

NordGen
Nordic Genetic Resource Center



norden

Nordic Council of Ministers



NordGen Annual Review 2010

SAMMANFATTNING

GRÖNA SIDOR

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VIHREÄT SIVUT

ANNUAL REVIEW 2010

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NordGen's Annual review for 2010 provides some glimpses into our activities and achievements during the past year. You will find scientific articles covering all NordGen's sectors (forest trees, farm animals and plants), addressing different aspects of conservation and sustainable use of genetic resources (GR). The short reports in the second part summarize the key issues and events for each sector.

NordGen's future and finances in focus

FOLLOWING THE SUMMER 2009 meeting of the Ministers for Fisheries, Agriculture, Food and Forestry, it was decided to appoint a working group to put forward recommendations for the future operational basis for NordGen. There was consensus within the group for a clear vision regarding future challenges of NordGen and the organizational and financial models needed to secure and strengthen the institution that will be necessary to maintain it as the central organization for Nordic cooperation on genetic resources. The intention was to ensure that NordGen has a long-term, carefully planned financial framework and to clarify and verify its resource requirements. The working group reached the conclusion that more resources and funds were needed to conserve the Nordic seed collection for future generations.

On the basis of a recommendation from an advisory group, it was concluded in 2010 that NordGen would continue as a two-campus model, with the head office and NordGen Plants based at Alnarp, in Sweden, and NordGen Farm Animals and NordGen Forest based at Ås, in Norway.

The second four month economic report, presented at a Board meeting in October, revealed that NordGen had accumulated a considerable financial deficit. In conjunction with the amended Swedish revision rules, this resulted in substantial negative capital for NordGen. Disagreement among Board members during the autumn led to the resignation of NordGen's director and following the appointment of an interim director the entire Board resigned.

POWERFUL AND CREATIVE WORK - THE NORDIC SOLUTION

The primary task of NordGen is to contribute to securing the broad diversity of genetic resources linked to food and agriculture. Based on international agreements, this task is carried out through conservation and sustainable use of the material, solid documentation and work on information management. These are costly activities and therefore the Nordic countries have opted for a joint Nordic solution, represented by NordGen, and established national programmes in each country. In addition, NordGen provides consultation services and support to decision makers, managers and users of plant, farm animal and forest genetic resources.

NordGen personnel exerted considerable effort in defining goals, procedures and division of activities among the national programmes and NordGen, thus providing a solid base for future cooperation.

NordGen Plants operates in close collaboration with five working groups actively involved in seed collection and vegetatively propagated plant material. A final draft of a clarification report, entitled "Responsibilities and tasks of NordGen and the national programs for plant genetic resources", was written in 2010, defining and synchronizing the work at the Nordic and national level.

The work of NordGen Animals was previously arranged around four species groups. However, following a SWOT analysis on their activities, processes and results, the species groups were replaced by the NordGen Council on Animal Genetic Resources. The Council consists of nine members and is a forum for organizing the Nordic cooperation.

NordGen Forest examines issues in forest genetics and genetic resources, supply of seeds and plants, and methods for regeneration. The work is organized through two networks, the NordGen Forest Council and the Working Group on Genetic Resources, made up of ten and five members respectively.

The Nordic Genetic Resource Council became part of NordGen in 2009 when the secretariat, including tasks and duties of the Council, was transferred to the institution. An Environmental Coordination Group, consisting of representatives from both the environment sector and agriculture and forestry in all Nordic countries, was subsequently established. This group works closely with the environmental coordinator at NordGen. The group has followed up a successful conference on genetic resources in protected areas and has actively campaigned for joint Nordic solutions for In Situ conservation.

NordGen is responsible for the operation and management of the Svalbard Global Seed Vault. In that capacity, NordGen has hosted a large number of visits and its staff has given interviews to both Nordic and international media. Since February 2008 the size of the seed sample collection in the Svalbard Global Seed Vault has more than doubled, and at the end of 2010 comprised more than 600 thousand samples, which originated from nearly all countries in the world. This already makes the Seed Vault one of the largest single global collections of plant genetic resources for food and agriculture.

NordGen is a service and knowledge centre in the public arena. NordGen is also a meeting place for researchers, managers and practitioners in the field of genetic resources for food and agriculture in the Nordic countries. Through networks of specialists, a successful and effective Nordic work is thus synchronized.

I would like to express my gratitude to the staff at NordGen, our colleagues and co-workers in the networks, and to the Nordic Council of Ministers, for supporting NordGen.

Árni Bragason
Director



Experimental evidence shows that Norway spruce can adjust adaptive traits by a kind of long-term memory of temperature and day length present at the time of its early seed development. This mechanism is termed epigenetics; changes in gene activity not based on differences in the genetic code and yet transferable from one generation to the next. This is a rapidly growing research field in human, animal and plant genetics.

Epigenetic memory – an important component in adaptation to climate in Norway spruce

CONIFERS FROM THE TEMPERATE and boreal regions, such as Norway spruce and Scots pine, have developed systems to modify their performance (phenotype) to tolerate seasonal changes in climatic conditions. They are able to acclimate from active growth to frost-tolerant winter dormancy and deacclimate back to active growth in a cyclic manner, synchronised with seasonal changes in temperature and day length. Evolutionary adaptation is vital for development of tolerance, resistance and avoidance of environmental constraints. However, there are studies indicating that adaptive phenomena cannot be explained only by traditional Mendelian genetics, but are likely influenced by epigenetic mechanisms.

EPIGENETICS

Epigenetics is best described as changes in gene activity that are not based on differences in the genetic code but nonetheless are transferred from one generation to the next. They cause genes to be turned on, or turned off, partially or completely. Such changes may persist over rounds of cell generations and also across generations. They contribute to phenotypic variability and may thus play a role in short-term adaptation. Epigenetic features have been well described in plants with short generation times, but few were known for more long-lived species such as trees. It therefore came as a great surprise to classical geneticists that adaptive traits, displaying clear clinal variation among Norway spruce populations, are adjusted by an epigenetic mechanism. We present results from genetic research with Norway spruce providing evidence that the species can adjust its performance in adaptive traits by a rapid and likely epigenetic mechanism, through a type of long-term memory from the time of its embryo development.

INFORMATION FROM NURSERIES

The phenomenon was first discovered more than 30 years ago when managers of Norwegian forest seedling nurseries alarmed scientists that seedlings from seeds collected in a Norway spruce seed orchard in southern Norway did not perform as expected. The parents in this seed orchard had been selected in central and northern Norway, and were grafted in this southern orchard where they produced seed at a site far away from natural or planted spruce stands, excluding pollination from the outside. The orchard seedlings performed more similarly to southern ecotypes. They expressed a much later timing of growth cessation and bud set in the autumn than seedlings from seeds collected in natural stands in the north. Later, similar effects were demonstrated on seedlings from seeds collected in a seed orchard located close to sea level, produced by parents originating from altitudes above 600 m in Norway. These seedlings, in addition to having a later growth cessation and reduced autumn frost hardiness, also had a bud flush considerably later in spring than seedlings from seeds collected in natural stands at high altitudes. Field experiments over many years have shown that the effects are long-lasting.

