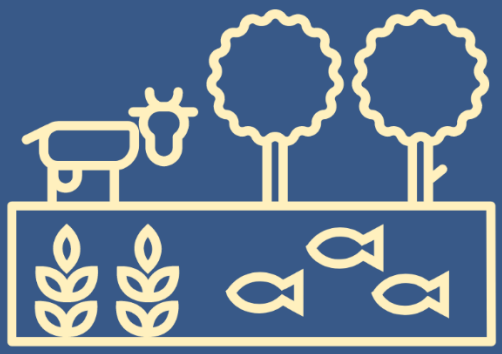
NordGen

Nordic Conference on Genetic Resources: Possibilities and Urgency



Report from conference arranged by NordGen in Hyllie, Malmö.

December 11, 2024

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Executive summary

December 11, 2024, NordGen arranged a conference titled 'Nordic Conference on Genetic Resources: Possibilities and Urgency' in Malmö, Sweden. The conference was also streamed worldwide. This report contains summaries of the conference findings and recommendations.

The conference was opened by the Swedish Minister of Rural Affairs, Peter Kullgren, and the Secretary General of the Nordic Council of Ministers, Karen Ellemann and featured 12 speakers from a wide range of areas connected to different fields of genetic resources. About 140 participants attended the conference on-site in Malmö and almost 160 registered for the online streaming.

The conference's morning session provided reports from the recent COP16 deliberations in Cali, Colombia followed by lectures and discussions on how climate change affects the Nordic region and how NordGen and genetic resource sin general can contribute to climate adaptation and the green transition.

The afternoon sessions included insights from the business side, plant breeders, researchers etc. and provided several examples of how genetic resources contribute to a more sustainable, resilient and efficient society.

The key takeaways from the conference were that genetic resources are excellent tools for the green transition. However, the Nordic collaboration needs to be maintained and communication accelerated to reach viable change.

Introduction

NordGen is the Nordic region's seed genebank and knowledge center for genetic resources. During my tenure as Executive Director, we have organized numerous conferences, seminars, and thematic events focused on genetic resources within plants, farm animals and forests. However, until this conference, none of these initiatives have taken a comprehensive, holistic approach to the topic, offering a broader perspective of the field. With the *Nordic Conference on Genetic Resources: Possibilities and Urgency*, we expanded the concept of genetic resources to a wider audience, fostering a deeper understanding of their potential.

The opening presentations covered the recent biodiversity COP in Cali and provided valuable insight into international policy developments in this area. The conference continued with what we can expect from the Nordic climate in the coming years. While I connected these discussions to our work at NordGen and the management of genetic resources, the panel discussion, which actively engaged the audience, helped connect the dots between the individual presentations.

The afternoon sessions included presentations on the business case for biodiversity, and showcased several concrete and inspiring examples of how a sustainable use of genetic resources is being applied in practice.

As is often the case with conferences, the lunch and coffee breaks proved just as valuable as the lectures themselves. We intentionally designed the program to allow ample opportunities for networking, and judging by the lively exchanges during the breaks, I believe we succeeded in creating a space for meaningful dialogue.

What we do in the coming years will be critical to our success in addressing both the loss of biodiversity and the climate crisis. It is essential to recognize the potential of sustainably using genetic resources. This conference was an important step forward in that journey—let's continue moving ahead together!

Lise Lykke Steffensen
Executive Director, NordGen
13 January 2025

Lectures

1. **Peter Kullgren, Swedish Minister for Rural Affairs**
   The conference was opened by a video greeting from Peter Kullgren, the Swedish Minister for Rural Affairs and the current Chair of the Nordic Council of Ministers for Fisheries, Aquaculture, Agriculture, Food and Forestry (MR-FJLS).

   In his statement, Minister Kullgren shared his concern for the uncertain times we live in and stressed that developing a strong bioeconomy is key to transforming the Nordic region and the EU into modern, resource-efficient, and competitive economies that support the green transition. Further, he raised the recently adopted Karlstad Declaration on Preparedness, Robustness, and Resilience and emphasized that strengthened cooperation, crisis preparedness and sharing of knowledge, technology and best practices is essential for a sustainable future within agriculture and forestry. Minster Kullgren also underlined NordGen's important role in safeguarding and utilizing genetic resources for the future.

2. **Karen Ellemann, Secretary General of the Nordic Council of Ministers**
   The opening of the conference continued with a speech by Karen Ellemann, Secretary General of the Nordic Council of Ministers.

   In her speech, Secretary Ellemann emphasized that the Nordic Prime Ministers has adopted a vision of making the Nordic region the most sustainable and integrated region in the world by 2030. She continued with that competitiveness and resilience will be the core focus of the MR-FJLS from 2025-2030. Their cooperation program has clear goals: advancing the green transition, boosting competitiveness, and strengthening resilience across the Nordic region. Secretary Ellemann seconded Minister Kullgren in raising the Karlstad Declaration but also added that the Kalmar II Declaration is important in its Nordic joint view

on Access and Rights to Genetic Resources. She concluded her speech with urging the participants of the conference to join forces and harness the potential of genetic resources to create a more sustainable, resilient, and equitable future for all.

3. **What happened in Cali and what comes next?**
Charlotta Sörqvist is a Senior Advisor at the Swedish Ministry of Climate and Enterprise but was also the Chief Negotiator for the Swedish delegation and Chair of Working group 1 at the Convention of Biological Diversity's (CBD) Conference of the Parties (COP16) in Cali, Colombia.

Charlotta Sörqvist started with informing the audience about the Kunming-Montreal Global Biodiversity Framework (GBF), which was adopted at the last COP and which is now to be implemented. She said that genetic diversity is clearly mentioned in the framework, both in Goal A and target 4 – meaning that all need to report on these targets. Focus of the CBD is now on implementation, where Sörqvist underlined that it was interesting to see that the discussions are alive, and that work is ongoing. The main outcomes of the COP16 were: a decision on a new permanent body and work program for Indigenous People and Local Communities (IPLC), a decision to align the work done and promote synergies between biodiversity and climate change, and a decision on Marine and Coastal Biodiversity (EPSAS). There was also a decision on Digital Sequence Information (DSI), how benefits arising from the use of the information connected to genetic resources should be handled. It was decided to establish a fund, to which companies using DSI should contribute with 1% of their profits or 0,1% of the revenue. However, the contributions are still voluntary. The fund income should be used for projects in low-income countries. Sörqvist concluded her presentation by informing the audience that the COP16 is not yet formally closed and will be resumed in Rome in February. COP17 will be arranged in Armenia in 2026.

4. **COP16 from a Youth Perspective: Thoughts from the Nordic Youth Biodiversity Network.**
   Villemo Tomasdotter is a member of the Nordic Youth Biodiversity Network (NYBN) which is a branch of the Global Youth Biodiversity Network (GYBN) and attended COP16 in Cali. The network's main goal is to halt and reverse the biodiversity crisis in the Nordics through advocacy work and capacity building.

