

NordGen
Nordic Genetic Resource Center



norden
Nordic Council of Ministers



**NordGen Annual Review
2009**

SAMMANFATTNING
YHTEENVETO

GULA SIDOR
KELTAISET SIVUT

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NordGen's Annual review for 2009 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 summarize the key issues and events for each sector. The overall picture is one of a complex and comprehensive Nordic institution. The introduction, however, has a specific focus – the gap between the Nordic Ministers' ambitions and the approved means available to NordGen to meet them.

NordGen – a flagship

ALL THE NORDIC COUNTRIES HAVE ratified the UN Convention on Biological Diversity (CBD). Their commitments have been followed up by establishing national programs in each Nordic country. In a common public statement from all the Nordic agricultural ministers in connection with the UN Food Summit Day in November and the COP15 Climate meeting in Copenhagen in December 2009, NordGen was held up as a flagship of Nordic cooperation for conservation and sustainable use of GR relevant to food and agriculture. NordGen plays a key role in contributing for future food security in a changing climate.

2009 was the first year of a new 3-year contract between the Nordic Council of Ministers (NMR) and NordGen. The contract commits NordGen to achieving particular results and the NMR to contributing the necessary means to NordGen. The contract states NordGen's overall aim regarding conservation and sustainable use of plant, farm animal and forest tree genetic resources (respectively PGR, AnGR and FGR). In addition, NordGen's mandate was expanded to include the environmental aspects of GR management.

GENEBANKING

Securing plant genetic resources for food and agriculture (PGRFA) is ensured through use of deep freezers in two facilities run by NordGen (base storage in Årsløv, Denmark, and active genebank in Alnarp) and in a back-up storage facility at Svalbard. NordGen has the curator's responsibility for all regeneration, documentation, distribution and information work connected with the genebanks. NordGen has also been given the operative responsibility to run the Svalbard Global Seed Vault (SGSV), which represents the sole global security storage facility for crop seeds. However, securing the diversity of GR is best done through sustainable use, which requires relevant information about and easy access to the GR. The crop seeds (accessions) are characterized using molecular traits, performance values or historical data. NordGen's molecular biology laboratory, field trials and collections play a central role in this respect. The information is made easily available through open, comprehensive and user-friendly databases developed and maintained by NordGen.

NETWORK

NordGen has a broad network of experts and associated personnel who help in transferring knowledge, coordinating tasks and strengthening influence on decision-makers. There are several networks within the three sectors that serve these purposes. A new network group was established in 2009 with the main aim of bridging the gap between the environmental and agriculture sectors concerning their views on and understanding of how to maintain genetic resources for food and agriculture (GRFA). Network meetings are cost-efficient and avoid unnecessary duplication of work by establishing robust scientific groups with a substantial political impact on Nordic genetic resource cooperation.

EMPLOYMENT LIMIT OF EIGHT YEARS

NordGen has a multi-faceted mission requiring a complex infrastructure and a large range of highly skilled employees. All NMR institutions allow a maximum of eight years of employment, which makes recruitment of the necessary staff for our work very difficult.

INCREASING DEMANDS

A genebank is not a static body, but represents a dynamic situation that follows structural changes in society, introduction of new technology and needs to meet new international and political demands. Most of such changes are followed by increased needs, but the budgets and infrastructural means of NordGen have not kept pace with developments.

In order to document costs related to genebanking, an accountancy firm (Ernst & Young) was contracted in 2009. Their report revealed a significant underestimation of budgetary requirements for genebank activities compared with the current needs and future expectations. They also stated clearly the drawback of the eight-year rule for employment at NordGen.

Fortunately the NordGen board, the NMR secretariat and some of the political establishment have grasped the implications represented by the gap between the commitment made by the Nordic countries according to the requirements of the CBD and the capacity of NordGen to fulfill its responsibilities. A working group was established in 2009 to explore a long-term solution for NordGen. We have confidence in the members of the group and eagerly await their findings and recommendations, which will be communicated in spring 2010.