EXPERIMENTAL EVIDENCE

These unexpected results and seemingly casual observations were the background for a series of experiments that have been performed during the last 30 years at the Norwegian Forest and Landscape Institute. The



experiments were based on seedlings from controlled crosses made on grafts of known parents and under controlled temperature and/or day length treatments during various stages of the reproductive process. We had indications that temperature conditions at some stage during sexual reproduction were the main environmental trigger influencing seedling performance, in addition to day length. One experiment clearly showed that variation in temperature and day length during pollen formation did not affect seedling performance. The temperatures during female flowering, however, did, and with an effect similar to that found earlier. Based on the results from five different experiments, we thus deduced that climatic adaptation in Norway spruce is most likely affected by the temperature sum during embryo development and seed maturation. In a later study, seed was produced from three unrelated crosses in eight large growth chambers given both low and high temperatures and short and long days. Also here we found that adaptive traits of the seedlings from these crosses measured during the first and second growth seasons were strongly influenced in an interactive way by temperature and day length when the seeds were produced. The effects are still present at age nine years.

Norway spruce plants can be produced in an *in vitro* system of somatic embryogenesis. This method was used to show that embryos themselves, detached from their mothers, perceive temperature signals that are expressed in phenotypic differences when the plants are grown in common garden experiments. The warmer the temperature applied during embryo formation, the later plants formed terminal buds. The same is also expressed when seeds are produced in Norway on mother trees of Central European origin. Adaptive traits of such seedlings were more similar to those of local Norwegian origin than to seedlings from seeds collected in Central Europe.

Another observation is that seedlings from commercial seed lots of Norway spruce collected in years with different temperature conditions during summer and autumn perform differently. Therefore, cultivation regimes in forest nurseries must be adjusted to obtain seedlings that

terminate growth and set terminal bud early enough in the autumn.

All these results suggest the presence of an epigenetic memory in the mother tree, influencing the performance of the seedlings of the next generation.

IMPLICATIONS

The change in adaptive traits from seed production in warmer conditions has been shown to be beneficial for performance under field conditions. A later bud flushing in spring, in particular, makes the trees less susceptible to late spring frosts, which may cause more damage under the changing climate conditions. The epigenetic mechanism is therefore an important factor in the adaptive process of Norway spruce and may contribute to rapid adaptation to changing conditions. Its effects cause variation patterns in adaptive traits which mimic the variation observed between populations from different latitudes and altitudes and contribute to the interpretation of such differences.

Research is underway to understand the molecular basis of the epigenetic mechanism causing these differences in adaptive traits among progenies.

Tore Skråppa and Igor Yakovlev



Potted graft of Norway spruce can be induced to produce female (A) and male (B) cones, and controlled crosses (C) can be performed in controlled or semi-controlled environments.

Nordic studies and strategies on impacts of climate change on primary industries have typically focused on agricultural productivity, land use, political issues and availability of water resources. However, domestic animal genetic resources for food and agriculture have not yet been adequately integrated into these studies and strategies.

Climate change and domestic animal genetic resources

A NEW NORDIC RESEARCH PROJECT, *ANGR-NordicNET*, represents pioneering work by focusing on the conservation, utilization and investigation of animal genetic resources as part of adaptation and mitigation issues.

LACK OF KNOWLEDGE

Previous studies and reports on effects of climate change on agro-ecosystems and food production chains have only briefly addressed issues on possible future changes in animal production. Furthermore, where climate change and genetic resource issues have been debated, focus has been on future plant breeding scenarios. Because livestock production contributes to and will be affected by climate change, domestic animal genetic resources, their conservation, utilization and further categorization, can be regarded as new and important topics in this context.

REBIRTH OF DUAL-PURPOSE CATTLE BREEDS

Eighteen percent of global greenhouse gas emissions are attributed directly or indirectly to livestock grazing, production of feed crops for livestock, manure management and enteric fermentation of ruminants. The effects of enteric methane (CH₄) fermentation in ruminants in particular have stimulated much debate.

The production pathways of different animal products differ in their greenhouse gas emissions. This may have impact on future policies developed for different production systems and even breeds adapted to these systems. For example, milk protein can be produced with less CH₄ emissions than for beef production. In the long run, dairying might become the major focus of cattle production, and beef production could become a by-product of dairying. Dual-purpose cattle breeds, bred for diverse production systems, could increase in importance in the future. This is contrary to the current breeding trends to produce specialized

breeds for dairy or beef production. The availability of a diversity of dual-purpose breeds, with a multitude of specific adaptations, will make the adoption of this aim faster and more cost-effective.

FOOD SECURITY IS A GLOBAL ISSUE

Climate change and global warming will increase the number and severity of heat waves and could cause heat stress in domesticated animals. Different farm animal species and breeds show different thermal tolerances owing to their various physiological and anatomical abilities to thermoregulate. Ruminants generally have a higher degree of thermal tolerance than monogastric species, such as pigs, and the high-output breeds originating from temperate regions may not be well adapted to heat stress.

One can argue that heat stress may be a less critical factor for domesticated animals in the Nordic regions. However, food security is a global issue: food shortages in one part of the World will affect prices and accessibility to food in other parts. Furthermore, it could affect the assortment of fodder plants and their varieties cultivated in the future and thereby affect animal husbandry. For example, by reducing the availability and increasing prices of grains for animal feeds, annual grazing patterns are likely to change and become increasingly important.

GENETIC DIVERSITY IS PREREQUISITE FOR ADAPTATION

The spread of new diseases may have more immediate and severe effects on Nordic animal production. Climate changes will affect host-vector



Photo: Tarja Ollikkala



Photo: Tapio Tuomela/MTT-archive



Photo: Harri Vehviläinen

Climate change will particularly affect reindeer, bee and fish farming, but has also many direct and indirect effects on other animal production.

and host-parasite interaction dynamics. Parasites may complete their life cycles more quickly and novel pathogens could be introduced. Outbreaks of *peste des petits ruminants*, blue-tongue virus and anthrax are triggered by specific weather conditions and changes in seasonal rainfall profiles.

Newly exposed host populations lack resistance or acquired immunity, resulting in a more serious clinical disease. The outbreaks of new diseases may be extremely severe for breeds that have a limited geographic distribution. This is particularly the case for native breeds, which are typically endangered, are often found in a few regions within one country and whose genetic resources play an important role in national genetic resource strategies.

In addition to diseases affecting the animal itself, a new range of pests and diseases will impinge on crop and forage species, and thus affect the quantity and quality of livestock feeds. Resource prices, availability of energy, water and other resources needed for livestock production can have immediate effects on the management of livestock production, including the genetic make-up of breeds performing best in the changing conditions.

ANGR-NORDICNET FOCUSES ON ANIMAL GENETIC RESOURCES

Experts from the five Nordic countries have set up a Nordic research network, which contributes towards developing a Nordic knowledge-base for policy making and research strategies for the conservation, utilization and investigation of animal genetic resources within an adaptation and mitigation framework. The Nordic Research Network on Animal Genetic Resources in the Adaptation to Climate Change (*AnGR-NordicNET*) is a three-year project funded by The Nordic Council of Ministers and NordForsk in the programme “Climate

Change Impacts, Adaptation and Mitigation in Nordic Primary Industries”. The programme is part of the Nordic Prime Ministers’ initiative on globalization, in which the Nordic countries seek new common solutions to global challenges.