   Villemo Tomasdotter shared their experiences from attending COP16 as part of a delegation of seven, representing Finland, Iceland, Denmark, Norway, Sweden and the Sápmi community. They were not part of the deliberations but had meetings with the official delegations to learn more and share their input. Tomasdotter also addressed the fact that it is difficult to find and administrate funding for youth representation at these international meetings, and will, due to lack of funding, not attend the COP16 closing in Rome. It was also underlined that climate change and loss of biodiversity are closely interlinked. They finalized their presentation by sharing a picture of a thought-provoking art piece at COP16, showing a Jenga tower representing biodiversity and nature. How many sticks can we remove before the tower collapses?

5. **Climate change's effect on the Nordic agri-food systems**
   Jørgen Oleson is Professor and Head of the Department of Agroecology at Aarhus University. He has contributed to expert panels of the EU, The World Bank and FAO and has also contributed as leading author to IPCC assessment reports.

   Jørgen Olesen informed the audience that the globe is warming at unprecedented rates. The temperature increases more over land than over sea. New research shows that regional climate models underestimate future temperature increases and droughts in Europe. Current adaptation strategies are therefore underestimating the severity and speed of climate change in Europe. The changes lead to environmental disruptions of food supply chains, caused by high temperatures and drought. Recent climate related supply problems include vegetables, coffee and olive oil. Expected issues due to heat and drought include cereal grain, tomatoes, coffee, cocoa and hops. A recent survey with experts throughout Europe shows that genetics plays a role everywhere. Looking into the future, genetics will play an even bigger role for adapting agriculture to climate change. According to Olesen, the Nordic agriculture will be less affected than global agriculture production, although increasing variability (droughts and floods) will have impacts.

6. **Genetic Resources as tools for mitigating climate change and promote green transition**
   Lise Lykke Steffensen has been the Executive Manager of the Nordic Genetic Resource Center, NordGen, since 2017.

   After an introduction to NordGen's mission, Steffensen presented some of the global challenges that lie ahead of us, including how we will be able to feed an increasing population without using more land while lowering greenhouse gas emissions. Steffensen stated that genetic resources are crucial for human life on earth and necessary to adapt agriculture and forests to climate change, new dietary requirements and

updated production methods. The trend she sees is an increased interest in genetic resources and the benefits of their sustainable use. There is also more focus now on the connections between climate and biodiversity. New genomic tools, AI and big data are important drivers within the field of genetic resources. Lise Lykke Steffensen also argued that there is now a window of opportunities – and we need to use it by incorporating genetic resources into national strategies to a much wider extent, increase cross-sector collaboration and co-creation, strengthen genebanks and increase research on genetic resources. She finalized her presentation by mentioning a number of NordGen projects which contributes to the sustainable use of genetic resources within Nordic agriculture and forestry.

7. **How to engage the business community in stronger biodiversity**
Michael Zöllner is a strategic advisor in sustainable finance and the former CEO of the Danish Green Investment Fund.

In his presentation, he focused on the financial and business side of biodiversity. Using a pendulum as illustration, he argued that climate and biodiversity is on the one side, as positive impact, but that profitability, financial return and stock prices are on the other side, the viable business. To help business commit to solving the climate and biodiversity crises, Zöllner stated that we need to help the business community to solve an equation with three unknowns: sustainable transformation, the demanded capabilities, the necessary compliance. He took an example from the dairy industry, where Arla gives points to farmers depending on how sustainable they are. The more points the higher the price for the milk. If you have more than 70 points, you get 30% discount on your loans. Michael Zöllner concluded his presentation with saying that we need to go from the holistic approach of WHY to a simple model displaying HOW – to make the business committed to change. According to him, academia needs to develop simple models for understanding how biodiversity is affected. But the model must include

profitability for the companies – otherwise the stock market won't value the contribution.

8. **Novo Nordisk Foundation's perspective on agrobiodiversity and its role in sustainability and resilience of the food systems**
   Anastassia Khrouchtchova is a Scientific Manager at the Novo Nordisk Foundation, an independent Danish enterprise foundation. She works with distributing funds to projects that align with the foundation's vision of improving people's health and the sustainability of society and the planet.

   Their strategy within sustainability is scientifically based with the nine planetary boundaries as base. According to these, a more plant-based diet is needed. Out of the habitable land on the earth, 45% is used for agriculture, and out of the agricultural land, 80% is used for livestock. Khrouchtchova also stated that the increased diversity in the field (considering both species and genetic diversity) correlates with increased resilience. Variety mixtures, mixed crops and crop rotation are all examples of increased diversity on the field supporting both resilience and productivity. She argued that it is often worth to get inspiration from approaches used in agriculture before intensification. Even though they perhaps didn't work before, they can do so now, as we have new tools. Anastassia Khrouchtchova concluded her presentation with informing the audience about two current projects, CropSustaiN and Ancient Environmental Genomics Initiative for Sustainability (AEGIS). CropSustaiN uses conventional breeding for a naturally occurring trait called BNI that works through plant root-soil interaction to reach a potential 20% reduction of nitrogen fertilizer usage. AEGIS is using ancient eDNA to understand interactions between species and environment over space and time to enable more sustainable agro-ecosystems.

9. **The importance of plant breeding in feeding the Nordic population**
   Kristin Børresen is the Managing Director of Graminor, Norway's plant breeding company which is 50% state-owned and 50% farmer's organization-owned.

   She commenced her presentation by stating that plant breeding is at the heart of our food systems – and continued by explaining what plant breeders do, through a humorous tweet: "I make good plants have sex with other good plants, and then I kill their weakest children". More formally, the aim of plant breeding is to increase the genetic gain for chosen traits. To do this, genetic diversity is a must. As traditional plant breeding takes time (12-15 years from crossing to new variety), and climate change is happening fast – Nordic collaboration is needed. This is the reason why the Nordic Public-Private Partnership for pre-breeding has been formed. Looking into the future, Børresen stated that a genomic revolution is happening right now. AI, new technologies for phenomics, marker-assisted selection (MAS) and genomic selection are important and complementing tools in the breeding programs. She noted that some investments are being made within this field, but more is needed. Kristin Børresen concluded her presentation by saying that robust plant varieties adapted for Nordic growing conditions are crucial for food production and food security in our region.

10. **Using genetic resources to adapt crops to the extreme environment in Iceland**

Hrannar Smári Hilmarsson is the Head of Hvanneyri Agronomy Research Center the Agricultural University of Iceland.