Jessica Kathle
Managing director

The Nordic region is characterized by simple, non-bureaucratic exchange of forest genetic resources (FGR) between countries that is strongly associated with the everyman's right legislation within the individual countries. The regime for international exchange of FGR is smooth and regarded as being very valuable for the forestry sector across the Nordic country borders as it secures the unrestricted availability of seeds and breeding material.

Legal rights to forest genetic resources – approaching a new framework?

THE STATUS OF FGR has not been defined in domestic legal frameworks and ownership issues are not explicitly dealt with in national legislation. Therefore, there is a risk that future developments could interfere negatively with current practices. If the legal circumstances remain unclear, the case for forest trees might be expected to follow the developments for plants, with one potential scenario being that FGR exchange is increasingly controlled through private property rights, thereby impeding access to the resources and cross-border exchange. The need to determine the legal status of FGR has been highlighted in several official documents of the Nordic Council of Ministers from 2003 onwards, through which NordGen was awarded the project “Searching for appropriate legislation regulating access and exclusive rights to forest genetic resources in the Nordic region”, to explore these issues (2009-2010) in close collaboration with The Fridtjof Nansen Institute in Norway.

HOW CAN FOREST GENETIC RESOURCES BE KEPT IN THE PUBLIC DOMAIN?

The overall aim of the project is to clarify whether it is necessary and possible to take legal steps to ensure that FGR remain in the public domain. Although there are few international treaties specifically relevant to FGR, there are several general laws that are important. Accordingly, it is crucial to identify issues and developments in international law that could affect the present situation, either positively or negatively, particularly regarding the legal status of breeding materials and breeding as a process.

PATENT LAW

The patent law has until now not been applied extensively to FGR, which may be due to the long rotation period of trees, from 50 to 100 years, and the maximum patent protection time of 20 years.

However, breeding methods that have not previously been described properly could be patented to produce indirect product protection for forest tree varieties. In the animal breeding sector there is an emerging practice of applying for protection for basic breeding methods.

According to the TRIPS (Trade-Related Aspects of Intellectual Property Rights) agreement, only essential biological processes are exempt from patenting. In Europe this has been redefined in practice to cover only methods that consist of entirely natural phenomena. Thus, a very low level of human involvement is required for a breeding method to be regarded as patentable. A breeding method must also meet the general patent criteria of novelty, inventiveness and industrial application to be granted. There are cases in which patenting would be needed for commercialization (e.g. Christmas trees). The project aims at exploring how these interests can be combined with the aim of maintaining a system of open exchange of FGR among the Nordic countries.

PROTECTION OF PLANTS

UPOV (The International Union for the Protection of New Varieties of Plants) was established by the International Convention for the Protection of New Varieties of Plants. The objective of the Convention is intellectual property right protection for new varieties of plants. The Convention was adopted in 1961 and revised in 1972, 1978 and 1991. The UPOV agreements for protection of breeder's rights apply also to forest trees as long as the general requirements for novelty, distinctness, uniformity and stability are met. Protection through UPOV (e.g. for certain poplars) can currently be more applicable than a product or process-based patent protection. The UPOV 1978 Act provides a softer right than the later UPOV 1991 version with respect to re-use of seeds and the right to use protected varieties in further breeding.

CONVENTION ON BIOLOGICAL DIVERSITY

The CBD (Convention on Biological Diversity) regulates a broad range of issues related to biological diversity. It applies to FGR, even though FGR has not received much attention in the work of the COP (Conference of the Parties), which is the governing body of the Convention. There is a need to explore how a new system for ABS (Access and Benefit Sharing), which is on the table for negotiation, will relate to the Nordic situation of open exchange of FGR. The main concepts of the CBD that need to be clarified in the context of FGR are

Apparently mist, but actually Norway spruce pollen grains.
Where are they heading for, and who owns them?