The project leader of *AnGR-NordicNET* is Professor Theodorus Meuwissen from the Norwegian University of Life Sciences (UMB). NordGen is responsible for project management and administration. The other partners come from The Icelandic University of Agriculture, MTT Agrifood Research Finland, SLU – Swedish University of Agricultural Sciences (Uppsala), the Faculty of Agricultural Sciences of Århus University (Denmark), Nordic Genetics, and the Knowledge Centre of the Danish Agricultural Advisory Service. The final goal of the project is to provide a Nordic strategy for the conservation, utilization and investigation of animal genetic resources with reference to adaptation and mitigation issues. This is designed through research, conferences and other network activities and literature reviews.

Juha Kantanen



NordGen stores germplasm of a wide range of cereal cultivars and landraces from the Nordic region. Such a comprehensive collection offers opportunities for describing the differences in this material in detail. This standard genebank procedure is termed characterisation of germplasm.

Characterisation of cereal germplasm by NordGen in 2010

CHARACTERISATION OF THE GERMPLASM stored in the NordGen genebank is required for two purposes: (1) delivering useful information to the users of the collection and (2) managing the collection by detecting mixtures or off-types within a seed sample. The value of a germplasm collection increases considerably when characterisation data are available. The Food and Agricultural Organization in Rome stated in the 2nd State of the World's Plant Genetic Resources for Food and Agriculture in 2010 that lack of adequate characterisation data is one of the most significant obstacles to greater use of genebank collections. In addition to facilitating utilisation, characterisation data are useful for gaining an overview of the diversity in a subset of material, for detecting trends in diversity over time and for highlighting differences among germplasm samples from various places.

In the 2010 growing season, on the grounds of the Horticultural Laboratory of the Swedish Agricultural University at Alnarp, NordGen sowed three subsets of cereal germplasm for

characterisation studies. From each sample a single 2m row was sown. The material included 62 cultivars of spring wheat released from 1892 to 1994, 22 landraces of spring wheat from Nordic countries, and 16 landraces of spring rye from Finland and Sweden.

For wheat, an internationally accepted descriptor list was applied to collect information on four phenological traits (e.g. days to flowering, days to maturity), 11 traits for vegetative plant parts (e.g. waxy layer on leaf surface), 19 spike or grain traits (e.g. length of spike; colour of awns) and infection levels of two diseases (mildew and rust). All data collected on the material were entered into the Internet-accessible database of NordGen (SESTO) so users can locate germplasm they are interested in.

The description of the material allowed detection of trends in the morphological and agronomical performance of Nordic spring wheat. A major change in wheat morphology has been the reduction in plant height that has occurred during the 20th century (Figure 1). As a general tendency it became obvious that the Nordic spring wheat cultivars changed considerably and the cultivars registered in the second half of the 20th century showed adaptation to modern agriculture with high yield potential under optimal growing conditions.

Some traits recorded for each accession could become important in plant breeding for adaptation to climate change, such as the presence or absence of a waxy layer on the leaf surface (Figure 2). Morphological



Figure 2. Spikes of spring wheat.
Left: no waxy surface (NGB355).
Right: spike with waxy surface (NGB13917).



Figure 3. Spikes of a heterogeneous wheat landrace from Finland (NGB121).
Left: 80% no awns (*var. milturum*).
Right: 20% awned spike (*var. ferrugineum*).

characterisation captures intra- and inter accession diversity relevant to collection management and utilisation. Heterogeneous landraces represent a challenge for a genebank, but may be of great relevance for the future when better stress tolerance resulting from climate change is required (Figure 3).

Description and documentation of phenotypic diversity is required to be able to use the collection. It is important to have not only germplasm but also detailed knowledge about the material conserved at NordGen. The collection curators at NordGen need to acquire

intimate knowledge of the germplasm maintained in the genebank. Comprehensive knowledge about the germplasm represents the basis for rational use and also allows gaps in the collection to be identified so that plant breeding in the Nordic region has access to the diversity needed to secure sustainable agriculture and food production.

Axel Diederichsen

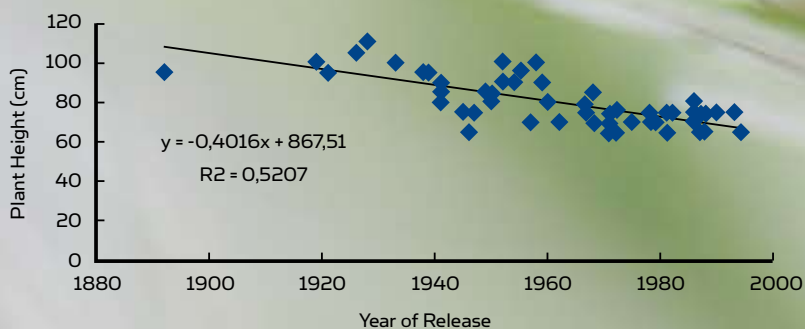


Figure 1. Plant height in Nordic spring wheat cultivars released between 1892 and 1994. Changes in plant height in Nordic spring wheat during the 20th century.

According to the UN, the genetic resources for food and agriculture are still threatened. Global efforts to conserve genetic resources that are lost and threatened in the wild and in the farmers fields, have resulted in the establishment of a large number of genebanks around the world. Unfortunately, many of these genebanks are vulnerable to natural and human made threats and a global back-up system is necessary to ensure the long-term conservation of the preserved resources. The Svalbard Global Seed Vault is an important element in this emerging global conservation system.

The importance of the Svalbard Global Seed Vault

WHEN GENE BANKS WERE ESTABLISHED in many countries decades ago and material was intensively collected we thought that the diversity in wild progenitors and older landraces was safe and well preserved for the future. What we have realized in later years is the opposite: gene banks are vulnerable and genetic resources are lost due to simple reasons like electricity failure, shortage of funding and equipment problems to more severe causes like earthquakes, tsunamis or civil wars. Many gene banks of the world still do not have an efficient back up system for their seed samples, which make the collections very vulnerable. The Svalbard Global Seed Vault (SGSV) is aimed to be the back up security system for the world's gene banks, where the seed material can be safely stored free of charge for the future and where the ownership stays with country or organizations depositing material. So far, The Svalbard Global Seed Vault is underway to fill this function. The Vault is thus a stand-alone project, with the focus of a collaborative initiative to create a global system of well managed collections of crop diversity.

INTERNATIONAL RECOGNITION OF THE GLOBAL SEED VAULT

In terms of international recognition and publicity the Seed Vault has kept the momentum from its inauguration in 2008. The importance of the Seed Vault for a sound conservation of crop diversity is recognized in FAO's State of the World's Plant Genetic Resources of the World (SoW) from 2010 stating that the Svalbard Global Seed Vault represents a major achievement since the first SoW report was published and that "the world's Plant Genetic Resources for Food and Agriculture (PGRFA) is undoubtedly more secure as a result". The influential "Global Biodiversity Outlook" published by the Convention of Biological Diversity (CBD) in 2010 gives special emphasis to the important role played by The Svalbard Global Seed Vault and the complimentary Millennium Seed Bank for the conservation of plant species and crop diversity for future generations. We in NordGen are proud to be part of this project that has become a flagship for the conservation of crop genetic resources.