He started his presentation with an introduction to the Icelandic climatic conditions. It is colder than nearby countries (but warmer during winter) and has the fewest sunshine hours in Europe. This emphasizes the need for a special plant breeding program. Iceland was settled in 874, and the settles brought farm animals –which developed into the breeds that are used still today. In fact, import of foreign breeds is forbidden today. The development of Icelandic agriculture focused on grazing management and herding, and moved away from arable farming. The diet of the Icelandic peasant consisted of meat and dairy products, and they could only dream of bread – quite the opposite to the rest of the Nordic peasants. In the 1920s, cereal cultivation was reintroduced by Klemenz Kristjánsson who used material from Sweden and Denmark but only a couple of varieties. The plant breeding emphasized early heading for it to mature quickly. The Icelandic breeding program was established due to the country having ample possibilities of increasing its cereal cultivation. Today, Iceland only produces 1% of its consumed grain. At the same time, 480 thousand hectares are available for cultivation – not counting land that could be changed into agricultural land. The breeding program has thus far primarily focused on barley, as it is the most early maturing cereal species. Oat can also be cultivated but are maturing late. Wheat which is maturing late is the most used grain in Iceland. The breeding program will look into more species in the future. Hrannar Smári Hilmarsson concluded by summarizing that genetic resources play a pivotal role in adapting crops to new environments – and that the lessons learnt from Iceland can be used when adapting crops to new extremes in a changing world.

11. **What can we learn from the current ash dieback crisis for future conservation of tree genetic resources?**
Jan-Peter George is a Senior Scientist at the Natural Resources Institute Finland (Luke). He is a tree geneticist with special emphasis on genetic diversity and forest health monitoring.

George's presentation started with a short introduction of the ash dieback disease, one of the deadliest tree pathogens in European history. The disease has spread throughout the whole of Europe since it arrived here in the 1990's from Asia and has a mortality rate of over 90%. As it is wiping out entire populations, the genetic diversity of the species is affected. In addition, 4-5% of other species are also lost when the ash disappears, meaning that their diversity will disappear. According to Jan-Peter George, it is evident that natural selection alone can't solve the problem. Monitoring is therefore needed, across the whole continent. Ideally, we should have acted 25 years ago – but it is still important to act today – and many initiatives are ongoing to conserve the ash. *In situ* conservation, dynamic *ex situ* conservation, static *ex situ* conservation are some examples. George stated that there is no singe approach, as all have their pros and cons. Within the field, there are several ongoing initiatives, such as *in situ* networks and national breeding programs. Jan-Peter George concluded his presentation with saying that the ash dieback disease has improved the collaboration within the field in the European region, but the research needs to be excelled.

12. **New sustainability traits in the breeding program of Norwegian Red dairy cows. How can we use knowledge from our research to select for lower methane emissions and improved feed efficiency?**
Karoline Bakke is a Researcher at the Research and Development Department of Geno, a Norwegian farmer-owned breeding company. She is focusing her work on collecting and analyzing data on new sustainability traits, such as feed efficiency and methane production of cows.

The Norwegian Red (NR) dairy cattle is bred with broad breeding goals, such as improved health, less use of antibiotics, improved fertility, calf survival, improved growth rate and higher production efficiency. The breeding program combines genomic data with phenotypic information to develop breeding values based on all traits with the help from complex statistical models. Bakke shared that one of the traits Geno is breeding for is methane and feed efficiency. As methane is emitted from the rumen, 6-12% of the feed energy is lost. With more efficient animals, less methane is emitted, leading to gains for both farmer and climate. One of the results of this research is that the adult size of the animals is limited, as heavier cows produce more methane which also increases the feed costs. The gathered data on methane emissions and feed intake suggests that breeding for lower methane emissions and feed intake is possible. Bakke concludes her presentation with saying that more research is needed, not least to learn more about the associations between the different traits and genetic association to other important traits, such as milk yield, health and fertility. In the future, research can lead to the breeding of a feed efficient and more climate friendly cows.

13. **Solutions from nature. Crop wild relative conservation for a more resilient and climate adapted Nordic agriculture**.
Anna Palmé is a Senior Scientist at the Nordic Genetic Resource Centre (NordGen) focusing on crop wild relatives. Currently she is coordinating a Nordic project on crop wild relatives and has since 2015 coordinated several Nordic cooperation efforts on the same theme. The focus of the projects has been on *in situ* and *ex situ* conservation, communication, and facilitating use.

A crop wild relative (CWR) is a wild species that is closely related to a cultivated crop. Properties from a CWR can be transferred to a crop and thereby contribute with genetic diversity that is likely to be of importance in the future, for example by adaptation to drought and heat, extreme weather or new pests and diseases. Sea beet and white

clover are two examples of wild Nordic species that have been used in plant breeding. Palmé continued her presentation with sharing information about the Nordic CWR project which ran from 2021-2024, with the long-term aim of a more resilient Nordic agriculture. Focus of the project has been improved conservation of CWRs as well as enhanced access to these important genetic resources. The project included participants from Denmark, Finland, Iceland, Norway, Sweden, and Åland and activities such as CWR inventories and seed collection took part locally in these countries, while others such as climate change modelling and genetic diversity analysis had a general Nordic focus. Palmé concluded her presentation by sharing some of the recommendations from the project, such as long-term monitoring, conservation of natural ecosystems and *ex situ* conservation of CWRs.

14. **Decoding the past to breed crops for the future: Pre-breeding and genebanks in crop innovation**.
Therese Bengtsson is a Researcher at the Swedish University of Agricultural Sciences focused on pre-breeding for host plant resistance in cereals against pests and pathogens through genomics-assisted breeding.

Bengtsson started her presentation with explaining the concept of pre-breeding – which is the stage where specific genetic variation is introduced with the aim of delivering parents to the breeding program, which later develop new varieties. She then moved on to presenting the Nordic Public-Private Partnership on pre-breeding, where long-term funding is secured for joint Nordic pre-breeding work. In the PPP, which is 50% state funded (through the Nordic Council of Ministers) and 50% partner funded, knowledge from the field and the laboratory is combined, without internal competition. In most cases, multinational companies don't see the need to breed for our climate and growing conditions – therefore it's important that we can do it ourselves, according to Bengtsson. There are currently four PPP-projects running. Examples of their impact include a stronger Nordic network among

breeders and academia, increased exchange of materials and the possibility to perform large-scale field experiments in multiple environments and the use of expensive techniques.

Panel discussions

The conference featured two panel discussions with speakers answering questions from the audience. The first, before lunch, included the four speakers of the morning session. The one right before the closing of the conference, included the first four speakers after lunch. Below is a short summary of the topics that were raised.

The first question to the first panel was connected to DSI and concerned where this data is stored and how it can be accessed. Charlotta Sörqvist referred to the agreed COP16 documents and underlined that it's only commercial companies that are expected to contribute to the fund. Academic institutions are excepted. Lise Lykke Steffensen referred to the Kalmar II declaration which states that the Nordic countries provide open access to all data of the Nordic seed collection. She said that there has been an idea of creating a global database gathering all DSI – but she hopes this idea is dead forever as it would be impossible to manage.

