to contribute to development goals internationally. Pooling such contributions and using its international contacts in projects, ISF can indeed show the commitment of the global industry to societal goals. It could show that the legal person ISF does not only represent commercial interests, but that it (and its sector) has a soul as well.

The botanic garden of Edinburgh

Much more than beautiful plants

Located in the centre of the city, one can find a magnificent historic place. Founded in 1670, RBGE (Royal Botanic Garden Edinburgh) is, after Oxford, the second oldest botanic garden in the UK. It certainly can be regarded as one of the leading botanic gardens in the world, not only because of its huge plant species collections. The garden, locally known as "the Botanics", offers many activities to scientists, the public, scholars and plant lovers. And, as almost all botanical gardens, it is an excellent place to relax. And : entrance is free.

John van Ruiten

As many botanic gardens in Europe (such as Padua, Pisa, Leiden), the garden was founded as a medicinal garden, connected to the University of Edinburgh and to Trinity Hospital. In the "Hortus Medicus Edinburgensis", published in 1683, the first Regius Keeper (the prefect or director) James Sutherland already listed 2,000 plant species with 460 images, grown mainly because of their importance to medicine. The garden supplied fresh plants for medical prescriptions.
In 350 years, the garden extended its collections to a wide range of species, of which many are arboricultural. Other locations in Scotland were integrated in RBGE. Nowadays, the garden is owned by the Scottish Government. The annual budget is € 25 million. There are 350 staff members and almost 300 volunteers working in the gardens. The garden is supported by a friends organisation with 11,710 members who donate generously for many projects. RBGE is member of the global organisation BGCI (Botanic Gardens Conservation International).
The plant collection at RBGE contains over 13,500 species and more than 250,000 plants, originating from 160 countries all over the world. Annually, more than 1 million visitors are welcomed. RBGE has 4 locations in Scotland. Besides the main garden of 28 hectares in Edinburgh, there are gardens in high rainfall area Benmore, with specialties such as conifers, redwoods and rhododendrons; Dawyck in a cooler and drier region, that has a huge arboretum and azalea collection; and Logan (on the very west coast, which has an almost sub-tropical climate), with palm trees, ferns and exotic plants.
RBGE is much more than a garden. It offers many training courses : short courses on gardening, botanic illustrations and arts, BSC courses in horticul-

Remarkable plants

Around 1780, rhubarb (Rheum rhaponticum) seeds were brought to Edinburgh from Türkiye and this was the first rhubarb grown in the UK. Used as a medicine at that time, this was successful. Plants of this species were crossed with Rheum rhabarbarum and the nowadays well-known culinary rhubarb R x Hybridum was developed. The oldest plant in the garden is a palm, Sabal Bermudana, planted in 1822. Another highlight is a Catacol whitebeam (Sorbus pseudomeinichii). At the highest point in the garden (overlooking the Edinburgh skyline) is where the rock garden is located. Over 5,000 plants from the world's mountains have been brought together here.

Sherlock Holmes

Arthur Conan Doyle, author of the Sherlock Holmes books, studied medicine at the University of Edinburgh (1876-1881) and botany at the garden, as this was then a compulsory subject for medical students. In the novels, Doyle uses the knowledge he gained about the plants and especially their poisonous characteristics. Watson (Holmes' assistant) describes this as follows : "Knowledge of Botany : variable. Well up in belladonna, opium and poisons generally. Knows nothing of practical gardening".

Ir. J.E.M. van Ruiten is chairman of the Netherlands Association of Botanical Gardens (NVBT)

The Victorian Tropical Palm House in Edinburgh

ture and MSC courses in botany, thereby training the next generation of horticulturists. An "edible garden project" teaches the skills and knowledge for people growing their own crops. The garden is a biodiversity research and conservation body. It partners with organisations and communities in more than 40 countries to conserve and restore biodiversity and to deliver nature-based solutions to adapt to climate change effects, in both in situ and ex situ projects. An example is the Rhododendron species project in Vietnam. The Rhododendron collection of RBGE itself is one of the largest in the world. More than half of the 1,000 globally known species can be found in the gardens.

The first glasshouse was built in 1713 and it also offered the possibility to grow southern and tropical plants. In 1820, the garden started to move its plant collections to Inverleith, the site where it is still located. The still existing great Temperate Palm House, which is the tallest one in Scotland, was built in 1856. Recently, a project was started to restore the glasshouses and to include new facilities in the "Edinburgh Biomes".

Besides the enormous, unique and globally important living plant collection, RBGE is home to a world leading and renowned Herbarium collection of over 3 million specimens, originating from 157 countries. The collection is now digitalised and can be visited by anybody with access to the internet. The library is also the Scottish national reference collection for specialist botanical and horticultural resources, and is also open to the public. There exist a close connection and collaboration with other botanic gardens in the UK, such as Kew Gardens, founded in 1840, which is the largest in the UK.

Simon Groot was born in 1934 in Enkhuizen in the Netherlands. A small town in an area where the cradle of vegetable seed breeding and production in Holland is located. His ancestors already started those activities in the mid-19th century, founding the company Sluis and Groot. After studying business economics at Rotterdam University, Simon entered the family business in 1958. He travelled a lot to the US and Asia and learned the need for specifically adapted varieties. In 1981, when Sluis and Groot/Zaadunie was sold to Sandoz, Simon left the company and started the company East West Seed in 1982, together with partner Benito Domingo, in Batangas, the Philippines. They also had a focus on training local plant breeders and to educate/inform growers, understanding that trust between farmers and seedsmen is crucial. Starting with improved bitter gourd (Momordica) varieties (first hybrid was Jade Star), it was followed by new varieties in kangkong (Ipomoea), yard long beans (Vigna), sweet corn, squash/calabasa and many other crops. In 1984, East West expanded to Chang Mai in Thailand and in 1990 to Indonesia. Knowing that better growing conditions are also required to realize the high yield potential of the new hybrids, Simon and East West set up huge training and demonstration programmes. That was new for seed companies. In the Access to Seeds index, East West ranked first. Nowadays, East West works in 14 countries with almost 3,000 employees, producing seeds of more than 650 varieties in 80 crops, with a turnover above 200 million dollars. Three of his children (Ard, Rutger and Maaike) are on the management board of East West Seed.

Remembering Simon Groot

A **school garden** for every child

John van Ruiten

On 6th July 2025, Simon Nanne Groot passed away at the age of 90, leaving behind his beloved family and his lifelong contributions to both the vegetable seed sector and to society. His meaningful work has been described in many articles and in memorials which have been published in the last months.

After he was awarded the World Food Prize in 2019, even more attention has been paid to the unique and important role that Simon played in helping farmers to produce more and better vegetables. In Southeast Asia, but certainly also in other regions of the world, they were able to earn higher incomes through better production. Especially small-scale farmers in Africa can escape from the vicious circle of low-quality seeds, poorly adapted varieties and lower yields, and increase the amount of produce using improved seeds, created with the knowledge and expertise that Simon Groot introduced.

Less well known is his eminent role in the setup of a "school garden programme" in the Netherlands. In 2021, together with Rob Baan, IVN Natuureducatie (Institute for Nature Education and Sustainability) and Bureau Beleef en Weet (education consultancy), they took the initiative to form the School Gardens Alliance with the strong ambition and goal to give every child in primary school access to a school garden. Gradually more partners joined the initiative.

Helping schools and teachers and parents find locations and (re)introducing gardening during those primary school years is what they do. Many initiatives were taken to realize that, supported by a grant from the Dutch Ministry of Agriculture, LVVN. The Alliance was able to bring the possibility of starting garden projects much closer to the schools. Films (see YouTube 'de schooltuin'), social media content, demonstration plots, handbooks, training programmes for teachers, advice on cultivation techniques, seeds, plants and varieties are some examples of support to move in the desired direction. But above all, they also want to provide policy advice to city councils on how to organize the setting up of school gardens. These gardens also have a social function in a community, and many volunteers find a way to help, which is important for a better livelihood and social cohesion in neighbourhoods. The number of school gardens in the Netherlands is now growing again (where there had been a tendency of decrease). Every year publicity is given in the national "week of the school garden" in May.