SEED DEPOSITS IN 2010

2010 was the third year of operation of the Svalbard Global Seed Vault. Like in previous years, 2010 saw a substantial increase in the holdings; 112 101 new seed samples were deposited. This increased the holdings by 23% and the total number of samples by the end of the year was more than 600 000. NordGen, on behalf of the Norwegian Ministry of Food

and Agriculture, signed 9 new Standard Depositor Agreements (SDA) with gene banks wishing to make use of the Seed Vault for safety storage of their important collections of crop diversity. By the end of 2010, NordGen had accepted deposits from 32 depositor institutes. Six new SDA signatories deposited material in 2010, namely the national gene banks of Georgia, Uganda, Israel, Democratic People's Republic of Korea (DPRK), Sudan and Peru. We appreciate that an increasing number of gene banks from developing countries are joining the project. The growth in holdings makes the Seed Vault one of the largest repositories of Plant Genetic Resources for Food and Agriculture in the world.

EXTERNAL CONTACTS AND VISITS TO THE VAULT

There are still an increasing number of requests for visits, interviews, lectures or information connected to the Global Seed Vault or more general questions concerning conservation and utilization of plant genetic resources. It reflects the general interest for the concern of global agricultural development.

The very strict visiting policy underlines the importance of safety and security of the operation of the Svalbard Global Seed Vault. In 2010 more than 100 inquiries from 27 countries from all over the world were obtained. More than 70 requests dealt with the possibility to visit the Vault – for various reasons, with the majority from different media. A restricted number of visits were accepted which resulted in a substantial media exposure in TV, radio, newspapers and magazines. An unexpected large category of visitors is dealing with various art projects like books, articles for art magazines, and art photography for exhibitions. These projects are attracted by the marvellous light, architecture and structure of the Vault.

A particular category of visitors represents the political system and international policy makers.



Entrance of the Svalbard Global Seed Vault. Photo: Simon Jeppson



The Vault has three chambers where seeds can be stored. So far, only one is used. The capacity is around 4.5 million seed samples.

Drawing: Global Crop Diversity Trust

Among the most important visitors to the Global Seed Vault in 2010 was the Indian minister of Science and Technology together with an Indian scientific delegation invited by the Norwegian minister of Education and Research. In July a group of US senators visited The Vault as well as a delegation from The Royal Swedish Academy of Forestry and Agriculture.

NordGen, responsible for the operation and management of seed material in the Vault, makes the planning of future visits, which can be accepted when new shipments are expected and at a few other occasions. The aim is to have the Vault accessible for visits 4-6 times per year when NordGen staff, representatives for the Global Crop Diversity Trust or the Norwegian Ministry of Food and Agriculture are present on Svalbard.

WHAT DOES THE FUTURE LOOK LIKE?

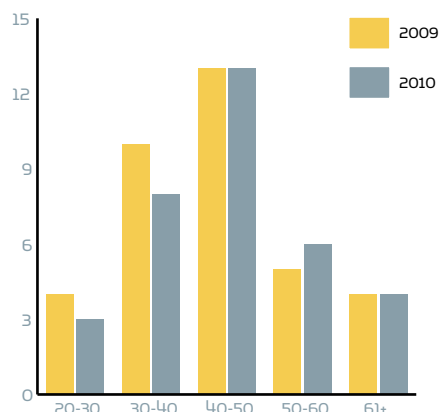
The current global focus on environmental problems, climate change, world population growth, sustainable food production and nature

disasters striking human societies puts a special emphasis on efficiency on conservation and utilization on plant genetic resources. The Svalbard Global Seed Vault is part of the strategy to secure future food production for the human population.

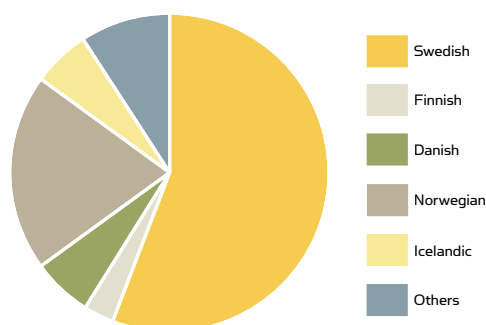
Roland von Bothmer and Ola Westengen



Facts and figures 2010



Graph 1. Staff by age



Graph 2. Staff by nationality

THE MAIN MISSION of the Nordic Genetic Resource Center (NordGen) is to secure genetic resources of plants, farm animals and forest trees of Nordic origin relevant to food and agriculture. Forest trees are generally conserved in their natural environment – in situ. Farm animals are conserved through sustainable breeding programmes and plants are conserved ex situ by storing seeds or maintaining vegetatively propagated material in clonal archives.

NordGen manages and has the operational responsibility for the seed genebank that operates on behalf of all the Nordic countries. The active gene bank is at Alnarp in Sweden, the base collection is at Årsløv in Denmark and the security storage is in the Svalbard Global Seed Vault (SGSV), Norway. NordGen has the operative responsibility for the SGSV. However, storage in gene banks is not sufficient to secure genetic resources for the future: they should also be used.

In order to be able to use forest tree, farm animal and plant genetic resources there has to be free access to information on them. NordGen therefore puts considerable emphasis on characterisation of genetic resources and developing specialised databases for them. The networks and information activities are vitally important if NordGen is to fulfill its mission.

STAFF

NordGen is an independent institution under the Nordic Council of Ministers (NMR). It is organised into three departments, Forest, Farm Animals and Plants. The two first are co-located with the Center of Forest and Landscape at the University of Life Sciences in Ås, Norway, while plants and the administration unit are located in Sweden at the Alnarp campus of the Swedish Agricultural University (SLU). In 2009 NordGen's mandate was expanded to include environmental aspects of genetic resource management.

INCOME	CONSERVATION	UTILIZATION	NETWORK/INFO	INTERNAT.	ADM.	TOTAL
NMR budget	4 961	2 200	6 436	519	4 214	18 330
Project means NMR	666	52	1141	186	1 333	3 378
National support	901	422	1 226	0	0	2 549
External project means	323	301	1 235	17 525	52	19 436
Other sources	19	35	17	3	158	232
Total Income	6 870	3 010	10 055	18 233	5 757	43 925
Total Costs	7 598	3 345	10 055	18 153	7 262	46 413
ANNUAL BALANCE	-728	-335	0	80	-1 505	-2 488

Table 1. Overview of income and costs split over activity fields (1000 SEK)

NordGen had 34 employees or 26.73 person-years of which 3.0 were allocated to Farm Animals, 0.55 to Forest and 14.38 to Plants. According to the NMR regulations, the duration of contracts is a maximum of 8 years within a Nordic institution.

During 2010 all Nordic countries were represented on the staff. The gender profile was close to 50% male and 50% female. The average age of the NordGen personnel was 45.5 years.

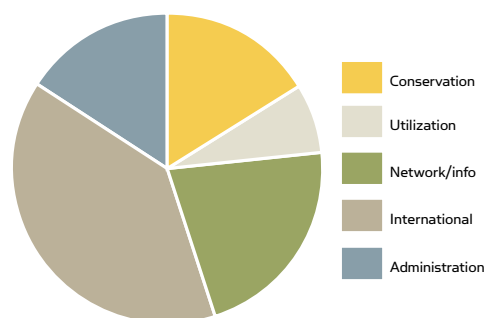
ECONOMIC REPORT

For reporting purposes activities are split into four fields according to our mission; conservation of genetic resources, sustainable utilisation of genetic resources, information and networks and international activities. General administration and leadership are reported separately.