Next question concerned NordGen's seed collection and if NordGen keeps tabs of the research done and other use of seeds from it. Lise Lykke Steffensen explained that all seeds are dispatched with a standard material transfer agreement, an international document. This is the same for everyone who has signed the International Treaty on Plant Genetic Resources for Food and Agriculture. The numbers are reported to FAO – and at times we ask the ones we sent seeds to what they have used them for and if they have any results to share. But it is voluntary to share this information with us.

Representation at the COP16 was also raised, as the question of women as a marginalised group was discussed. Villemo Tomasdotter said that they considered women as a marginalised group as they have a history as, and still are, victims of discrimination. Their voices are generally not as listened

to as men's, in a global setting. At the COP16, there were a lot of women – primarily representing their work. But there were also women representing women as marginalised groups, just as there were people representing indigenous people and local communities (IPLC) and other marginalised groups. Another matter, pinpointed by moderator Kes Mccormick is that one thing is how is present – another is who is actually taking the decisions.

Jørgen Olesen added that when talking about representation, and plant genetic resources as part of the solution – this issue is underrepresented, both in political debates and also in the general research. For instance, he said, seen to how important they are for the solution, the EU Horizon program has not much money allocated to plant breeding and genetic resources. This is, according to Olesen, a problem of advocacy and understanding of how much these areas contribute to solving the problems. There is a need at a higher level to advocate for plants and genetics as part of the solution, and Jørgen Olesen urged the conference participants to be part of this by engaging more in European and other activities, for instance in the EU initiative Plants for the future.

Sörqvist picked up the thread of meaningful participation and underlined that in the Global Biodiversity Framework, target 22 and 23 links to this, meaning that all countries need to report on how they have ensured participation from different groups. It is therefore important to make sure that there is participation from all who have knowledge to share. Sometimes you do not know who have knowledge beforehand. Therefore, it is vital to have the right people in the room and make sure they can raise their voices.

A question from the audience concerned Jørgen Olesen's presentation and if it can be interpreted as the Nordic region must take a larger responsibility for feeding the world, considering climate change. Olesen said with a smile that researchers don't take responsibility. But the question is how much the Nordic region actually can contribute with. Even though the Nordic region likely will be less hard hit, we have many other sustainability challenges such as nutrient leakage that needs to be solved, perhaps with less land. There is also an important issue of agricultural husbandry considering grazing lands and rumen methane emissions which needs to be addressed.

The afternoon panel was invited by the moderator to reflect on the day they just had been part of and share a key take away. Michael Zöllner started by stating that he was very impressed by the knowledge in this room – and rhetorically asked how we can accelerate and support communication between all different knowledge centres to solve the biodiversity crises together.

Hrannar Smári Hilmarsson agreed that the discussion needs to continue, but that this was a good starting point. He said that it's important to see how we can harvest the genetic resources of the genebank and make them a good business.

Kristin Børresen said there is so much good working going on and good cooperation in the Nordic region. More resources are needed. We need food also in the future and for that genetic resources are essential.

Anastassia Khrouchtchova stated that the thing that got stuck in her head is something Anna Palmé said: that if you talk about something often enough, finally it will trickle down in society and people will get more aware. She also said that NordGen is championing this communication, persistently talking about genetic resources and what they can do. It can be discouraging, as people can't seem to hear, but the engagement and persistence still help to raise awareness.

From the audience, a comment came regarding how the panellists thought about involvement from the indigenous people and local communities, considering the COP16 deciding to create a permanent organ for these groups. Another member of the audience, representing the youth, agreed that this is an important comment, as often IPLCs are the stewards of genetic resources. It would be interesting to hear from a representative of this group as well as the next step of the conversation. It is important to recognize that we are a wealthy region and share as much as possible with the less fortunate parts of the world. The Nordic countries can be leader in this on a global level, as we have been before.

Kristin Børresen finalized the panel by saying that it is vital that we keep the climate for cooperation as we have in the Nordics. It is unique, in most other countries and companies - this is not the case.

Poster displays

Preparing for the conference, a poster call was announced encouraging scholars within the field of genetic resources to share their research through a poster displayed at the conference. A total of 24 posters were accepted and shared at poster walls in the conference room. In most cases, the poster authors were standing by their posters for parts of the lunch and coffee breaks enabling discussions on their research topics. In appendix 3, the poster titles, authors and, if available, abstracts are shared.

Participant feedback

After the closing of the conference, a link to an evaluation form was shared with all participants. The form contained six questions and took in average about two minutes to answer. As of January 9, 74 people (29%) had answered the form. 56% of the respondents had been attending the conference in Malmö, and 43% joined online.

On a 5-star scale, 93% of the respondents gave 4 or 5 stars as the overall satisfaction of the conference, with a mean value of 4,59.

92% liked the program, with a mean value of 4,51.

The form also contained a free-text reply where many of the respondents thanked for a well organised conference with interesting topics. Some particularly raised the updates from COP16 as beneficial. A couple of answers stated that it would have been nice to add an interactive element in the program, allowing for group discussions, and one sought more in-depth presentations. Several comments praised the ample space for networking, whilst one wanted more breaks in the program with fewer presentations in row.

Appendices

Appendix 1: Program

09:00	**Drop-in registration and networking**
10:00	**Opening of the conference** Peter Kullgren, Swedish Minister for Rural affairs Karen Ellemann, Secretary General of the Nordic Council of Ministers Kes Mccormick, Moderator
10:15	**What happened at COP16 in Cali and what comes next?** Charlotta Sörqvist, Chief Negotiator for the Swedish delegation and Chair of Working group 1 at CBD COP16
10:35	**COP16 from a Youth Perspective: Thoughts from the Nordic Youth Biodiversity Network** Villemo Tomasdotter**,** Member of the Nordic Youth Biodiversity Network
10:55	**Climate change's effect on the Nordic agri-food systems** Jørgen Olesen**,** Professor and Head of the Department of Agroecology at Aarhus University
11:15	**Genetic resources as tools for mitigating climate change and promote green transition** Lise Lykke Steffensen, Executive Manager, NordGen
11:40	**Panel debate and questions from the audience with speakers**
12:00	**Lunch, networking and poster exhibition**
13:30	**How to engage the business community in stronger biodiversity** Michael Zöllner, Strategic Advisor in Sustainable Finance and former CEO of The Danish Green Investment Fund
13:50	**Novo Nordisk Foundation's perspective on agrobiodiversity and its role in sustainability and resilience of the food systems** Anastassia Khrouchtchova, Scientific Manager, Novo Nordisk Foundation
14:10	**The importance of plant breeding in feeding the Nordic population** Kristin Børresen, Managing Director, Graminor
14:30	**Using genetic resources to adapt crops to the extreme environment of Iceland**

Hrannar Smári Hilmarsson, Director of the Icelandic plant breeding program Vala at the Agricultural University of Iceland

14:50 **Coffee and networking break**

15:20 **What can we learn from the current ash dieback crisis for future conservation of tree genetic resources?**
Jan-Peter George, Senior Scientist, Natural Resources Institute Finland (Luke)