Simon was proud to participate in this initiative. Bringing enthusiasm for gardening to children, teaching them where food comes from, making them aware that food is not automatically there and that you really must take care of your crops, growing them from seeds. To combat weeds and insects or diseases can be very harmful. To learn about the influence of climate, soil and water on plant production. To understand biodiversity and sustainability better. But above all: to be proud when you can take home potatoes, carrots, lettuce, beans, cucumbers and much more for making dinner. Make a pizza or pasta with tomato and basil coming from your own garden! But he was also hoping that this activity might help to let the next generation of growers, students and plant scientists emerge. To bring the existence, the fascination and challenges of horticulture to scholars, only a very limited number of which come into daily contact with farming or gardening in western societies.

Ir. J.E.M. van Ruiten is the treasurer of the Prophyta Foundation, Leiden, the Netherlands, jvanruiten@prophyta.org

Fast germination versus shelf-life – can we have **both**?

Patricija Gran, Leónie Bentsink

Priming is a widely used method in commercial seed technology to speed up and synchronize germination. But faster germination often comes with a trade-off: reduced seed longevity. What if we could break this trade-off?

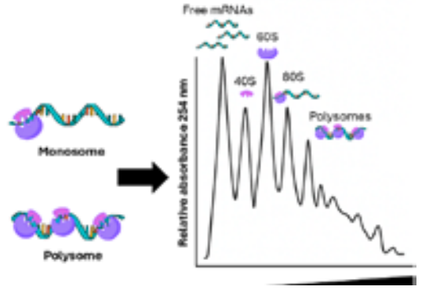
In a recent study titled "*Unravelling the dynamics of seed-stored mRNAs during seed priming*" published in *New Phytologist* (DOI: 10.1111/nph.70098), our team explored the translational control mechanisms during hydropriming of *Arabidopsis thaliana* seeds. The central question: can we decode the molecular decisions that determine whether a seed becomes fast-germinating, long-lived or both?

Our hypothesis: the key to balancing germination rate and storability lies not only in which messenger RNAs (mRNAs) – the molecular blueprints for proteins – are present, but in which mRNAs are actively translated during the priming process. We uncovered how seed-stored mRNAs are recruited into ribosome complexes during priming, essentially "priming" the protein production machinery itself.
Using advanced techniques, such as ribosome nascent chain sequencing (RNC-seq) and polysome profiling (Figure 1), we were able to capture a high-resolution picture of translational activity as it unfolds during priming.

Translational reprogramming: the molecular 'ready' state. Our findings showed that hydropriming drives a strong recruitment of both pre-existing and newly synthesized mRNAs into active translation complexes. This means that during priming, seeds shift to a stage at which mRNAs are being loaded onto ribosomes for protein synthesis. Polysome profiling revealed an increase in ribosome-mRNA complexes in primed seeds compared to dry ones, suggesting the seeds are placed in a translational "ready" state, poised to germinate rapidly upon subsequent imbibition. This enhanced translational activity correlates with the well-documented outcome of faster and more synchronous germination in primed seeds. Also, it shows that this molecular reprogramming is selective.

The longevity trade-off: loss of stress-related mRNAs. The priming process led to a decline in several stress- and longevity-related transcripts, including those involved in desiccation tolerance and oxidative stress responses – likely these transcripts help the seed survive during long-term storage or under harsh conditions. This selective exclusion might explain why primed seeds are able to germinate in a broader set of environmental conditions, as well as the often-exhibited reduced shelf-life: while the seeds are being biochemically and translationally prepared for rapid germination, they may simultaneously lose some of their stress tolerance mechanisms. In other words, the seed's internal programming may be shifting too soon - from a survival mode to a germination mode, leaving them vulnerable during long-term storage. These insights point to a fundamental biological constraint, but also provide an opportunity. If we can understand and control this selective translational reprogramming, we may be able to design priming protocols that enhance germination performance without sacrificing storability.

Figure 2: Hydropriming dynamically remodels the seed translational machinery across priming stages

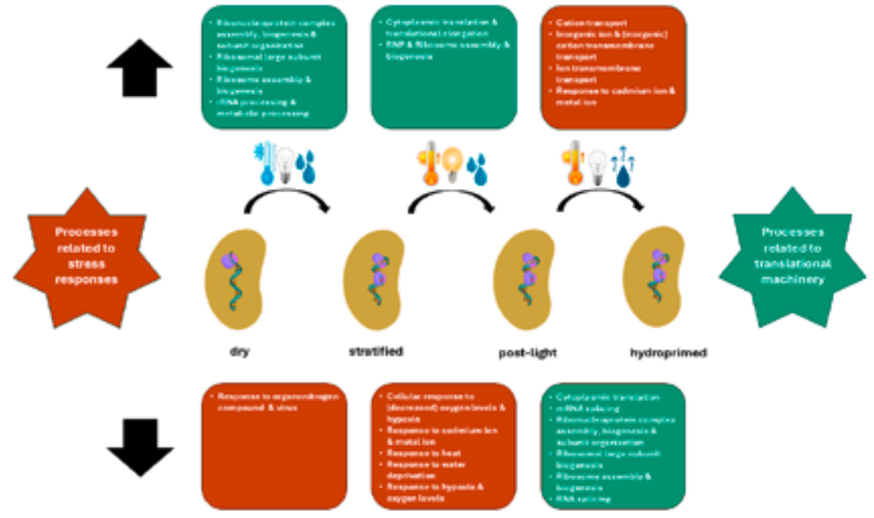


The four priming stages of our study - dry, stratified, post-light and hydroprimed seeds - and the processes that are translationally up- or down-regulated are presented. During imbibition (stratified and post-light), transcripts associated with the translational machinery are upregulated, priming the seed for rapid protein synthesis upon re-imbibition. However, during these hydrated phases, many stress-responsive transcripts become depleted. Notably, upon drying (shift from post-light to hydroprimed), the upregulation of translational transcripts subsides, reflecting a molecular shift from active preparation to preservation.

The role of RNA binding proteins (RBPs): a hint at translational control mechanisms?

Patricija Gran PhD, Researcher in Seed Technology & Science Communicator, Wageningen Seed Science Centre, the Netherlands & Prof Dr Ing Leónie Bentsink, Personal Professor Seed Science, Laboratory of Plant Physiology, WUR, the Netherlands

Figure 1: Polysome profiling to assess mRNA translation activity.



Polysome profiling separates messenger RNAs (mRNAs) based on the number of ribosomes bound to them using sucrose gradient ultracentrifugation. Fractions collected along the gradient reflect increasing ribosome association: free mRNAs and ribosomal subunits appear in lighter fractions, monosomes (single ribosome-bound mRNAs) in intermediate fractions, and polysomes (multiple ribosomes per mRNA) in heavier fractions. mRNAs in polysomal fractions are considered actively translated, whereas monosome-associated or free mRNAs are typically translationally inactive or repressed. After fractionation, RNA is extracted from individual gradient fractions and subjected to downstream analyses, such as reverse transcription quantitative PCR (RT-qPCR) or RNA sequencing. These approaches allow the detection and quantification of specific mRNAs in each fraction, revealing their distribution and thus which ones are actually being used to produce functional proteins.

Among the molecular changes during priming, we identified a previously uncharacterized transcript encoding a protein with Arginine - Glycin - Glycin (RGG) motifs, which was highly enriched in the polysome-associated mRNA fraction. RGG motifs are well-known RNA-binding elements involved in translational control and RNA metabolism in other systems (from fish to mammals), suggesting a potential role for the encoded protein in regulating selective mRNA translation. While the presence of this transcript in ribosome-associated fractions does not confirm translation or function of the protein, its strong enrichment specifically after priming makes it a compelling candidate for future functional studies. This observation raises an intriguing possibility: could RGG-motif proteins function as molecular switches that modulate mRNA stability and translation during seed priming?