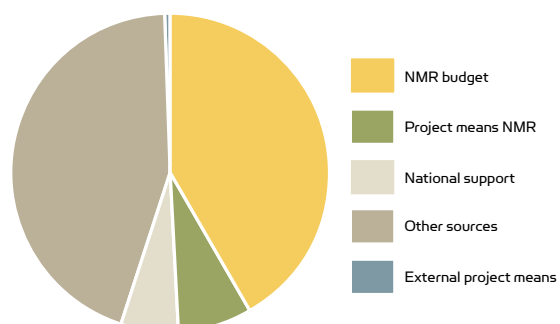
The budget component from NMR was 18.3 MSEK, while the NordGen turnover was 46.4 MSEK, resulting in a deficit of 2.5 MSEK (Table 1), mainly due to higher expenses connected to the seed bank in combination with postponed incomes. The various sources of finance and the costs divided among the five fields of activities are indicated in the following table and pie chart.

INTERNATIONAL PROJECTS, EXTERNAL FINANCE

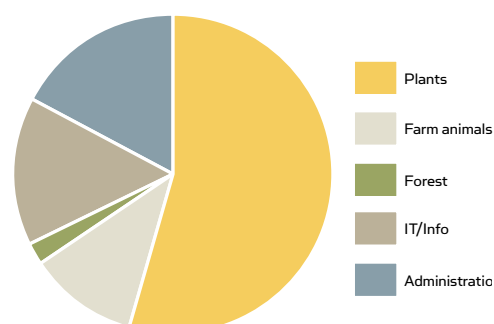
The Strategic Plan (2008-2012) states that all international projects shall be fully financed from external sources. In 2010 NordGen was engaged in three projects, financed from the Nordic Development Agencies, in developing countries or countries in transition in addition to involvement in SGSV. See Table 2.



Graph 3. Costs by activity fields



Graph 4. Financial sources



Graph 5. Sum of man-years by sector

PROJECT	1 000 SEK	SOURCE
SADC – Southern African Development Community	6 963	Nordic Development Agencies
EAPGREN – Eastern African PGR Network	131	SIDA – Swedish International Development Agency
CAC – Central Asian Countries Network	8 231	SIDA
SGSV – Svalbard Global Seed Vault	1 847	Ministry of Food and Agriculture, Norway Global Crop Diversity Trust
TOTAL	17 172	

Table 2

NordGen Forest is organized as a project of the Norwegian Forest and Landscape Institute, Ås Norway. Personnel resources correspond to 55% of a person year and include three part time employees.

Nordgen Forest



Seed trees of Scots pine left for natural regeneration. Leaving adjacent trees in groups may increase the probability of inbreeding in subsequent generations.
Photo: Sverre Skoklefeldt, Norwegian Forest and Landscape Institute.

THE MAIN GOAL OF NORDGEN FOREST is to contribute to the establishment of the best possible Nordic forests for the future by providing and exchanging information about supply of seeds and plants, methods for regeneration and long-term conservation of forest tree genetic resources. We organize thematic days and conferences and initiate and take part in research and development projects. NordGen Forest contains two external bodies, each with members from all Nordic countries:

- The Council members exchange information on regeneration issues, discuss various topics of interest for Nordic forestry and plan coming events.
- The Working Group on Genetic Resources ensures cooperation on conservation and use of forest genetic resources.

CONSERVATION OF FOREST GENETIC RESOURCES (FGR)

The main theme of the meeting of the Working Group of Genetic Resources, which was held in Scotland, was introduction and use of exotic tree species. Such exotic species are important for commercial forestry. Information was exchanged with the national genetic resource programmes and with international initiatives such as the European

Forest Genetic Resources Programme (EUFORGEN) and the FAO State of the World Report on Forest Genetic Resources. The project on the legal status of FGR and a preliminary project report were presented at a meeting in Vienna attended by 55 participants from most European countries. A shorter and more popular article will be published in addition to the project report.

SUSTAINABLE USE OF FGR

At the two meetings of the Council, reports on activities in the Nordic countries related to forest regeneration were presented and discussed, conferences and thematic days were planned and information was exchanged about international activities. A scholarship was given to one applicant from each of the countries Iceland, Sweden, Finland and Norway.

The project “Cooperation in breeding of Norway spruce” was funded by the Nordic Country of Ministers for the period 2010-2012. It is coordinated by NordGen Forest and its goal is to establish and maintain a network with members from the breeding and research organizations to obtain beneficial cooperation in breeding of Norway spruce in the Baltic Sea region. This project is one of the recommendations to Nordic forestry to follow up the Selfoss Declaration signed by the Nordic ministers responsible for forestry.

INFORMATION AND NETWORKING

Two thematic days were held in 2010: one in Helsinki entitled “Damages at the nursery and young forests”, with six presentations and 33 participants, and one in Iceland on “Forest seedlings and plant quality”, with ten presentations and 42 participants. The title of the annual conference was “Exotic tree species – possibility or threat?” and took place in Uppsala, Sweden, with 65 participants and 17 presentations. These arrangements represent important information activities of NordGen Forest. All presentations are available from the NordGen home page.

The staff of NordGen Forest has written one article for the NordGen Annual Review and two thematic articles for the web page, in addition to more general information about NordGen Forest activities.

INTERNATIONAL ACTIVITIES

Members of the NordGen staff and of the Working Group participate as national representatives in EUFORGEN and the FAO Commission on Genetic Resources. A presentation was given about Svalbard Global Seed Vault at OECD meetings in Paris and at the European Seed Kiln Conference in Verona.

Tore Skråppa



NordGen Farm Animals had four employees in 2010: the sector leader, a senior advisor, a senior researcher and a senior consultant. The personnel resources corresponded to three person years in total. The office is located at the Norwegian Forest and Landscape Institute in Ås, Norway.

NordGen Farm Animals

NORDGEN FARM ANIMALS is a coordinating unit and a competence and information centre that contributes to the categorization, conservation and sustainable utilization of farm animal genetic resources in the Nordic countries.

CONSERVATION

An experimental part of the project "Optimization of Conservation of Poultry Genetic Resources in North Europe" was completed. At UMB's (Norwegian University of Life Sciences) experimental poultry farm in Ås, poultry material from the Norwegian in situ Gene Bank for Poultry in Hvam was tested for meat production. The purpose of this experiment was to investigate whether genetic materials found in the Hvam Gene Bank can be used to develop an alternative chicken to the current broilers for meat production. The chickens from the Hvam Gene Bank were healthy, but their growth and meat quality did not meet current requirements.

The Dutch Rare Breeds Conservation Society and the University of Utrecht in the Netherlands initiated a molecular diversity project on European goat breeds and NordGen Farm Animals coordinated the collection of DNA samples for the project.

SUSTAINABLE UTILIZATION

NordGen Farm Animals organized a workshop on "Risk management in animal breeding programs" in Tallinn, Estonia on the 14th – 18th June in collaboration with the Estonian University of Life Sciences. The workshop focused on genomic selection, the management of breeding programmes with respect to genetic risks and the use of the computer program 'EVA' for optimal balancing of inbreeding and selection. Participants were from the Nordic countries, Estonia, Latvia and Poland, and represented breeding organizations, research institutes and universities.

A research and network proposal to The NordForsk call on Climate Change Impacts, Adaptation and Mitigation in Nordic Primary Industries was submitted in collaboration with UMB. The project, entitled ANGR-NordicNET (Nordic Research Network on Animal Genetic Resources in the Adaptation to Climate Change), got three years of funding from the Nordic Research Call. NordGen's role is to act as the institute responsible for project management, administration and coordination.