Photo: R. Jonskås, The Norwegian Forest Seed Centre



the interests of the provider (e.g. sovereign rights, access regulation and material transfer agreement) and of the user (e.g. benefit-sharing and right to patenting) of the genetic resources.

FAO TREATY

The FAO Commission on Genetic Resources for Food and Agriculture has included FGR in its Programme of Work. This is one of the first general international processes to address the area of FGR specifically. FGR is, however, only one area of genetic resources open for discussion in the FAO. Lack of knowledge of how the forest tree sector functions encourages a normative discussion and copy-paste legal solutions drawn from the plant sector, which might prove to be counter-productive for research and development in the FGR sector. To avoid the passing of undesirable laws, typical FGR issues need to be brought to the negotiations, otherwise a treaty under the FAO might prove to be damaging for the sector in the Nordic countries in the long run.

The project aims to suggest legal steps to address significant undesirable and desirable developments in the Nordic countries, as well as by the Nordic countries at the international level. By the end of 2009 all participating countries had given a detailed description of the present situation as regards access and rights to FGR, which is important for identifying differences among countries.

A GROWING INTERNATIONAL INTEREST

There is growing international interest in clarifying the legal status of FGR and such an early initiative could represent a useful reference for countries outside the Nordic region. The project will aim at providing applicable and relevant recommendations for decision makers regarding future challenges in FGR, and an international meeting will be organized in Vienna in September 2010 to discuss implications of the results. Being at the interface between genetics and law, this project exemplifies the necessity for an interdisciplinary approach to policymaking on access and rights to genetic resources.

Tor Myking and Morten Walloe Tvedt



A previous version of this article appeared in Bioversity Newsletter for Europe 2009, 38.

The conservation of old native breeds is justified for, among other reasons, their cultural values. However, recent studies have indicated that local breeds can be associated with several other important non-genetic conservation values.

Old farm animal breeds are of socio-cultural value

WHAT IS A CULTURAL VALUE?

Cultural heritage is a complex fusion of numerous elements and comprises knowledge based on a series of achievements, expressions, reflections, appreciations, beliefs and traditions. Cultural heritage provides an opportunity to locate oneself temporally, spatially and socially. Cultural heritage evolves, and what occurs today, even if it seems mundane, can become part of tomorrow's cultural heritage. This is the situation for old local livestock breeds whose cultural values were hardly discussed 40 years ago, but are now foremost in the minds of the animal genetic conservation community.

Local farm animal breeds are often characterized by distinctive markings that are typically associated with their cultural value. These breeds have played a significant role in our economic and cultural history. The native farm animal breeds of the North are typically based on original domestic animal stocks that accompanied humans as they migrated to the northern areas of Europe thousands of years ago. The first breeding associations and herd books were established for these local animal populations in the 1800s, when animal breeding activities began and breeds were defined.

It is characteristic to the native breeds that they occur in relatively confined geographical areas and bear a strong stamp of the locality. They can be of unique local symbolic value, as in the case of the Icelandic horse and its cultural value for Icelanders.

WHAT ARE THE CULTURAL VALUES OF NATIVE BREEDS?

The cultural values of native breeds can be discussed at various levels. They serve as witnesses to the agricultural history of a particular area and represent a vehicle to advance local traditions in the future. Native breeds are also valuable for scientific and educational purposes.

Numerous native breeds have been used in traditional agricultural systems. The summer pastures of local breeds have often been located in mountainous or otherwise distant areas, and the migration

of herds to the summer pastures through villages has been a significant event in the annual rhythms of everyday life of many people. Through their grazing on summer pastures, many native breeds have shaped the current traditional landscapes that now comprise important ecosystems and which feature in the efforts to conserve cultural and biological diversity.