A commentary on translation

Dr. Naoto Sano's commentary, "*Priming the pump: translational dynamics from seed to seedling transition under priming treatment*" (DOI: 10.1111/nph.70098) elegantly contextualizes these findings. Dr Sano highlights that translation - the process of turning mRNAs into proteins - is not just a downstream event in seed biology, but a key control point. It is not only about *what* messages are stored, but also *how and when* they are translated.
This insight reshapes how we think about seed quality. It is not just the transcriptome that matters, but the *translatome* - the set of mRNAs actively engaged in protein synthesis. For the seed industry, this means that tailoring priming protocols at the molecular level could allow us to fine-tune the balance between germination speed and storability.

Industry impact: toward smarter seed technologies
Refined priming protocols: by understanding which mRNAs are stabilized or lost during priming, we could design priming conditions that preserve both the improved germination characteristics as well as seed longevity
Biotech innovation: identifying key mRNAs or regulators involved in translational control opens up new routes for molecular breeding or seed treatment technologies
Predictive seed testing: molecular markers identified in this study could help assess seed performance post-priming before field deployment

As climate stress, logistical challenges and shelf-life demands mount, fine-tuning the balance between enhanced stress resilience and long-term seed viability becomes not just desirable, but essential.

The molecular reprogramming during hydropriming is not just a side-effect – it is the mechanism. By understanding how seeds prioritise which mRNAs to translate, the industry can shift from a one-size-fits-all priming approach to a molecularly-informed, crop-specific optimisation strategy. The takeaway is clear: we now have the tools to crack the code. And with targeted innovation, the future of seed priming could include both resilience and shelf-life.

Fighting **illegal seed practices** in field crops

Corné van Beers

Illegal production and infringements of Plant Breeders' Rights are a big concern in many crops. For vegetables, AIB was founded. For ornamentals, various companies (united in Ciopora) are very active, and for seed potatoes and field crops, the Breeders Trust organization has been defending the rights of its shareholders and members since 2008. In this article the vision of managing director Corné van Beers on this issue.

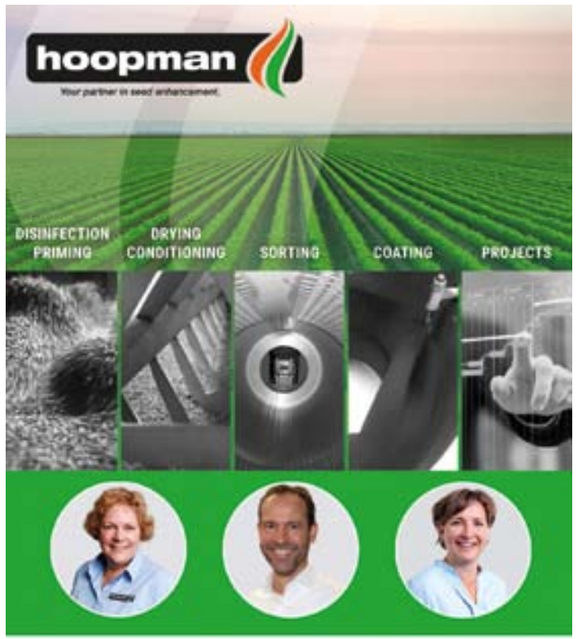
Potatoes and grasses represent two very different 'worlds', each with its own dynamics. In (vegetatively propagated) seed potatoes, varieties are protected by Plant Breeders' Rights. This right gives the rightsholder exclusive rights in relation to multiplication and marketing their protected varieties. Potato growers in Europe are allowed to hold back a part of their harvest and to use that on their own premises as seed potatoes for next year (FSS : Farm Saved Seeds). But if the variety is protected, royalties for the planted quantity (acreage) must be paid to the breeder. In most countries, there are national organizations taking care of that. In Belgium, this is done by Breeders Trust itself.
In the world of grass seeds, there is much less protection of varieties by PBR. They control the flow of (pre) basic seeds. Illegal practice occurs by marketing inferior seeds or non-certified seeds with falsified certificates and/or using labels containing inadequate or misleading information. If Breeders Trust or one of its members detects possible illegal material, they inform the certification organization responsible in the country. Information that has become available and results of sampling and investigations, etc. are provided to the authority (including an official report that the certified seeds are not true to type, that certificates are misused). Also these cases are brought to the attention of the EU Commission and its so-called Seed Fraud Network. As a result of this, other member states also receive information about this fraudulent behaviour.
Collecting royalties for FSS is an important issue for Breeders Trust. Receiving royalties is crucial for breeders. It is an important source of income to be able to finance (large) breeding programmes. It is not easy to estimate what the annual amount of missed income is, but it must be millions of euros. And everybody understands that serious measures are needed. Two examples of possible infringements are the production of seed potatoes without the consent of the breeder and the sale of ware potatoes as seed potatoes. Complicating factor is that if these 'seed' potatoes are marketed to another country in Europe, the competent authority of that country lacks information and the competent authority of the producing country does not have the legal position to act. That is where Breeders Trust has additional value. It has contacts with many agencies in Europe that can investigate these types of cases. If the action has been successful, Breeders Trust always issues press releases to inform the public and to make clear to others to withhold them from doing the same. Also presentations in congresses serve the same purpose.
For fodder crops and grass seeds, it is totally different. Buyers rely on certificates on the seed bags. They basically trust that the information on the label is correct. Each year, Breeders Trust organizes trials in which samples of suspicious batches (selected on the basis of previously done research) are tested and grown. Regularly it is seen that there is something wrong with the sample/label. Or that certificates are false and are the result of very creative work behind a computer - these falsified certificates are sometimes hardly distinguishable from real certificates. In those cases, the certification agency is also informed and action is taken. Recently, a batch of seeds was found that contained 23% sand.
Breeders Trust is now elaborating a new PBR database. Batches of seed potatoes can be followed during the whole chain from breeder to end user. Also because the potato processing industry should be aware that using illegally produced potatoes is not allowed. Recently, the court in Germany (the Agravis and BayWa case on FSS cereals) made a clear judgement on this activity.

Corné van Beers is managing director of Breeders Trust

Managing director Corné van Beers; following batches of seed potatoes from breeder to end user.

Breeders Trust

Breeders Trust was founded when a number of seed potato suppliers joined forces against illegally produced seed potatoes. These companies are very different with many items and market competitors with items such as breeding, marketing and selling their produce, but they have the same goals in protecting their plant breeders' rights protected varieties. In 2012, grass seed companies also joined Breeders Trust. Inspired by the work of the seed potato companies, they found a way to cooperate in the fight against illegal practices and fraud in certification of seeds. Additional information can be found on www.breederstrust.eu
Breeders Trust has its office in Brussels and the sole goal is to serve the interests of the members and shareholders in relation to their intellectual properties . Shareholders (13 seed potato companies) and members (11 grasses and fodder crops companies) are active in breeding and selling seed potato varieties, seeds of grasses and a number of green manure crops, such as clover, (white) mustard and fodder radish. Companies are located in 6 European countries.



Epigenetic information

Seeds meet **Priming**

Aline V. Probst and Ulf Feuerstein

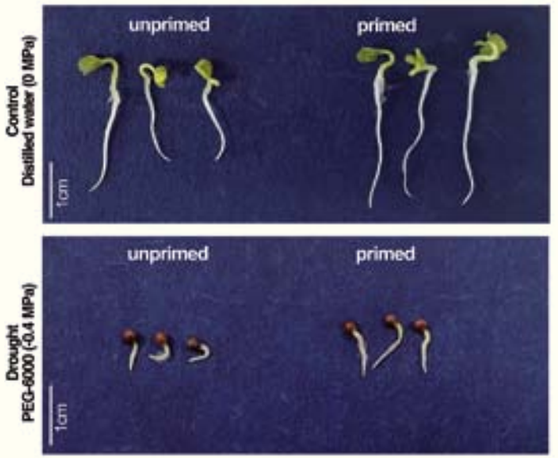
The MSCA Doctoral Network *EpiSeedLink* aims to identify beneficial epigenetically based traits for seed vigour and stress tolerance, to develop techniques and/or isolate chemicals that modulate the plant epigenome to enhance the desired traits. Successful implementation of epigenetic information could significantly reduce the use of pesticides and stabilise yields.