NETWORKING AND INFORMATION

NordGen Farm Animals had four farm animal species groups: poultry, sheep and goat, horses and cattle. A SWOT analysis on the groups' activities, processes and outcomes was made. The assessment indicated that there is a need for change in the organizational structure and led to the closure of the groups.

NordGen Farm Animal's Council for Animal Genetic Resources, a network of experts, was established in February 2010. The Council has nine members from all the Nordic countries. The mandate of the Council was established. The aim is to develop role division between NordGen and national actors and to facilitate an active dialogue between NordGen and national stakeholders. A meeting was organized in Denmark in March and a workshop in Finland in September. In addition, the coordinators from Estonia and Lithuania participated at the Workshop.

Lectures on animal genetic resources, their conservation and research have been given at UMB in Norway, the University of Helsinki and the University of Turku in Finland (20 hours). Juha Kantanen acted as an opponent in the doctoral defence of Emma Svensson at Uppsala University on the 11th of June.

The content of the Farm Animal section's homepage was revised and updated with new material. In addition, articles were published and presentations held in Nordic forums.

INTERNATIONAL ACTIVITIES

NordGen Farm Animal's staff participated in the Livestock Biodiversity Workshop at FAO, Rome, Italy (5th and 6th of May 2010). The workshop presented the results of EU-funded projects on farm animal genetic resources. The staff participated also in the WCGALP2010 Conference in Leipzig, Germany (World Congress on Genetics Applied in Livestock Production), the EAAP2010 Conference in Greece and in the Workshop on Nordic Economic Cattle Breeding in Iceland. A poster was presented in WCGALP2010 and an oral presentation on niche production in the conservation of genetic resources in the Nordic countries in EAAP2010. In addition, NordGen Farm Animals took part in the Intergovernmental Technical Working Group on Animal Genetic Resources at FAO, Rome on the 24th – 26th November.

Juha Kantanen



NordGen Plants is a knowledge centre for plant genetic resources of cultivated crops and their wild relatives. In addition to being a platform for information exchange, NordGen Plants operates the Nordic genebank for seeds. Handling more than 300 crop plant species is no trivial task, requiring knowledge of the individual species, crops and their diversity, and also adequate facilities to ensure efficient and cost-effective operation.

NordGen Plants

CONSERVATION: NEW GREENHOUSE INAUGURATED AND REGENERATION CAPACITY INCREASED

In spring 2010 we finally inaugurated the new greenhouse at Alnarp, providing the long needed expansion in regeneration capacity. Maintaining more than 30 year old Nordic collections viable requires more efficient systems, and access to suitable seed threshing and cleaning facilities is our next goal. Special attention was given to our regeneration work to ensure efficient use of the new greenhouse. We were also able, in collaboration with Carlsberg Research Laboratory, to use facilities at Lund University to speed up regeneration of our special collections, and on limited scale material has been sent for external regeneration.

The inventory of NordGen's seed store has continued as planned, and another 20% of the active storage has been checked, updated and secured. A new and simple facility for germination tests has been established, addressing a bottleneck in our system, but does not yet provide fully for the 3-4000 analyses required each year. The limiting factor is now technical assistance.

Conservation of the Nordic potato collection remains a challenge. In collaboration with SLU, we have ensured temporary access to laboratory facilities to maintain the collection, and a proposal for a long-term solution is under preparation. In terms of agricultural and ethno-botanical value, potato is a very important crop in our region, and secure conservation is of high priority.

Providing adequate facilities and staffing for our genebank operations remains a challenge. The European AEGIS ambition, to create A European Genebank Integrated System, remains a highly relevant issue, and a renewed application for basic European funding is under preparation. In 2010 NordGen Plants was also able to participate in a targeted work on Umbellifera and contribute to developing further applications for Secale and forage crops.

SUSTAINABLE UTILIZATION: HIGH INTEREST IN NORDIC PGR

A substantial interest in access to Nordic PGR has resulted in the highest number of seed transactions and seed deliveries ever. More than half of the seed deliveries were for research purposes and approximately a third for purposes under the International Treaty on Plant Genetic Resources for Food and Agriculture. The large interest from private citizens, both within and outside the Nordic region, is positive and challenging, and indicates the effects of increased attention being paid to genetic resources – and presumably also represents a spin-off from the media attention paid to the Svalbard Global Seed Vault. While celebrating this positive development, it unfortunately also means postponing other standard gene bank operations. The automatic seed ordering system was finalized and has been in full operation since spring 2010. In the future this will rationalize seed orders and generate more comprehensive statistics on use of Nordic PGR.

NordGen Plants continued to address some of the developments in the improvement of Nordic food culture and products by providing a minor selection of vegetables and spices for tests and analyses at universities, restaurants and laboratories. A bottleneck is the lack of relevant evaluation data, and the costs of providing such data. The potential for development in this area is much larger than can be currently realized.

The questions regarding pre-breeding for climate and market adaptation for the Nordic region was pushed forward in 2010. An internationally supported concept note available from NordGen's homepage was developed as an outcome of the seminar in 2009, and funding was obtained for a follow-up seminar in early 2011. The proposed public-private partnership to support Nordic pre-breeding initiatives was further developed and is now finally in process. This structure is expected to form a very important platform for efficient use of Nordic plant genetic resources, and hence will help fill the existing gaps between science, breeding and conservation work.

The Baltic Sea strategy is a new initiative. NordGen Plants received support for developing regional networks on PGR issues, and the first workshop on PGR stakeholders was held in Tallinn. A successful outcome was the joint application on an AEGIS small grant and collaboration on clonal archives.

Contributing to relevant Nordic educations with conservation themes is important for NordGen, and our work continued in 2010, both participating in programmed university courses and also by receiving MSc. students at our institute. A new development in collaboration with LBHI in Reykjavik was to develop a joint secretariat to restore the NOVA courses in plant genetics and breeding. Collaboration with national

programmes continued through, for example, our joint projects with the Icelandic national programme on caraway and angelica.

INTERNATIONAL ACTIVITIES

NordGen's international engagements were restricted in 2010 by a tight budget. Nonetheless, maintaining expertise and networks are very important and must be secured. Our contribution to European collaboration in ECPGR continued, and the AEGIS collaboration, both regarding crop specific activities and our own contribution to the AEGIS advisory committee, were high priority. Our long-term engagement in international development projects came to an end with finalization of the Central Asia project and the SADC project. Since December 2010 two new genebanks operate in Kyrgyzstan and Tajikistan, both well equipped, secured and their staff trained. It will be a challenge for these new institutes to secure further development, however, being located in one of the world's most important regions for PGR of global importance we hope and expect them to thrive and excel in the future. We are wishing our new colleagues in Central Asia a warm welcome to the international PGR community.

ENVIRONMENT AND IN SITU CONSERVATION

NordGen's environment work and the process of integrating environment aspects into our conservation programmes continued in 2010. GRIPA II was organized as a follow-up conference on In Situ conservation and access and benefit sharing, which continued development of these important themes in our region.

To secure sustainable conservation of our indigenous crop plants, especially forage grasses and legumes, a stronger focus on In Situ conservation and direct conservation actions is required. Our environmental coordination group currently provides valuable input and assistance to explore these issues further. Bridging the gaps among stakeholders remains a challenging task of the utmost importance.