Breeds are naturally linked to food culture: milk and meat of old breeds has been used to create local, traditional dishes. Wool is needed for traditional handicraft products, including clothing, and is often shorn from native sheep breeds. Native breeds have also inspired artists



Pramenka Sheep from Serbia

Photo: Juha Kantanen

and influenced the cultural traditions associated with particular localities. The longer a native breed and its ancestors have been raised in their traditional areas, the greater the cultural significance of the breed.

An old breed can be connected to the nation's collective memory, and represent a watershed in a people's history. It is well known that the ancestors of Iceland's native breeds arrived on the Viking ships. The Finnhorse played a significant role on the battle fronts during the Second World War and the Eastern Finncattle walked beside their owners when the evacuees of Finnish Karelia fled from the occupied areas.

New products based on local breeds represent new forms of food and handicraft culture. Conservation through utilization is currently emphasized in the maintenance of farm animal genetic resources and several projects to develop breed-based production and branding of the local breeds have begun in the Nordic countries.

FEW STUDIES HAVE BEEN CONDUCTED

The distinctive values of native farm animal breeds have only been studied in a few research projects. In the ECONOGENE project funded by the European Union and co-ordinated by the Italian University, Università Cattolica del Sacro Cuore in Piacenza, genetic and non-genetic values of the local sheep and goat breeds of central and western European origin were examined. In Finland, Agrifood Research Finland (MTT) co-ordinated and conducted two studies that focussed on values

of Finnish native cattle and sheep breeds and those of an endangered Siberian cattle breed, the Yakutian cattle of the Sakha Republic in Russia. The data necessary to evaluate the distinctive non-genetic values of farm animal breeds are typically obtained by interviewing animal owners, authorities, researchers and other stakeholders, and from demographic records, historical archives and media analyses.

The Finnish research group identified six different value categories that describe the importance of native breeds for animal owners, different stakeholders and for society in general. In addition to the cultural value, native breeds also were of ecological, economic, social, political and ethical value.

Native breeds are of conventional economic value, but can represent an essential component of everyday life for some people, particularly in marginal rural areas. The Yakutian cattle, which have adapted to the harsh environment in Siberia, represent one such example. In such cases additional economic values are closely related to ecological values. Conservation of native breeds is vitally important to secure the genetic diversity of a domesticated species. The genes of native breeds can, for example, enter a crossbreeding program to develop a new breed.

The social values of native breeds are linked to a people's welfare and interests, securing control of their own lives, and in establishing ideological rights and social relationships. For example, the rural people of northern Siberia have traditionally relied on their cattle during times of great social upheaval, as represented by the Russian revolution, and more recently, the collapse of the Soviet Union. From the point of view of social sustainability, native breeds provide numerous opportunities to improve a people's physical and mental welfare, which benefits individuals and society as a whole. Raising endangered native breeds also increases interactions between people and promotes social diversity and social capital.

In addition to social and cultural studies, molecular genetic investigations can also increase our knowledge and the awareness of the cultural importance of local breeds. Such studies have shown that several Nordic native breeds share prehistoric ancestries and can reveal ancient migratory routes of domesticated animals. A recent study on the molecular genetics of sheep indicated that northern European sheep breeds, such as Gutesheep in Sweden, Finnsheep and Icelandic Sheep, have unique pre-histories and can be considered true original breeds on the European scale.



Yakutian youngsters

Photo: Anu Osva



Juha Kantanen

Genetic diversity can evolve and be conserved in many different ways. Perhaps one of the most aesthetically appealing ways of doing both is in maintaining meadows, which represent beauty on both the large and the small scale. Aesthetic pleasure is however not the only benefit meadows bestow on us humans, they are truly multi-functional, providing a wide range of important ecosystem services, and are an abundant source of genetic resources.