Over the past few decades, scientific research has yielded substantial evidence indicating that the developmental transition from a seed to a seedling involves significant changes in genome expression. The packaging and organisation of the genome within the nucleus in the form of chromatin - where DNA wraps around histone proteins - significantly influences this regulation.

Still much to learn

Histone proteins come in different variants and may carry distinct post-translational modifications. Along with DNA methylation and non-coding RNAs, histone modifications constitute the so-called *epigenetic information*, which instructs how and when genes are expressed to perpetuate distinct gene expression states over cell divisions. There is still much to learn about the organization of the genome in dry seeds and how epigenetic information is reprogrammed to allow for the massive changes in gene expression patterns that occur during seedling establishment.

For field crops, farmers aim to achieve even crop emergence and high tolerance to extreme weather events such as dry periods. They consider good initial development to be essential for achieving a high yield. Seed priming offers an approach to improve the germination and field resilience of crops and thus stabilise the yield. During the seed priming process, seeds undergo a regulated hydration process before being redried. These pre-sowing treatments have been shown to result in more efficient and uniform seed germination, as well as improving the stress resilience of the seedling.



Canola (Brassica napus) unprimed (left) or primed (right) seeds were germinated under control (distilled water, top) or under drought stress (PEG-6000, bottom) conditions. Images of seedlings were taken after 72h imbibition.

Epigenetic selection

However, further research is necessary to identify the molecular mechanisms underlying the observed improvement in germination efficiency. One compelling hypothesis suggests that changes in the heritable epigenetic information acquired during the seed priming process may accelerate and synchronize seed germination, potentially resulting in enduring outcomes reflected in plant yield. A better understanding of these mechanisms would therefore help to select varieties with the desired traits, using genetic or epigenetic marker-assisted selection.

Dr. Aline V. Probst, Research Director CNRS, Université Clermont Auvergne; Clermont-Ferrand Cedex, France, and Dr. Ulf Feuerstein, Researcher, Deutsche Saatveredelung (DSV), Germany

The EU-funded MSCA Doctoral Network *EpiSeedLink*, under the coordination of Dr. V. Rubio (CNB, Spain), unites fundamental and applied research to investigate these questions. Eleven early-career researchers in nine European research institutes and two companies, namely the Deutsche Saatveredelung (DSV) in Germany and BioAtlantis in Ireland, are conducting research in both the model plant thale cress (*Arabidopsis thaliana*) and its relative rapeseed (*Brassica napus*).

The EpiSeedLink consortium is organizing an international conference in Amsterdam on 9th-10th February 2026. This conference will offer an integrated view on Priming, stress and epigenetic memory from model plants to crops and aims to bring together researchers, stakeholders and breeding companies.

Henk Dresselhuys and Sirekit Mol

Top sport throughout the supply chain

Steven van Paassen

Poinsettia, or Euphorbia pulcherrima, is a commercially important plant in the range of ornamental plants. But this position must be achieved in a very short season. And that places special demands on Poinsettia, according to product manager Henk Dresselhuys at Selecta-one and Head of Commercial Operations (outside Europe) Sirekit Mol at Beekenkamp Ornamentals.

Originally, the Euphorbia pulcherrima grew as a shrub in the subtropical forests of Mexico. The plant was already appreciated by the Aztecs for its bright red bracts. In the early 19th century, the plant was described as a new Euphorbia variety. It is still the national plant of Mexico. Its fame as an ornamental plant started when the American botanist and US diplomat, Joel Poinsett, introduced the plant to the United States and the plant was given the name Euphorbia pulcherrima Poinsettia.

Monopoly family corner

In the early 1900s, German emigrant to the USA, Albert Ecke, had a great interest in the Poinsettia as a commercial pot plant. For decades, the Ecke family tried to improve the Poinsettia through breeding and grafting, especially in a more compact form.
It was the third generation of Eckes who made the link between Poinsettia and Christmas. The Christmas Star was born. With considerable promotion, the popularity of Poinsettia in the USA as decoration during the Christmas period grew. A popularity that also spread to Europe. Until the 21st century, the Ecke family had a monopoly of the worldwide production and sale of Poinsettia cuttings.

Sirekit Mol: “A lot of experience is needed to make a Poinsettia a success at the right time”

Henk Dresselhuys is product manager at Selecta-one and Sirekit Mol is Head of Commercial Operations (outside Europe) at Beekenkamp Ornamentals.

Mainly European companies

Nowadays, almost 200 million Poinsettias are sold worldwide every year, with an estimated turnover of more than 1 billion euros. Although this turnover does not make it in the top 5 of year-round popular houseplants, Poinsettia does occupy a dominant position during the Christmas period.

Annual sales

[source: Rabobank research, 2023]

United States	70 million
Germany	25 million
Mexico	20 million
Italy	15 million
Spain	10 million
Netherlands	6 million

The total yearly European production is estimated to be around 105-110 million units. Although exact market shares are difficult to provide, Dümmen Orange [including Ecke Ranch], Selecta One, Syngenta Flowers/Florensis, Lazzeri and Beekenkamp Ornamentals dominate the Poinsettia market with their variety development and worldwide distribution. And with that, the current development, production and distribution of Poinsettia are mainly controlled from Europe.

Mother Plant Cuttings

Cultivation starts with growing cuttings from mother plants. The production of unrooted cuttings often takes place under climatically favourable conditions such as in Costa Rica, Guatemala, Kenya and Uganda. The unrooted cuttings are usually rooted in the country of the final grower. The rooted cuttings are delivered to growers in July or August.
“Millions of cuttings have to be picked and distributed in a short time,” says Dresselhuys. “The first cuttings are, of course, for the larger pot sizes Poinsettia which need a longer growing period. Sometimes, also for Poinsettia on a stem, up to 1-1.5 metres high. The standard pot sizes used are 10 to 13cm. The cuttings later in the season are for the smallest plants, the minis in 6-8 cm pots. These cuttings go directly unrooted into the final pot.”

Sorting the Poinsettia cuttings at Selecta in Uganda

All climate conditions

Dresselhuys: “Growing a saleable Poinsettia from cuttings takes about 15 to 20 weeks, depending on the variety, type and pot size. Part of that is vegetative growth and, about 6 to 9 weeks, reaction time after flower initiation. So, if you want to grow Poinsettia with a natural day length and, therefore, in a relatively cheap and easier way, you will automatically end up with a saleable plant in November and December.”
The cultivation itself is not easy. Poinsettia is a tropical plant and very sensitive to climate deviation. A little too much or too little water, light or temperature can already have negative consequences for the delivery date and/or final quality of the plant.
“The cultivation of Poinsettia starts in the summer and ends in December,” says Mol. “So, it has to withstand all the different climate conditions. A lot of experience is needed to make a crop a success at the right time.” And a lot of energy, because to get a nice colour, Poinsettia requires a greenhouse temperature of 18-19°C. Therefore, the cultivation of Poinsettia is increasingly shifting to specialized companies that can grow large quantities of plants at low margins.