Morten Rasmussen



Regeneration 2010

2010 WAS A VERY BUSY YEAR regarding regeneration, with more than 800 accessions successfully regenerated. Regeneration is undertaken partly because of low germination capacity (below the set standards) and partly because the number of seeds in storage is low (below the set standards). Each accession should represent a certain number of plants to secure enough seeds and represent adequate genetic variation. Many of the breeding lines only need one individual, while wild material or landraces need more than 100 individuals per accession to maintain the genetic variation in the following generation. Characterization, photo documentation and/or identity checks are carried out as part of the regeneration work. This adds value to the work and is part of a quality system now being established for regeneration work in our gene bank. A lot of work is still to be done on developing our regeneration facilities and routines as well as the follow-up of regeneration work carried out by partners.

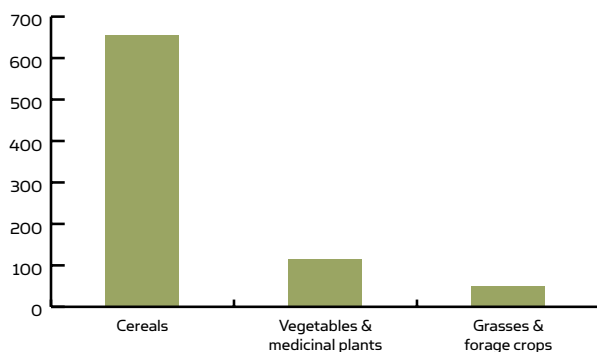


Table 1: Seed propagated crops; number of accessions regenerated and put into storage in 2010.

Cereal regeneration concentrated on McKey's lines of spring wheat (110 accessions) carried out in our new greenhouse at Alnarp and Bowman's lines of spring barley (500 accessions) carried out in collaboration with Carlsberg in greenhouse at Lund. In addition 960 spring barley mutants were sent to Chile for multiplication and expected return of seeds next year.

Vegetable regeneration was carried out at Alnarp, focusing on old cultivars of turnips and swedes donated from the Vavilov institute in St. Petersburg (15 accessions), peas of various Nordic origins donated by seed savers organizations like SESAM and Frøsamlerne in Denmark (25 accessions), mutants of faba beans (54 accessions) and a few accessions from a wide range of vegetable species and spices of herbs and medicinal plants. A few accessions of ornamentals were regenerated as well.

Grasses and forage crops were both regenerated at Alnarp and at research stations in Norway, Sweden and Finland. Grasses (41 accessions), clover (6 accessions) and flax (3 accessions) were harvested in 2010. Regeneration of another 65 accessions of grasses collected in the arctic region has begun, with expected harvest in 2011 or 2012.



Svein Solberg



Utilisation of plant genetic resources

THERE IS A WISH TO FURTHER increase the use of plant genetic resources (PGR) for research and breeding purposes, as well as draw attention to the value of PGR among the public, both from a biological and a cultural-historical point of view. As a part of this process, NordGen further improved its ordering system during spring 2010, improving access to PGR with updated online ordering functions such as a “shopping cart”. NordGen’s seed delivery increased significantly during 2010 to a total of 5 152 seed samples delivered to clients (Fig. 1). This is a 49% increase when compared to the 3 465 seed samples delivered during 2009, and is 20% higher than in 2007, which previously represented the year for the highest number of delivered seed samples. An increased demand for material was expected as a result of the improved online ordering functions. In addition, the increase was further accelerated by the international media attention that NordGen received in connection with its role as the administrator of the Svalbard Global Seed Vault. This led to new groups requesting PGR material from the NordGen online-order pages. There is also a growing trend of increased use of PGR material for research, which contributed to the large number of seed samples delivered during 2010.

There is substantial variation among those requesting PGR material from NordGen, although the majority are plant researchers and breeders. Another important group is represented by museums and botanical gardens interested in cultural history, which use the PGR for exhibitions. A third group is the public, who frequently wish to grow

material and help with the conservation of rare and endangered local varieties. During 2010, 45% of the PGR material delivered was used for research and breeding (Fig. 2), 23% was intended for “other professional use”, including the 10% delivered for exhibitions to agricultural museums and similar institutions, and 32% of the seed samples delivered were dispatched to private, non-commercial users.

The PGR material requested from NordGen is delivered worldwide. In 2010 approximately 35% of the requests came from the Nordic countries, while the remaining 65% was delivered to countries outside the Nordic area.

Fredrik Ottosson and Simon Jeppson

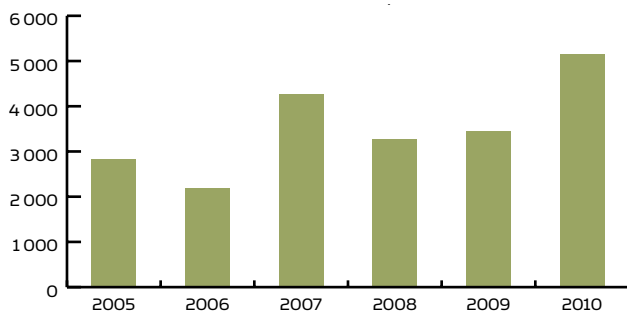


Figure 1: Delivered seed samples

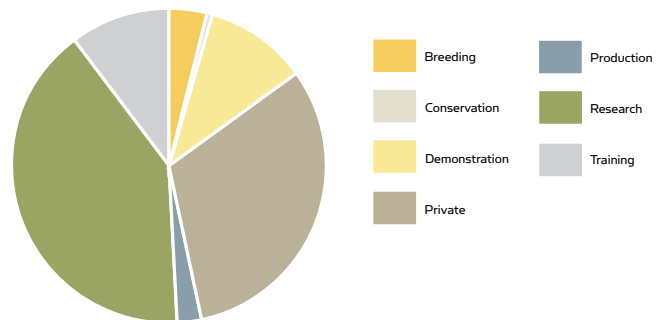


Figure 2: Intended use of delivered material.



The documentation section works on all aspects of the documentation and information technology regarding the stated goals in NordGen's contract with NMR. 2010, especially the second half, was characterized by considerable work on externally funded projects, much due to completion of the SIDA funded project in Central Asia. A major task for both Documentation & IT and Communication was the upgrade of our web site.

Documentation, Communication and IT

DOCUMENTATION & IT

During the reporting period the Document & IT section had three full time staff, of which 85% of one position was dedicated to IT infrastructure and support for the whole organization and the remainder worked on documentation and documentation systems. 2010, especially the second half, was characterized by considerable work on externally funded projects, much due to completion of the SIDA funded project in Central Asia.

CONSERVATION OF GENETIC RESOURCES

An important part of our work has been general support, advice and hands-on assistance with the documentation of existing and incoming accessions in the genebank collections. Maintenance and development of our documentation system in 2010 concerned label printing, report production and seed requests, among many other activities.

A project was started for documentation of molecular genetic information, involving the POM (programme on cultivated diversity) and the SLU (Swedish Agricultural University). The inventory database we developed for POM and the Swedish national programme was expanded with an image archive.

SUSTAINABLE USE OF GENETIC RESOURCES

During 2010, our on-line ordering system was integrated into the SESTO documentation system. From January all seed requests were handled through the web-based system, with considerable savings in time and work, especially for handling MTAs (Material Transfer Agreements). There was a big increase in seed requests in 2010 compared with 2009.