15:40 **New sustainability traits in the breeding program of Norwegian Red dairy cows. How can we use knowledge from our research to select for lower methane emissions and improved feed efficiency?**
Karoline Bakke, Researcher, Geno Research

16:00 **Solutions from Nature. Crop Wild Relative Conservation for a more Resilient and Climate Adapted Nordic Agriculture**
Anna Palmé, Senior Scientist, NordGen

16:20 **Decoding the Past to Breed Crops for the Future: Pre-breeding and Genebanks in Crop Innovation**
Therese Bengtsson, Researcher, Swedish University of Agricultural Sciences

16:40 **Panel discussion and final remarks**

17:00 **Closing of the conference**

Appendix 2: Video and photos from the conference:

The full recordings of the conference can be found at NordGen's Vimeo-page:

Part 1: https://vimeo.com/1039623009?share=copy#t=0

Part 2: https://vimeo.com/manage/videos/1039625510

Photos from the conference is available in NordGen's Flickr-folder:

https://www.flickr.com/photos/nordgen/albums/72177720322521962/

Appendix 3: Authors and titles of posters displayed at the conference

1. "PhD course on Global policies and legal frameworks for research and innovation with plant genetic resources"

André Rosado, Dennis Eriksson.

Swedish University of Agricultural Sciences, Alnarp, Sweden.

The use of genetic resources is governed by a complex range of international and national regulatory frameworks to secure their conservation and sustainable use, fostering innovation, and ensuring environmental and consumer safety. Students, researchers and breeders working with plant genetic resources must navigate these frameworks, which significantly impact their activities. This PhD course aims to provide students with a comprehensive understanding of relevant global policies and legal frameworks for research and innovation with plant genetic resources. Key topics include environmental regimes for biodiversity, accessing and benefit sharing of plant genetic resources, biosafety of Living Modified Organisms and gene edited products, and for plant variety protection such as plant breeders´ rights. This PhD course will explain key provisions and obligations under the Convention on Biological Diversity, the Nagoya Protocol on Access and Benefit Sharing, International Treaty on Plant Genetic Resources for Food and Agriculture, Cartagena Protocol on Biosafety and International Convention for the Protection of New Varieties of Plants. By completing the PhD course, students will understand these international regimes related to genetic resources and engage in informed discussions about their development and opportunities. Students will also gain skills to comply with applicable regulatory requirements, particularly in the Nordic context, when using genetic resources. The knowledge gained from the course will give students an interdisciplinary competence that is highly sought after both in

the academic and the private plant research and breeding sector. This PhD course is scheduled for Autumn 2025.

2. "Identification of candidate genes conferring resistance to the bird-cherry oat aphid in *Hordeum spontaneum* using targeted RNA sequencing of resistance gene analogs"

Ronja Wonneberger[1], Sandeep Kushwaha[2], Inger Åhman[1], Therése Bengtsson[1].

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Bird-cherry oat aphid (BCA, *Rhopalosiphum padi*) presents a significant challenge to barley production both through feeding and virus transmission, and there are no sufficiently resistant cultivars available. An 11 Mbp genomic region conferring partial resistance from the wild barley (*Hordeum spontaneum*) accession Hsp5 has been introduced into modern barley germplasm via backcrossing. To identify putative resistance (R) genes differentially expressed (DEGs) between two susceptible backcrossing parents, Hsp5, and four resistant BC_4F_3 lines, we enriched RNA from these lines for common R gene motifs using the ResCap pipeline before sequencing. Through pseudoalignment to the reference transcriptome of H. spontaneum accession FT11 we identified eight DEGs, five in the region of interest and one located 5 Mbp downstream. These genes are considered candidates for conferring BCA resistance in Hsp5. We are now extending the search for candidate genes using a transcriptome-wide analysis of responses to aphid infestation. We will generate an annotated reference genome of Hsp5 to validate our previous findings. Transgenic lines with knocked out or overexpressed candidate genes will be assessed for resistance to different aphid species. The identification of the causative gene(s) will shed light on aphid-host interactions and will generate genetic markers for use in barley breeding programs.

3. "Leksikon over gamle danske grøntsagssorter"

Svend Erik Nielsen.

Med Leksikon over gamle danske grøntsagssorter - kulturhistorie, beskrivelser, frøavl og føde har forfatteren, Svend Erik Nielsen ønsket at udforme et opslagsværk over gamle danske handelssorter af de vigtigste frøformerede, en- og toårige grøntsagsarter frem til og med 1950. Værkets to bind formidler over 1176 sider kulturhistoriske beretninger om og historiske beskrivelser af op mod 400 gamle grøntsagssorter, som har haft afgørende betydning for den danske grøntsagsdyrkning. Og det rummer et nutidigt og nordisk perspektiv. Gennem århundrederne har de gamle

grøntsagssorter været menneskers rejsekammerater og givet os både føde og udkomme. Målet med leksikonet, der rummer mere end 390 billeder og illustrationer, er at føre læseren ind i historien for gennem den at lære, hvordan sorterne i nutiden kan anvendes og dyrkes, så de giver det bedste af sig selv. De gamle grøntsagssorter kan bidrage med mangfoldighed og smagsrigdom i nutidens dyrkning og madlavning, og de kan danne grundlag for forædling af fremtidens sorter. Deres genpuljer udgør en vigtig ressource, fordi sorterne gennem årtier og århundreder har vist sig tilpasningsdygtige i det danske og nordiske klima. Gennem viden om, hvad sorterne har kunnet bidrage med i fortidens dyrkning, og gennem autentiske beskrivelser fra de mennesker, som har haft dem i hænderne, har forfatteren ønsket at genindsætte de gamle grøntsagssorter på deres rette plads i kulturhistorien på samme måde som musikkens kompositioner, litteraturens værker og billedkunstens frembringelser ved at bringe en sortshistorisk inddeling i tidsperioder. Fortællingen om sorterne rummer nemlig en guldgrube af information af stor kulturhistorisk værdi. De har for vores grøntsagsdyrkning været, hvad eksempelvis Johann Sebastian Bachs oratorier, Ludvig van Beethovens symfonier og Wolfgang Amadeus Mozarts operaer har været for musikken. Leksikonet beretter også om den forædling, frøavl, frøhandel, dyrkning og madlavning, som gennem historien har omkranset sorterne, ligesom det forsøger at opstille målemetoder for at give et svar på, hvad man med en vis ret kan kalde en gammel grøntsagssort. Hertil prøver værket at give svar på, hvilke sorter der har været de allervigtigste i den danske grøntsagsdyrkning. Ud fra dette arbejde opstilles en dansk kanon over gamle grøntsagssorter.