14 hours of darkness

During cultivation, artificial darkening is used to get the plants nicely coloured. The plant is a so-called short-day plant. To get beautiful coloured bracts, about 14 hours of constant darkness are needed per day. Even a few minutes interruption of this period of darkness can totally disrupt this process.
The more specialized Poinsettia growers, who can mainly be found in the USA, Germany and the Netherlands, use blackout cloth in their greenhouses, which can be used to simulate the day length at any time.
“This allows growers to control the cultivation much better on the exact delivery date for the very early sales in November or for special days like Thanksgiving or Charity sales,” says Sirekit Mol. “But for outside the Christmas season, there is hardly any demand for Poinsettia, so then it is not profitable at all.”

Limited product range

Dresselhuys: “The Poinsettia has a large market in the USA and Europe, but a very limited sales period of a very limited product range: 90% red and the rest represent all other colours like pinks, yellow, orange and other special bicolour patterns”.
Several attempts have been made to spread the season more over the year. For example, in North America, specific crosses have been used to try to offer Poinsettia in October and November in combination with Thanksgiving.
Mol: “While Poinsettias are not yet a top-selling flower in Asia, they are gaining popularity. The Asia-Pacific flower market includes potted plants like Poinsettias and demand is increasing in both home and commercial segments. Asia is not currently a major export destination for Poinsettias, but the rising demand for ornamental plants and seasonal flowers suggests potential for growth, especially if local

Henk Dresselhuys: 'To make a crop a success at the right time, a lot of experience is needed'

production or regional supply chains are developed."

Small genetics

Genetics could provide solutions to cultivation and marketing problems, but then there is another problem, according to Dresselhuys. "The basic genetics of the Poinsettia, with which it started in the early 1900s, showed little variation, so we don't have that many possibilities in breeding."
In addition to plant and bract resistance, cold tolerance is an important direction for breeding. If the temperature at which the Poinsettia will colour, currently 18-19°C, can be lowered by a few degrees, it will save a lot of energy and production costs. And that cost saving is desperately needed to keep cultivation profitable.
Variants in shape are also being sought. Dresselhuys: "A compact plant with a nice V-shape is important for being able to sleeve cover the plant quickly with a minimum risk of stem breakage and leaf damage."
Considerable breeding effort has gone into developing naturally compact varieties that need much less plant growth regulator to produce the right size plant.
Also heat tolerance in Poinsettias is becoming increasingly important as global temperatures rise and production expands into warmer regions. In hot climates, heat stress can cause delay of flowering time, leaf drop, bract fading and poor growth - directly impacting quality and marketability. Heat-tolerant varieties, such as Robyn Red and Aurora, reduce the need for costly climate control, improve shelf life, and open new production markets in tropical and subtropical zones.

Little room for diversity

"Of course, we are also looking for product diversification; more colours and shapes," says Mol. "But that's still pretty much locked. Most of the colour variants we know today are mutants from the original dominant red variety. But short sales peak and low margins remain the problem. Then, in an efficient cultivation of a commodity, there is little economic room for deviating products for niche markets."

Extra promotion

To continue to stimulate the cultivation of Poinsettia, various joint projects are active between the European breeding companies. For example, a joint consumer campaign 'Stars for Europe' has been launched that focuses mainly on the consumer experience with new colour combinations (such as salmon, orange and yellow), different plant sizes and colourful leaves.

Plenty of challenges

The Poinsettia is making frantic attempts to hold its position on the world market. On the one hand, by making cultivation as efficient as possible, on the other hand by keeping the product varied and interesting for the consumer.
Mol: "The cultivation of Poinsettia is top-level sport throughout the entire supply chain. Ultimately delivering insufficient quality too early or too late does not yield anything. Every link, from breeding, cuttings, production and distribution, including handling at point of sale in shops, must therefore perform at their best."
Dresselhuys: "On the one hand, this requires a product that is as generic and efficient as possible and, on the other hand, we want to offer the ideal Poinsettia for each sales segment and consumer colour interest. So, there are still plenty of challenges for the future of Poinsettia."

Sow to Grow

Sow to Grow is a so-called 'plant science experience centre', where people can learn more about plant breeding and its crucial importance for human health and wellbeing, as well as for the environment. It is based on self-discovery learning.
Contact: Sow to Grow, Westerstraat 111, 1601 AD Enkhuizen, the Netherlands, www.sowtogrow.nl, info@sowtogrow.nl

The experience centre Sow to Grow, in the Netherlands, inherited a vast collection of historical objects from the former national seed museum, Saet & Cruyt. From seed machines, plaster models, photographs, a library and watercolours, to the rare botanical books of the Weinmann collection. In this edition of Prophyta, the treasurer reveals another one of his favourites: the Meihuizen Rapid Dryer.

It is obvious that the hand-held moisture meter has been frequently used: the humid conditions to which it was exposed have caused the paper scale to fade

Spotlight on **drying**

Jan Timmerman

In the early 1940s, B. Meihuizen invented an apparatus to quickly determine the moisture or dry matter content of products. As he was involved in seed testing, his primary goal was to improve seed quality.
The principle of the invention was simple, yet effective: a sample was briefly exposed to hot air at around 160-175°C, and the weight loss was immediately displayed on the dial. In just a few minutes, users obtained reliable results that would otherwise take hours with conventional drying methods.
The instrument consists of a copper column which contains a liquid with a higher boiling point than water. This liquid is heated electrically. Samples of the seeds to be dried are placed on a rack in the centre of the column. These are heated to a temperature above 100°C.
A tube with round dishes allows the liquid to be checked for boiling. When the bottom dish is hot and the top one barely warm, the apparatus has reached the correct temperature. After a certain time (depending on the product), the samples are reweighed after cooling. The difference between the pre-heated weight, indicates the weight of evaporated water, thus the moisture content of the product.
For seed companies, this instrument was of great importance for accurate determination of moisture content of seed to be harvested and during drying and storage.
The Meihuizen Rapid Dryer, however, soon found its way outside the seed sector, especially in the dairy industry, where the moisture content of cheese was crucial for both quality and trade value. The commercial model was manufactured and supplied by 'Labor, Amsterdam', a Dutch laboratory equipment company.

Boost Plant Breeders' **Innovation**

Edgar Krieger

Over the past decade, global agriculture has undergone profound changes in production and consumption patterns, as well as in the relationship between companies and consumers. The plant breeding sector has not been immune to these shifts. New technologies, climate change, food safety concerns and the need for stronger protection systems are just some of the pressing issues faced by companies dedicated to developing innovative plant varieties.

In this context, 2024 marked the 30th anniversary of Council Regulation (EC) No 2100/94 - better known as the *Basic Regulation* - a cornerstone of plant variety protection in the European Union (EU). This milestone provides the perfect opportunity to assess the Regulation's impact and set the course for the future.

Since its adoption in 1994, the Basic Regulation has played a crucial role in safeguarding Plant Breeders' Rights (PBRs), encouraging innovation and ensuring that new plant varieties can be developed and brought to market for the benefit of agriculture, horticulture and consumers across Europe.

Gaps

However, more than three decades have brought significant change. Advances in breeding techniques, globalization, the rise of new production hubs, and key court rulings - most notably the Nadorcott decision (C-176/18) of the European Court of Justice - have exposed gaps that now threaten the competitiveness and innovative strength of the European horticultural sector.

The Nadorcott Decision: A Turning Point

One of the most troubling developments in recent years was the ruling by the European Court of Justice in the so-called Nadorcott case (C-176/18). The case ended in a decision in favour of a grower who planted trees of the mandarin variety Nadorcott during the provisional protection period, without authorization from the breeder. The outcome of the case has been highly detrimental to titleholders, raising concerns about the overall strength of the system

The court ruled that during provisional protection, no authorization is required for third parties to propagate or commercialize the applied-for variety. Consequently, the post-grant condition of "unauthorized use of variety constituents" for exercising the breeders' right on harvested material was not met. This interpretation of Article 13(3) of the Basic Regulation significantly narrowed the protection for harvested material. CIOPORA has warned that such a precedent could push breeders to delay commercialization of their newest varieties or seek alternative protection methods - undermining the very system the EU intended to strengthen.