INTERNATIONAL COOPERATION

In 2010 considerable work was devoted to externally funded projects, most notably the SIDA funded Central Asia genebank support programme. One training course for genebank staff was held in

Alnarp, and there were two visits to Kyrgyzstan and Tajikistan for training and installation of documentation systems. NordGen administers the database of the Svalbard Global Seed Vault. All data on accessions, deposits and placement in the vault were quality checked, stored in the database and made available by documentation staff through NordGen's seed portal.

We compiled a new database on "Minor Forage Grasses" for ECPGR (European Cooperation on Plant Genetic Resources) and participated in the work for standardizing and improving European genebank documentation in the ECPGR documentation and information network coordinating group. In a project financed by GBIF (Global Biodiversity Information Facility) NordGen documentation staff evaluated network technology (web-services) for the European genebank community. Installations and training trips under the project were made to genebanks in Prague, Leningrad, Gatersleben and Wageningen during 2010. Finally, NordGen documentation staff held a workshop on documentation of vegetatively propagated material in Tartu, Estonia, with participants from the Nordic and Baltic countries. The workshop was partly financed by the Nordic Council of Ministers' office in Estonia.

INFORMATION AND NETWORKING

This year the NordGen website, www.nordgen.org, was substantially upgraded. The upgrade included a new version of the underlying content management system (EZ Publish) and a Finnish version as an addition to the existing Scandinavian and English versions. The Finnish version will however not cover news and theme articles. A change in structure and graphic design was also made, taking into account the experiences from 2009. The new version was released in May.

In this project the Documentation & IT worked closely with the Communication department.

COMMUNICATION

The Communication department's focused this year on external communications. Contacts were made with journalists to create a network to be used when there is a need to reach out with our activities or news. The overall goal is to create understanding for our conservation work and to make ourselves better known as experts in our field. When something requires expert opinion, we should be the ones to contact! In May we arranged our annual "Open House" and attracted several hundred visitors. Since FAO selected 2010 as the Year of Biodiversity, we opted for the same theme. As illustrations we chose creating an egg exhibition (eggs from different Nordic poultry landraces),



Bean exhibition at our Open house in Alnarp.

Photo: Karin Bäcklund



Showing apple varieties at the Night of Culture in Copenhagen. Photo: Malin Dörre



Practical training in seed laboratory work in Kyrgyzstan. Photo: Alfa Khairullina

Photo: Alfa Khairullina

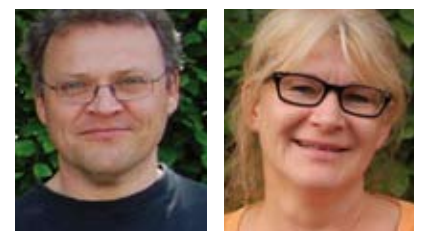
a demonstration of the apple key that NordGen produced for Pometet, KU Life, an exhibition of the Svalbard Global Seed Vault and served samples of locally products such as goat cheese from Ven island, near Landskrona in Sweden, and apple juice from Österlen. We answered many questions on both plant and animal conservation.

In July we issued a press release searching for old varieties of seed-propagated annual and biennial ornamentals that resulted in around 100 tips and seeds.

The night of Culture in Copenhagen in October was a further event where we participated under the auspices of the Nordic Council of Ministers (NMR). This year NMR's attracted 9 000 people, compared to 1 700 the year before. As we offered samples of different apple varieties for tasting, we were busy cutting apples all evening.

During autumn we overhauled the Farm Animal sector's part of the web and a draft external communication strategy was written and presented to the board.

Jonas Nordling and Karin Bäcklund





The NordGen board

The NordGen board members are appointed by the Nordic Council of Ministers and the Executive Committee for Fisheries and Aquaculture, Agriculture, Food and Forestry. The board consists of five members and five deputies. An employee representative from NordGen and two representatives/observers from the Nordic Council of Ministers are also included.

MEMBER	DEPUTY
DENMARK	
Grethe Tarp The Danish Plant Directorate Ministry of Food, Agriculture and Fisheries	Henrik Gorm Jensen The Danish Plant Directorate Ministry of Food, Agriculture and Fisheries
FINLAND	
Tuula Pehu Ministry of Agriculture and Forestry	Merja Veteläinen Ministry of Agriculture and Forestry / MTT
ICELAND	
Áslaug Helgadóttir Agricultural University of Iceland	Jón Hallsteinn Hallsson Agricultural University of Iceland
NORWAY	
Per Harald Grue Ministry of Agriculture and Food	Elisabeth Koren Ministry of Agriculture and Food
SWEDEN	
Ylva Tilander Ministry of Agriculture Chairman	Per Ståhl Skogforsk – the Forestry Research Institute of Sweden

The employee representative from NordGen was Magdalena Svärth.

Environment observer was Johan Bodegård.

The representative from the Nordic Council of Ministers was Mads Randbøll Wolff, Senior Adviser, and Mia Rahunen/Mats Ekenger was deputy.

The board met nine times in 2010.

Photos: Simon Jeppson



Staff 2010

Director

Jessica Kathle, until 8 th of December

Árni Bragason, from 9 th of December

Communication Coordinator

Karin Bäcklund

Economy Manager

Eva Jorup Engström

Economy Assistant

Carina Frankel

Administrative Coordinator

Annica Nilsson

Administrative Coordinator

Kolbrún Árnadóttir

IT Manager

Jonas Nordling

PhD student, outreach

Dag Terje Filip Endresen

Service Administrator

Lars Falk, until March

Martin Forsén, from February

Database Developer

Magdalena Svärth

Professor, PR, Svalbard

Global Seed Vault

Roland von Bothmer

Coordinator of Operation and Management,

Svalbard Global Seed Vault

Ola Westengen

PLANTS

Section Leader

Morten Rasmussen

Senior Scientist

Lena Ansebo (on parental leave from July)

PhD student

Lena Mabande

(on parental leave from August)

Seed Store Officer

Simon Jeppson

Deputy Seed Store Officer

Malin Dörre

Seed Store Technician

Eva Johnsson

Laboratory Technician

Pia Ohlsson

Laboratory Technician/ Project Manager

Alfia Khairullina

Senior Scientist

Agnese Kolodinska Brantestam

(on parental leave)

Deputy Scientist

Magnus Göransson

(replacing Agnese K. Brantestam)

Senior advisor

Lene Krøl Andersen (until August)

Senior Scientist

Gert Poulsen

Scientist Emeritus

Udda Lundqvist

Genetic Resources Officer

Fredrik Ottosson

Environmental coordinator

Erik Persson

Senior Scientist

Svein Øivind Solberg

FARM ANIMALS

Section Leader

Juha Kantanen

Senior Scientist

Hans Ekström

Senior Scientist

Erling Finland

Senior Advisor

Benedicte Lund

FOREST

Section Leader

Tore Skrøppa

Senior Scientist

Kjersti Holt Hansen

Senior Scientist

Tor Myking


FIELD & GREENHOUSE

(SUMMER STAFF)

Johan Axelsson

Jerker Niss

Erika Weström



The Nordic Genetic Resource Center – NordGen – is a joint Nordic institution, responsible for the conservation and sustainable use of agricultural, horticultural and forestry genetic resources. NordGen is funded by the Nordic Council of Ministers. NordGen has about 35 employees and maintains a comprehensive seed collection of more than 30,000 different samples of various Nordic plants.

NordGen collaborates with genebanks, research centers, and breeding programs at both the Nordic and global levels. We participate in extensive international collaboration with Bioversity International and the Food and Agriculture Organization of the United Nations (FAO).

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