4. "Searching Unique Qualitities from Old and Alien Cereals for Use in Conventional and Organic Breeding"

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Global food security faces increasing threats from malnutrition and heavy metal contamination. Micronutrient deficiencies, particularly in zinc (Zn) and iron (Fe), affect over three billion people worldwide, with pregnant women and children most vulnerable. In regions like Sweden, cadmium (Cd) in wheat presents additional health risks, including kidney dysfunction and cardiovascular disease. Wheat, which provides over 50% of daily calories and essential nutrients, is a key crop for nutritional improvement. However, low genetic diversity in modern wheat limits quality enhancement, while wild

and ancient wheat relatives offer valuable genetic variation. This study uses Genotype-by-Sequencing (GBS) and Genome-Wide Association Studies (GWAS) to identify genes that enhance wheat quality traits in 342 diverse background genotypes. Ancient and alien wheat genotypes showed significant phenotypic variation, revealing promising germplasm for increasing protein, gluten, antioxidant, Fe, and Zn content while reducing Cd uptake. We identified 22 candidate genes associated with high Fe and Zn and low Cd accumulation, and 17 linked to protein content and gluten strength. A strong correlation was observed between polyphenols, antioxidants, and phenolic acids. These findings support the potential to develop nutrient-enriched, low-Cd wheat varieties, offering a scientific foundation for advancing global food and nutrition security.

5. "Nordic soybean – Unlocking genetic resources in the sequencing era"

Norbert Tamas Bokros.

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Soybean (*Glycine max L. Merrill*) is the world's leading protein crop, with enormous potential for enhancing sustainable agriculture throughout Europe. To facilitate improved breeding efforts, we present the entire collection of 155 Nordic soybean accessions conserved at the Nordic Genetic Resource Center (NordGen). This collection has been whole-genome resequenced, alongside 495 additional cold-adapted, globally diverse soybean accessions. Analysis of genomic variation revealed the Nordic soybean collection to be highly related yet globally distinct. Reduction in genomic variation is revealed to be concentrated around genomic regions associated with the regulation of defense responses, stress resistance, and the promotion of early maturation critical for production in Nordic climates. Interestingly, although Fiskeby III has previously been selected as a global standard for the study of cold and disease stress tolerance traits characteristic of Nordic growing conditions, we show that it only represents approximately half of the genomic variation present within Nordic soybean. This genomic resource will soon be available to more efficiently select and breed improved, regionally adapted soybean varieties.

6. "The Effect of Agriculture and Climate Change on Farmland Biodiversity Indicators"

Sarella Arkkila[1], Johan Ekroos[2,3], Aleksi Lehikoinen[1] & Laura Bosco[1]

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7. "Plant Genetic Resources of Ukraine as a Component of the World Plant Gene Pool"

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Ukraine with its diversity of natural and climatic conditions possesses a rich plant genetic diversity numbering 5.1 thousand vascular plants species. More than 530 species of 360 crops are used in Ukraine's crop production. Plant breeding in Ukraine is carried out at a high level and has created a wide variety of varieties with high yields, product quality, environmental adaptability. Landraces maintained on-farm and crop wild relatives are significant source of valuable genes. In order to preserve, enrich and intensify plant richness use in breeding, research and other areas, the National Plant Genebank of Ukraine has been formed since 1992 and currently includes 156,300 accessions belonging to 554 crops of 2020 plant species. There are cereals, legumes, vegetables, oilseeds, medicinals, fruits, berries etc. The Genbank is conducted by 26 institutions under the scientific, methodological guidance and coordination of the National Centre of Plant Genetic Resources of Ukraine which operates on the basis of Yuriev Plant Production Institute (Kharkiv). Russia's aggression against Ukraine caused significant damage to the genebank. We are very grateful to NordGen, Novo Nordisk Foundation and FAO for their invaluable assistance in preserving and restoring the National Plant Genebank for benefit of people of Ukraine and all mankind.

8. "Breeding better faba beans for Nordic agriculture: Exploring genomic tools and root trait diversity "

Amanda Karlström[1], Hannah Ohm1, Johanna Åstrand[2], Alf Ceplitis[2], Diana Bengtsson[2], Cecilia Hammenhag[1], Aakash Chawade[1], Åsa Grimberg[1]

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The Nordic countries rely heavily on imported soy for vegetable protein, mainly used in animal feed and increasingly in food processing. To reduce this dependency, our project focuses on promoting local cultivation of high-quality protein crops, particularly faba beans (*Vicia faba*), a high-protein grain legume already grown in the region. We aim to accelerate breeding efforts by developing genomic tools tailored to germplasm adapted to Nordic growing conditions. Using a training population based on lines from the Swedish breeding program alongside accessions from a previously characterised diversity panel, we are developing genomic prediction models

to improve breeding efficiency. To optimise breeding strategies for this partially outcrossing species, we conducted simulations using AlphaSim-R, comparing genetic gains from conventional phenotypic methods, such as line breeding and synthetic variety development, with genomic selection-based breeding schemes. Additionally, we are studying root architecture traits within this population due to their importance in resource efficiency, stress tolerance, and adaptation to adverse climates. Incorporating these traits into breeding programs has the potential to improve the resilience and sustainability of faba bean cultivation, supporting a more self-sufficient protein supply in the Nordic region.

9. "Genomic screening of common and scarlet runner bean accessions to understand adaptation to Scandinavian climates"

Martha Rendón-Anaya, Pär Ingvarsson.

Department of Plant Biology, Swedish University of Agricultural Sciences, Uppsala, Sweden.

The common bean (*Phaseolus vulgaris*) and scarlet runner bean (*P. coccineus*) are important grain legumes for direct human consumption that for the past five centuries, have been incorporated into European diets. On the edge of drastic climate changes, more efforts should be made to accelerate the use of such grain legumes as a primary source of protein and thus, adapting them to Scandinavian climates is crucial. A major pre-requisite for such adaptation is the loss of photoperiod sensitivity that, until now, is partially understood at the genomic level. For this, we sequenced a collection of >300 accessions of the common and runner bean of Mesoamerican and European origin, that we obtained from different gene banks (CIAT, NordGen and IPK). We generated phenotypic data under growth chamber conditions to identify photoperiod-(in)sensitive cultivars. GWAS and haplotype structure tests identified single nucleotide variants and gene candidates associated to the capacity to flower under long days, typical of Scandinavian latitudes during the summer season. Furthermore, population structure analyses evidence different dynamics in both species, such as admixture and the generation of new gene-pools. Altogether, these genomic resources should contribute to a deeper understanding and incorporation of Phaseolus legumes as a priority crop in Scandinavia.

10. "A new translocation in wheat-rye introgression line"

Mahboobeh Yazdani[1], Eva Johansson[1], Mahbubjon Rahmatov[1].