The CPVR System: An Overview

The Basic Regulation established the legal framework for Community Plant Variety Rights (CPVR), creating an EU-wide protection system that grants breeders exclusive rights over their new plant varieties for a defined period - usually 25 to 30 years, depending on the crop.

The Community Plant Variety Office (CPVO), headquartered in Angers, France, has administered the system since 1995, harmonizing plant variety protection among EU Member States, streamlining application processes and strengthening breeders' rights across the region.

Internationally, the CPVO also plays an important role by cooperating with other PBR offices, facilitating information exchange and supporting the development of plant variety protection systems in other countries.

A System in Need of Renewal

While the CPVR system has been a model for other countries, the Basic Regulation itself has remained largely unchanged since 1994 - despite significant developments in plant breeding, biotechnology and the broader horticultural and agricultural industries. As early as 2011, a European Commission-sponsored evaluation identified areas in need of improvement. Now, in 2025, breeders face legislation that no longer reflects commercial and technological realities or provides adequate protection in a globalized economy.

In its March 2025 submission to the EU-Commission, CIOPORA stated that "the CPVR system does not effectively address the modern developments and challenges of the green industry."

CIOPORA Secretary General, Dr. Edgar Krieger, who has closely monitored both the implementation and impact of the Regulation, added that, "the CPVR system has enabled the industry to grow within a framework of common understanding, with measures that protect innovators. However, under today's conditions, certain weaknesses in the Regulation are more apparent, and we must take steps toward a system that allows breeders to continue developing their innovations."

CIOPORA's Key Reform Proposals

In its comprehensive proposal to the European Commission, CIOPORA has outlined targeted reforms to restore legal certainty, encourage innovation and ensure fairness in a global market.

The Nadorcott Decision dramatically shrank control over the harvested material of protected varieties. While the EU Commission attempted to limit the reach of the decision to the scope of provisional protection, the decision goes beyond and has created a loophole where, when no authorization is required to propagate and commercialize a variety – for instance in countries where there is no PBR system in place or no title available – the requirement of "unauthorized use" for the protection of harvested material would not be fulfilled.

CIOPORA proposes that harvested material, especially from vegetatively reproduced crops, should enjoy direct protection, regardless of whether there was unauthorized use of propagating material. This approach is compatible with the UPOV 1991 Convention, which sets minimum (not maximum) protection standards.

Interpretation of "Variety Constituents"

Article 5(3) defines variety constituents as "entire plants or parts of plants as far as such parts are capable of producing entire plants." Despite the clear text of the Basic Regulation, some interpretations of this Article try to narrow the scope of the variety constituents by referring to a "subjective" element implied in the definition. This interpretation is not in line with the text of the regulation, which clearly refers to the objective "capacity" element of the material to produce another plant with the same characteristics.

CIOPORA emphasizes that only material, which is not capable, by any means, of producing another plant true to type should be considered harvested material in the legal sense.

Reinforcing the Scope of Rights

CIOPORA proposes that breeders' exclusive rights should cover all uses of protected material, particularly for ornamental and fruit varieties, including the use of protected material of vegetatively reproduced ornamental and fruit varieties should fall into the scope of the right. Products made directly from harvested material, such as fruit juices, should enjoy at least secondary protection under Article 13(4), if not primary protection.

Clarifying Novelty and Distinctness

CIOPORA recommends redefining novelty, so that it begins only when variety constituents capable of true-

Dr. Edgar Krieger is Secretary General of CIOPORA, Hamburg, Germany

Group Picture of CIOPORA AGM 2023 in Alexandria, Washington, USA

Dr. Edgar Krieger [r]: “Under today’s conditions, certain weaknesses in the Regulation are more apparent”

to-type reproduction are physically transferred within the EU. The sales of harvested material incapable of reproduction (e.g., most fruits) should not trigger the novelty period of grace, because it does not allow a continued utilization of the variety.
This period should be extended to two years within the EU and ten years outside, reflecting the current market conditions.
Distinctness should be based on economically and agronomically significant traits, not merely botanical differences. Breeders need assurance that minor cosmetic differences will not undermine their rights.

Cost-Efficiency of DUS Testing

For certain species - especially fruit trees and short-cycle ornamentals - DUS (Distinctness, Uniformity, Stability) testing is too costly and time-consuming, deterring applications. CIOPORA calls for acceptance by the CPVO of DUS reports from UPOV member countries (especially third countries) or countries that are part of the Agreement on Trade-Related Aspects of Intellectual Property Rights (‘TRIPS’), in line with UPOV’s collaborative spirit.

Looking Ahead

The challenges outlined above reflect a broader reality: if the EU wishes to remain a hub for horticultural innovation, investment and biodiversity, it must modernize the CPVR framework.

Adapting to new breeding technologies, addressing economic barriers, fostering international cooperation and resolving inconsistencies in legal interpretation will be essential to maintaining the system’s integrity.
The CPVR system must evolve alongside the industry it was created to support - and the time for reform is now.

Prevention is better than cure

A new initiative for **plant raisers**

Jacques Wolbert

Producing healthy, disease-free vegetable plants is essential for plant raisers. Preventing viruses, bacteria and fungi from entering the areas where young plants are grafted or grown is crucial and increasingly important. To reduce risks, strict hygiene measures for employees, tools, machinery, incoming materials and water are necessary.

To reduce risks also strict hygiene measures at plant raisers are necessary

To produce healthy vegetable plants, Dutch plant raisers, together with Naktuinbouw, developed the HSPO programme (Hygiene Systeem Planten Opkweek, or Hygiene System Plant Propagation). This programme helps companies to implement preventive hygiene systems and acknowledges those who comply with the requirements.

The origin of HSPO

The initiative started in 2020, when young plant raisers Gipmans Young Plants and Gitzels Plant Nursery raised concerns after several sector-wide incidents with virus and bacteria infections. With the support of Plantum, the Dutch trade association for breeders and propagators, Naktuinbouw developed a draft programme and protocols. The HSPO system was inspired by existing programmes, such as NAL and Elite, and especially the French/Dutch GSPP system (Good Seed and Plant Practises). GSPP was introduced in 2011 for tomato seed companies and plant raisers after serious outbreaks of Clavibacter in the EU. Recent virus outbreaks, such as ToBRFV and CGMMV, pinpointed the urgency and the need for more measures.
While GSPP has since then been globally adopted and has proven very effective in reducing Clavibacter incidents, its complexity and high administrative burden made it less suitable however for broader use. The HSPO system was therefore designed as a more general and practical approach, applicable to many crops beyond greenhouse vegetables.

Testing and implementation

In 2024, the new HSPO system was extensively tested and refined, together with the plant raisers mentioned and the companies Brabantplant, Fortaplant and WPK. The programme was officially introduced at the end of 2024. Implementation started with

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A practical example in ornamentals using HSPO as a tool can be found at Van Lint Boskoop Nursery. Training of employees in company hygiene led to a significant increase in awareness and better internal protocols.
Joost van der Wolf, Quality Manager at Van Lint Nursery and former crop protection advisor, explains: "In many arboricultural crops, such as roses, shrubs and perennials, hygiene was underexposed. After the training course at Naktuinbouw, I realised all our colleagues would benefit from education on this topic. This training led to concrete improvements:

– Regular cleaning of cultivation floors /areas
– Removing infected plants in sealed plastic bags (instead of unprotected)
– Stricter attention to personal hygiene (handwashing, clothing, tools)
– Immediate removal of polluted substrates

Although these measures may seem obvious, they are often overlooked when work pressure is high. Van der Wolf concludes: "We are now better prepared for challenges in clean plant production and meet the strict requirements of our clients, such as discounters, supermarkets and garden centres.