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Emerging races of wheat stem rust (*Puccinia graminis* f. sp. *tritici*) represent a significant threat to global wheat production. The most effective and

environmentally strategy for managing the disease is through breeding of resistance varieties. The resistance gene *Sr59*, found within a T2DS·2RL translocation, provides broad-spectrum resistance against various stem rust races. This study aimed to identify a shorter segment of the 2RL chromosome that contains this gene, accurately map its physical position, and develop a molecular marker for marker-assisted selection. Through seedling assessments, molecular marker analysis, and cytogenetic investigations, line #284 was identified as possessing a novel wheat-rye T2BL.2BS·2RL translocation that carries the *Sr59* gene. This translocation has shown broad-spectrum resistance at the seedling stage, highlighting its potential for effective disease management. By employing genotyping-by-sequencing (GBS) and aligning GBS-derived SNPs to Wheat reference genome and rye references genome, one nucleotide-binding leucine-rich repeat (NLR) gene identified in T2BL.2BS·2RL which is associated with *Sr59* resistance. This line were then crossed to commercial verities to increase the agronomic performance. These results provide essential molecular markers for wheat breeding programs and deepen the understanding of the genetic basis of *Sr59* resistance.

11. "Green proteins: A way through chickpea green biomass"

Losari Vaishnavi, Ramesh Vetukuri, Aakash Chawade, Eva Johansson.

Chickpea is an important legume crop that has high protein content in leaves besides seeds. Many studies have used green biomass to extract protein for human food and animal feed. One of the methods is to mechanically press the green biomass and use thermal or acid precipitation to extract the total protein. Previous studies have shown significant variance in protein extraction depending on the type and age of biomass. Thus understanding the genetic and molecular mechanisms underlying these differences is crucial for improving extractability and utilization. The present study aims to identify genetic loci associated with leaf protein content and extractability through a genome-wide association study (GWAS) using 518 chickpea accessions from INIA-CRF genebank. Phenotypic data would be collected for leaf proteins, chlorophyll and vigour traits in a controlled environment. The genotypic data will be collected using single nucleotide polymorphism (SNP) markers and their associations with phenotypic data will be analysed using statistical models. The findings would reveal insights into the genetic architecture influencing protein content from green biomass and facilitate the marker-assisted selection for breeding high-protein chickpea varieties. This research will contribute to developing chickpea varieties as intermediate crops that can be a second income for the farmers.

12. "Enhancing Potato Genomic Prediction with High-Throughput Phenotyping"

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Potato (*Solanum tuberosum* L.) represents one of the most relevant crops for human diet. However, its slow breeding progress, driven by low multiplication rates and disease susceptibility, highlights the need for innovative approaches. Genomic selection (GS) holds promise for accelerating genetic gains, but predicting breeding values in tetrasomic polyploid species like potato poses significant challenges. High-throughput phenotyping (HTP) offers a promising solution by enabling faster, cost-effective evaluation of breeding clones, which could enhance GS efficiency. As part of the Nordic PPP project SustainPotato, a breeding trial was conducted in Helgegården, southern Sweden, during the 2020 and 2021 growing seasons. The experiment included 256 clones and cultivars, evaluated for traditional traits such as tuber weight and size, alongside unmanned aerial vehicle (UAV)-derived vegetation indices. Phenotypic data were analyzed to estimate heritability and best linear unbiased estimates (BLUEs). Genotyping-by-sequencing (GBS) was used to identify single-nucleotide polymorphisms (SNPs) and compute a tetrasomic genomic relationship matrix. This study aims to explore HTP integration into GS models, combining UAV-based vegetation indices with advanced statistical frameworks. By leveraging both phenomics and genomics, this approach could enhance selection accuracy, shorten breeding cycles, and provide a framework for improving genetic gains in potato and other polysomic polyploid crops.

13. "Identification of the genetic bases conferring stem rust resisitance in perennial ryegrass"

Remi Ollivier, Torben Asp.

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Perennial ryegrass (*Lolium perenne*) is a key crop in grassland production, widely used as forage
and turf. However, foliar diseases significantly aaect seed yields, particularly stem rust
(*Puccinia graminis* f. sp. *lolii*). Climate change and reduced pesticide use in Europe are
expected to increase the risk of outbreaks. Developing durable resistant varieties oaers a

sustainable strategy for disease control. This study aims to characterize the natural variability of resistance to stem rust and identify the underlying genetic bases. A collection of 364 *Lolium* genotypes selected from diverse populations was screened for resistance to a Danish stem rust isolate by assessing pustule types, revealing completely resistant, partially resistant, and predominantly susceptible genotypes. A genome-wide association study (GWAS) identified a single resistance-associated locus on chromosome 7. Candidate genes within this locus were pinpointed using linkage disequilibrium analysis. To identify rare variants potentially involved in resistance but not detected by GWAS, two biparental mapping populations are being developed using four parental genotypes with contrasting resistance to three European and one American stem rust isolate. This study lays a foundation for understanding the molecular pathways of stem rust resistance and supports the development of resistant cultivars.

14. "Speed Vernalization protocol in perennial ryegrass (Lolium perenne) cultivars to reducing generation time"

Divino Rosa dos Santos Junior, Torben Asp.

Centre for Quantitative Genetics and Genomics, Faculty of Technical Sciences, Aarhus University, Denmark.

Developing high-yielding and nutritious crops adapted to future environments remains a significant challenge, with generation time being a key bottleneck. Extended generation times hinder research and breeding progress, delaying genetic advancements. Recent innovations in speed breeding (SB) protocols have substantially shortened generation times for both short-day and long-day species through optimized light and temperature regimes, accelerating trait improvement and cultivar development for breeding companies and farmers. However, crops with vernalization requirements, such as winter species, still necessitate prolonged cold treatments (6–10 weeks) to induce reproductive development. This study aims to develop tailored SB protocols for vernalization-dependent perennial ryegrass, a vital forage crop, to expedite breeding programs. We will evaluate four cold treatment strategies to determine the optimal vernalization approach, using a diverse panel of 12 varieties with varying maturity groups and ploidy levels. By refining these protocols, we aim to significantly reduce the breeding cycle duration in perennial ryegrass, enhancing genetic gains and facilitating the development of improved cultivars. The outcomes will provide critical insights into integrating SB methodologies for vernalization-requiring species, benefiting to researchers, agricultural industry and farmers.

15. "Impact of genomic inbreeding on dairy cow survival"

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Increasing the lifespan of dairy cows is a key industry goal to enhance economic efficiency and reduce the carbon footprint of milk production in the Nordic countries. This study investigates the impact of genomic inbreeding (Froh) on the survival of Danish Jersey (JER) and Holstein (HOL) dairy cows, focusing on the influence of different lengths of runs of homozygosity (ROH). Unlike other genomic estimates for inbreeding, Froh provides insights into both historical and recent breeding patterns. A Cox Proportional Hazard model was used to estimate the risk of culling based on breed and Froh lengths. Long ROHs (>10 Mb), reflecting recent inbreeding, were associated with increased culling risk, while short ROHs (1–2 Mb), linked to historical selection, showed neutral or decreased risk of culling. Despite higher genomic inbreeding levels, JER cows exhibited higher survival probabilities than HOL cows, likely due to the purging of deleterious alleles over time. These findings underline the importance of genomic-based breeding strategies to manage recent inbreeding effectively. Incorporating genomic relationships in breeding programs can enhance animal health and economic efficiency by mitigating risks associated with close inbreeding. Such strategies may reduce replacement rates and support the environmental and economic sustainability of the dairy industry.

16. "Integrating Greenhouse and Field Studies for resistance breeding in Barley and Wheat"

Adrien Vial[1], Su Myat Noe[1], Valentina Rossi[1,2], Firuz Odilbekovs[2], Tina Henriksson[2], Aakash Chawade[1].

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Plant breeding is crucial in developing varieties adapted to changing climatic and societal needs. Plants resistant to pests and diseases would reduce the need for pesticides, decreasing the environmental impact of agrosystems. Barley, spring, and winter wheat are all important crops in Sweden, and therefore, we are developing methods and protocols for resistance breeding for key pests and diseases in this crop. In barley, a diverse set of NordGen germplasms was tested against Scald disease. Significantly associated genetic markers were identified from the study using Genome-Wide Association Study (GWAS). In wheat, protocols are being developed in the

greenhouse to assess the disease resistance of germplasms to Tan Spot and Septoria tritici blotch on a large scale. The protocols are being optimized using individual isolates and mixtures, to highlight differences between broad and specific immunity. Going forward, field experiments will be conducted to compare the results with those obtained in the greenhouse. Field trials will incorporate plant-to-plant interactions and plant-to-microbiome interactions. Additionally, the impact of these interactions on the pathosystem will be assessed.

17. "A cooperative project for the conservation of genetic resources in Spain (REGEN)"

Revilla, P.[1] and Grivet. D.[2] (Coord) and 86 scientists and experts from 14 CSIC Institutes, 6 universities and 17 ministerial Departments, centers of the Autonomous Communities or other organizations.
[1]Mision Biológica de Galicia, CSIC; [2]ICIFOR-INIA, CSIC.

18. "PTI AGRO4FOOD: A Collaborative Tool for Innovation in the Agri-Food Sector"

L. Guasch[1], J.D. Alche[2], M. Barón[2], F. Barro[3], A. Butrón[1], L. de la Rosa[1] J. Frias[5], E. Igartua[6], J.A. Jiménez-Berni[3], A.J. Monforte[7], R. Morcuende[8], P. Peón Torres[4], P. Prieto[3], P. Revilla[1], M. Romero-Aranda[9], D. Rubiales[3], R.A. Malvar[4].

CSIC: [1]INIA, [2]EEZ, [3]IAS, [4]MBG, [5]ICTAN, [6]EEAD, [7]IBMPC, [8]IRNASA, [9]IHSM.

19. "The Flowering Window and Test Wheight of Bread Wheat and Durum Wheat Varieties in Iraq"

Abdulsattar Asmair Alrijabo, Ary Sulayman Albarwary.

Center for Arid Farming and Conservation Agriculture Research's (C.AFCAR), University of Mosul.

20. "Delineating spring wheat for yield stability and adaptability under natural drought conditions in Sweden"

Aakash Chawade, Firuz Odilbekov, Lan Yuzhou, Mahbubjon Rahmatov, Jonathan Cope, Tina Henrikson, Eva Johansson, Vishnukiran Thuraga.

Wheat is an important global crop covering the food, feed, and industrial needs of a growing population, which is threatened by climate change, particularly increased incidences of drought, such as those observed in 2018 and 2023 across Sweden and Europe. Identifying high-yielding, stable wheat genotypes specifically adapted to Sweden are vital to address this issue,

which is challenging due to genotype-by-environment (G × E) interactions. In this study, 20 spring wheat varieties were evaluated over two years at two locations in Sweden under natural drought conditions. Drone-based phenotyping revealed significant positive correlations between plant chlorophyll content, height indices, and grain yield, facilitating high-throughput drone based drought tolerance evaluations under field. AMMI and GGE biplot analyses identified the environment as the major contributor to grain yield variation, followed by genotype and G × E interaction. GGE analysis further identified a single mega-environment, with genotypes SW180258 and SW180272 consistently producing stable yields. These findings infer the importance of integrating advanced phenotyping techniques with robust G × E modeling to spot drought-tolerant, stable-yielding wheat genotypes, leading the way for the development of climate-resilient varieties adapted to Sweden's growing conditions.

21. "Identification of duplicates in Nordic potato collections"

Pawel Chrominski[1], Ulrika Carlson-Nilsson[1], Anna Palmé[1], Lena Ansebo[1,2], Åsmund Asdal[1,3], Hanne Grethe Kirk[4].

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The potato arrived in the Nordic countries approximately 300 years ago and subsequently became a staple food in the region. In the early 1980s organized conservation efforts for potato genetic resources were initiated within the Nordic countries. Today potato landraces, improved varieties, and breeding lines cultivated in the Nordic region are conserved in genebanks at the Nordic Genetic Resource Center (NordGen) in Alnarp, Sweden, and the Norwegian Genetic Resource Centre (NGS) in Norway. Furthermore, potato breeding companies in Denmark, Norway, and Sweden maintain collections of potato germplasm for their own breeding purposes. All these collections contain a substantial number of potato genotypes associated with diverse local names and cultivation histories. However, the presence of duplicates and varied names has occasionally resulted in confusion. Morphological identification alone was found to be insufficient, prompting the use of molecular fingerprinting methods as a more reliable tool for identifying duplicates within and across potato collections. In this study, 198 cultivated potato (*Solanum tuberosum* L.) accessions were genotyped using 62 microsatellite markers. The analyzed accessions come from three collections: 43 from the Danish Potato Breeding Foundation in Vandel (LKF-Vandel), 90 from NordGen, and 65 from NGS. The molecular fingerprinting unveiled the presence of 31 duplicate groups within the examined material, with the most extensive group comprising ten accessions bearing distinct names. Accessions from all three collections were included in this group. The

results indicate that certain accessions with different names are the same genotype, suggesting widespread distribution across the entire Nordic region and subsequent local naming over the years. Additionally, the study identified cases where improved varieties from early potato breeding efforts in other countries were mistakenly considered Nordic landraces. The study also confirmed that accessions in different collections sharing the same name, indeed corresponded to the same genotype. The results will be used to improve the management practices for potato collections at both NordGen and NGS. The newfound knowledge will be useful for potato breeding, as well as enable the dissemination of more accurate information to users of the collections and other stakeholders interested in potato diversity.

22. "Nordic cooperation on crop wild relatives"

Anna Palmé.

Nordic Genetic Resource Center (NordGen), Alnarp, Sweden.

23. "NordGen's bean collection in detail"

Ulrika Carlson-Nilsson.

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24. The Nordic PPP for Pre-breeding

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NordGen

The Nordic Genetic Resource Centre (NordGen) is the Nordic countries' genebank and knowledge center for genetic resources. NordGen is an organisation under the Nordic Council of Minister and works with the mission of conserving and facilitating the sustainable use of genetic resources linked to food, agriculture and forestry.

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