More information:
www.naktuinbouw.nl

greenhouse vegetable plant raising and will gradually be extended to other vegetable crops, and possibly also ornamental plants and soft fruit. The programme offers custom made approaches for these types of crops, adapted to specific company operating conditions.
Participating companies first need to describe their working procedures and hygiene policy in detail. And, of course, they must take care to implement these measures 'on the shop floor', and regularly self-audit their company system. The system is also set up as a tool that can be used by inspection organisation Naktuinbouw to authorize companies to carry out certain activities themselves (under supervision). The HSPO system, certainly in the first years, is dynamic, meaning that adjustments and additional requirements can be updated on practical experiences.

International relevance

HSPO is intended to improve the quality and health of young plant production. It reduces the risk of disease infection and damage throughout the production chain. For internationally active companies, the system also helps to meet export requirements. Phytosanitary authorities and trading partners can use HSPO as a tool to prevent the spread of plant diseases. Although the system was developed in collaboration with Dutch companies, it is expected to become available to companies outside the Netherlands if there is sufficient interest.

Single-pollen genomes unlock meiotic recombination landscapes

Snapshot of meiotic recombination DNA profiling thanks to single-pollen-nuclei sequencing of 14 pollen nuclei. In every horizontal 'lane', recombination in a single chromosome of an individual pollen nucleus is characterized: pink is DNA coming from one parent, blue is DNA from the other parent. On the left side of the lanes, the number of crossovers is mentioned.

Dick Roelofs

Combining KeyGene's advanced protocols for the isolation of single-pollen nuclei and smart bioinformatics with the recently introduced Ultima Genomics sequencing platform can help plant breeders to improve their breeding by better understanding the recombination of the DNA from both parents during meiosis. That is the result of joint research by KeyGene and Ultima Genomics.

When plant breeders want to develop new varieties with new combinations of traits, they need to rely on the recombination of genes between male and female parental plants that occurs during meiosis. This recombination is possible thanks to 'crossing over' events that happen between homologous chromosomes coming from the female and male parents during meiotic cell division upon fertilization. This process occurs during meiosis in the formation of gametes that eventually give rise to a segregating offspring population.

Costly, slow and labour-intensive

To optimize crop improvement, breeders want to gain insight into the frequency and preferred locations in chromosomes where cross over events take place in order to generate novel allelic combinations of genes involvied in important crop traits. Currently, DNA of F2 progeny plants from crosses between parents of interest are evaluated for parental SNP inheritance to generate recombination landscapes. Because genotyping F2 plants requires growth to maturity of the F1 and the growth of F2 plants, this is a very costly, slow and labour-intensive procedure.
Studying crossing overs in gametes, so shortly after meiosis, holds the promise of a fast and cost-effective approach to generate precise recombination landscapes. For an approach like that, a way to isolate nuclei of individual gametes, as well as a cost-effective high throughput platform to sequence the DNA of individual nuclei is needed. Finally, smart bioinformatics will allow correct interpretation of the results to make impactful decisions on breeding strategy.
KeyGene is well known for its protocols to isolate high quality and high molecular weight DNA from plant tissue. Very recently, KeyGene developed proprietary protocols for isolating intact individual nuclei from pollen in a high throughput way, while Ultima Genomics developed the high throughput UG100 sequencing platform able to sequence pools of single genomes cost-effectively at high speed.
As proof of concept, hundreds of pollen nuclei were isolated by KeyGene. Each nucleus was sequenced by Ultima Genomics on their UG100 platform. The sequencing results of millions of parental single nucleotide polymorphisms (SNPs) were then analyzed using KeyGene's data science capabilities. Meiotic recombination profiling analysis delivered evidence-based maps of recombination in individual gametes at extremely high resolution of approximately 5 Kbp.

Local double crossover events

Consequently, it delivered valuable conclusions about recombination frequencies, the distribution of recombination along the chromosomes and even evidence of local double crossover events (2 crossovers nearby each other on the same homologous chromosome). Such double crossovers are often overlooked, or dubbed as 'false positives', by the more traditional F2 progeny plant DNA approach.
The Ultima Genomics platform produced highly accurate results, probably thanks to the single-end 300 bp read length of the DNA sequence output. Conventional short-read next generation sequencers (NGS) commonly generate only 150 bp sequence reads. Moreover, the costs of the use of the UG100^{tm} Ultima Genomics platform are substantially lower than the costs of sequencing on conventional NGS platforms.

Perspectives outside breeding

KeyGene experts foresee that the substantial cost reduction of the Ultima Genomics sequencing platform will make single cell sequencing applications accessible for other research objectives too.

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DUS Testing for Plant Breeders' Rights

Cécile Collonnier

Distinctness, Uniformity and Stability (DUS) are the technical criteria that form the basis of plant variety protection in the EU. Using the DUS reports produced by its network of entrusted examination offices, the CPVO (Community Plant Variety Office) has granted about 67,700 Plant Variety Rights (PVRs) in the last three decades, proving the success of the system in place. However, in response to the rapidly evolving agricultural and technological landscapes, DUS testing faces new challenges and the need is growing for more efficient, reproducible and precise methods and procedures. Digital phenotyping, powered by image analysis and artificial intelligence (AI), is emerging as a promising solution.

Up to now, DUS testing has relied heavily on expert judgment, with traits observed visually and data analysed manually. While experts' knowledge is invaluable, this approach introduces subjectivity and limits scalability. In parallel, the increasing variety collections and trials' size, in a context of resource constraints, call for more restrictive ways of selecting comparators and methods of observations with higher throughput. Also, despite their high level of harmonization, more standardization across examination offices in the implementation of DUS protocols is still needed.

Digital phenotyping

Digital phenotyping involves the use of imaging technologies and machine learning to capture and analyse phenotypical traits. Recent advancements in sensor technology, automation and computational power have made these tools more accessible and cost-effective. Potential applications to plants are vast, ranging from measuring shapes and colours of plant organs to predicting varietal behaviour under diverse stress and environmental conditions. For DUS testing, AI-powered tools would be used for the assessment of characteristics from the technical protocols and could enhance procedures by:

- Saving time and resources via automation;
- Increasing precision and reliability of traits assessment;
- Supporting decisions (with the setting of clear thresholds);
- Offering data storage and traceability for secure evidence-based decisions;
- Strengthening standardization across examination offices;
- Preserving expert knowledge through digital processes and decision support systems.

Supporting evidence

Therefore, the potential benefits of digital phenotyping should clearly support the PVR system. Nevertheless, these outcomes should be handled with caution and the data produced considered as supporting evidence. The final decisions will remain in the hands of the experts in charge of validating the thresholds for minimum distances and preserving the legal validity of observations, even if they pass the capacity of the human eye. High costs for data storage and system maintenance will also have to be considered, as well as the need to deploy in-house expertise, before any implementation in routine by the examination offices. Moreover, all data capture methods may not suit every species or trial setup. Hence, any new method will have to provide clear added value over current practices to justify its integration.

Many examination offices around the globe are actively exploring digital phenotyping for DUS testing. Contributions from Argentina, China, Korea and the UK were highlighted during the recent meetings of the UPOV-TWM (Technical Working Party on Testing Methods). Within the EU, research programmes, including national initiatives (like PHENOTIC, PHENOME, CAPTE, MODOMA), along with EU-funded projects (such as INVITE, PHENET and the EMPHASIS network), have accelerated progress in this area.

Becoming phenotypically closer

Inside the CPVO's network, examination offices have been using simple 2D image analysis, sometimes for about 20 years (e.g., RGB pictures treated with ImageJ). This kind of analysis is precise and allows validation of distinctness decision by providing supporting data, which is especially useful for species whose varieties are becoming phenotypically closer and closer. Image analysis also facilitates the assessment of small organs (beak of bean pods) or complex shapes (carrots) and supports calibration between examination offices.

Molecular and phenotypic data

However, this approach requires protracted preparation of samples that need to be brought from the trial to a studio where pictures are taken, which is time-consuming and imposes a limit on size of organs. In the future, 3D imaging and machine learning should help in assessing more complex characteristics, such as shapes and patterns, in a more efficient way. Large integrated platforms and workflows for the treatment of data (e.g., drone pipelines) will be created to host and use molecular and phenotypic data for variety testing. Such programmes are already in discussion in certain examination offices, such as the Naktuinbouw (NL) and GEVES (FR).

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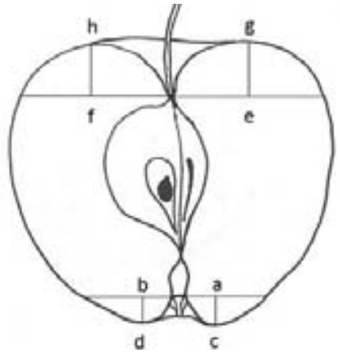
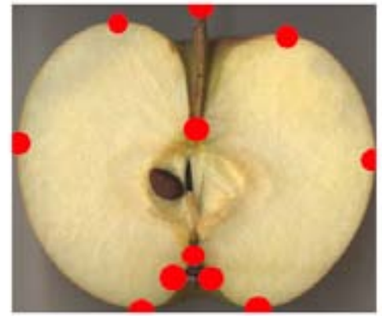


AI to identify the main pomological points on an apple fruit (Pilot study at NEBIH, HU).



UAV and AI to assess plant width in perennial ryegrass (WUR and the Naktuinbouw, NL).

Diverse characteristics

For the time being, about half of CPVO entrusted examination offices have engaged in image analysis supported by AI, some of them even developing specific internal competences for data capture and algorithms development and training. Diverse approaches are being tested, including UAVs and portable sticks equipped with cameras and sensors (RGB, multi and hyper spectral, ultrasound, etc.), targeted devices (like the Earbox from Phymea system) and custom-made mobile phone applications (such as the MORPH software developed by Wageningen University and Research [NL]). These tools are used to assess very diverse characteristics (e.g., plant height, plant counting, intensity of green colour, fruits and flowers colour and shape) on a large range of species (e.g., lucerne, ryegrass, fescue, maize, sunflower, potatoes, rapeseed, chicory, flax, tomato, melon, squash, apple, apricot, rose, buttercup, anemone, etc.). Like any other tool, before being used in routine, these tools will have to be validated for their capacity to assess not only the distinctness (D) but also the uniformity (U) of the candidate varieties.

Staying up to date

On 27 March 2025, the CPVO organized a workshop, the purpose of which was to share experience on studies conducted by examination offices, to receive opinions and advice from specialized academic scientists, to gain knowledge about available tools and platforms and to discuss the best ways to support the introduction of new phenotyping tools in DUS testing in the future. Presentations were received from examination offices inside and outside the EU and from guest speakers representing the EMPHASIS network, the NPEC platform (NL), CSIC (SP), the Universities of Ferrara (IT) and the WUR (NL). At this occasion, examination offices expressed the importance for them of staying up to date with new tools and topics, acquiring or maintaining internal expertise, consulting scientists when setting up new protocols and making value of services offered by platforms for proofs of concepts and training.

The road ahead

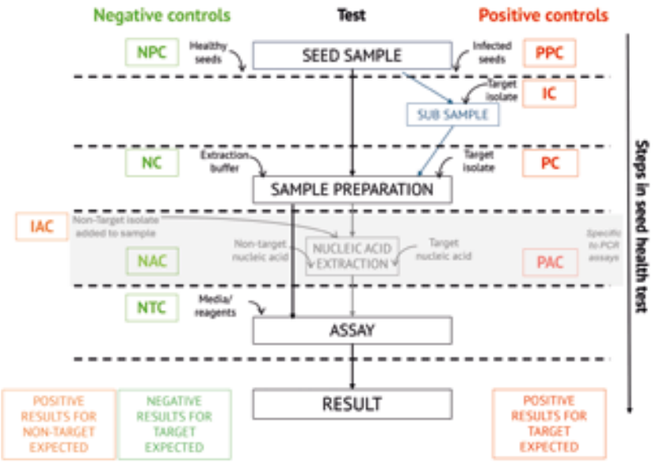
Looking forward, the CPVO is committed to supporting the integration of phenotyping tools into the routine work of examination offices. Its R&D strategy, which emphasizes cost-efficiency and quality improvement in DUS testing, will include digital phenotyping as a key driver for the upcoming 2026-2030 cycle. The CPVO is presently launching actions in terms of coordination, training and support to the setting of appropriate pilot studies and more long-term R&D projects in this area.
Digital phenotyping holds great promises for transforming DUS testing. While challenges remain, the groundwork has been laid and continued collaboration among breeders, examination offices and scientists will be key to its successful implementation. The future of DUS testing embraces digital tools - and it is rapidly taking shape.

Building blocks of the ISHI **best practices**

Ludivine Thomas and Joyce Woudenberg

A team of International Seed Health Initiative (ISHI) volunteers finished the task of harmonizing the control terminology and definitions. These harmonized controls are now presented in a consistent format across all six Best Practices, including a standardized name, definition, objective, and expected results. They represent a significant advancement in seed health testing.

Over the years, six Best Practices have been developed to support routine testing methods, encompassing biological assays (bioassay and pathogenicity assay), blotter and agar plating assays, dilution plating assays, ELISA assays, PCR assays and sweat box and grow-out assays. These Best Practices primarily defined the necessary controls to assess and monitor the performance of each assay. However, until recently, no harmonization of the description of these controls was applied.



Summary of negative and positive controls recommended throughout the steps of the tests.

Legend: IAC: internal amplification control; IC: inhibition control; NAC: negative amplification control; NC: negative control; NPC: negative process control; NTC: negative template control; PAC: positive amplification control; PC: positive control; PPC: positive process control.

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Technical Guidelines, ISHI Method Validation Guidelines (https://worldseed.org/our-work/seed-health/ishi-technical-resources/)
ISHI Best Practices (https://worldseed.org/our-work/seed-health/ishi-best-practices/).

In 2024, a team of ISHI volunteers undertook the task of harmonizing the control terminology and definitions across the six Best Practices. This effort was aimed at improving clarity, consistency, and ease of communication among users worldwide.
Each step of a seed health test is verified through a series of controls (Figure 1), including negative controls, such as the negative (extraction buffer) control (NC) or the negative process control (NPC), as well as positive controls, such as the inhibition control (IC) and the positive amplification control (PAC). These controls are applied from seed sample preparation through to the assay itself, to ensure test accuracy and to safeguard against contamination or any unintended errors that may happen during the process.

Consistent format

The harmonized controls are now presented in a consistent format across all six Best Practices, including a standardized name, definition, objective, and expected results. Additionally, a simplified description has been included to enhance clarity. The criticality of each control, categorized as not applicable, optional, recommended, or essential, has also been reviewed and verified to guide laboratories in determining whether to include a given control, depending on their test objective and available resources.

Advancing global seed health

The harmonization of control terminology and presentation across the ISHI Best Practices represents a significant advancement in seed health testing. By aligning definitions and clarifying the role and criticality of each control, ISHI has strengthened the consistency, and global applicability of its Best Practices. This achievement reflects ISHI's continued commitment to advancing global seed health by supporting laboratories implementing high-quality seed health testing methods.

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Dear Prophyta reader,

As you will have read in the previous issue of Prophyta, Monique Krinkels has stepped down as editor-in-chief of the magazine after more than thirty years. She has made Prophyta what it is today, an inspirational magazine for everyone working in our field, both nationally and internationally.

Now that changes are taking place in the editorial team with Steven van Paassen taking over from Monique Krinkels as of August 2025, we are also asking ourselves the question, 'Can we make Prophyta even better?'
Can we ask you something? Who better to answer this question than you, the reader. We are therefore asking you to fill out a short reader survey. You can access the survey by scanning the qr code. It will take only a few minutes to complete and the results of this survey will help us to improve Prophyta and better respond to your interests. Thank you in advance for your cooperation!
Help us to improve. Scan the qr code.

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