The meadow and *in situ* conservation

MEADOWS ARE AMONG THE MOST biodiverse environments in the Nordic region. They support insects, birds, fungi, and not least flowers and grasses. Throughout our history grasses have been important for forage, and many relatives of modern cultivated forage plants still survive in meadows. This genetic diversity, conserved in meadows at different levels, can be used in future plant breeding. The diversity of species in a single meadow can be impressive, as can the diversity within the species and the diversity among meadows themselves. These various classes of diversity are closely connected. Different meadows represent different growing conditions that appeal to different species and promote different adaptations within the species.

There are big differences between a mowed meadow and a grazed meadow. Mowing meadow plants has a very different effect to grazing them as different species have different tolerances to different disturbances. Consistent management over a long time period allows local populations of the same species to evolve in different directions to other populations in other meadows. Mowing creates a different flora compared with grazing.

TO MOW OR GRAZE A MEADOW

The range of species and local adaptations that can be found in a meadow also depend on other factors, such as type of soil, local climate, how wet the area is at different times of year, and not least whether and to what extent the meadow is fertilized. If you mow a meadow, different floras evolve depending on frequency and timing of mowing. In order to maintain substantial biodiversity it is important not to mow the meadow until after midsummer to allow the plants sufficient time to reproduce. If grazed, the grazing animal can influence the type of meadow that develops.

Cows, horses and sheep graze in different ways, have different tastes, and move differently in the landscape, which benefits different species and promotes different adaptations. Such floral diversity in a grazed meadow will vary in both kind and degree depending on the livestock species and sometimes even on the breed.

Taking all these aspects into consideration, it is very important that meadows are preserved, that management of a particular meadow is consistent over time, that inventories are made of variation within as well as among plant species, and that the diversity at different levels is registered and made accessible.

PLANTS EVOLVE IN THE MEADOW

Preserving the diversity in a meadow on site in the form of living, reproducing plants is important for several reasons. Firstly, a selection of seeds is just that: a selection. It takes well planned and performed collecting missions to capture the whole diversity, and current knowledge of within species diversity is often lacking. Secondly, in the meadow the plants are subject to selection pressure from both nature and management. This means that as long as the populations are sufficiently large and diverse, new adaptations have a chance to evolve. Seeds in the freezer cannot evolve or exert selection pressure on other species, although they can capture the diversity existing at a certain place and at a certain time. Genebank seeds are also important as they render the material accessible at any time, whereas the plants in the meadow bear seeds for only limited periods. Genebank material is accessible all through the year. The ideal solution is to have ongoing evolution and functioning ecosystems in the meadows and conserved germplasm, in the form of seeds, in the genebank.



Red Clover (*Trifolium pratense*)

Preservation of meadows is very important for other reasons. In order for the meadows and their constituent species to play an active role as suppliers of ecosystem services that benefit us and other species they have to be “up and running”.

THAT PARTICULAR GRAZED MEADOW

Because of the large variation among different meadows, it is important not just to preserve a meadow as a meadow, but as that particular meadow, managed in that particular way. It is that management that has resulted in the particular diversity on that particular meadow. Changes in management will eventually also change the composition of species and local varieties in the meadow. Genetic diversity will then be lost even if the meadow is preserved but the management is not. If the traditional management includes grazing by a local livestock breed that has co-evolved with the meadow, it is valuable that this breed continue to graze the preserved meadow to maintain the local adaptations in both plants and livestock.

Genetic diversity is not just represented by diversity among species, but also includes diversity within species. Sometimes within-species diversity can be as great as among-species diversity. From both a genetic resources perspective and a nature protection perspective, it is important to consider this type of diversity. Most conservation work is focused at the species or the landscape level, but species viability depends

on its degree of genetic diversity. This is not less true when we also want to conserve genetic resources. In order to secure these two objectives, inventories and management plans should go beyond the inter-species level and also look at intra-species variation.

We believe that strong Nordic synergy will be achieved if the Nordic countries choose to cooperate in conservation, data registration and access to the genetic resources in our most scenic genebanks – the Nordic meadows.

Erik Persson



IN SITU

Latin for ‘in the place’.

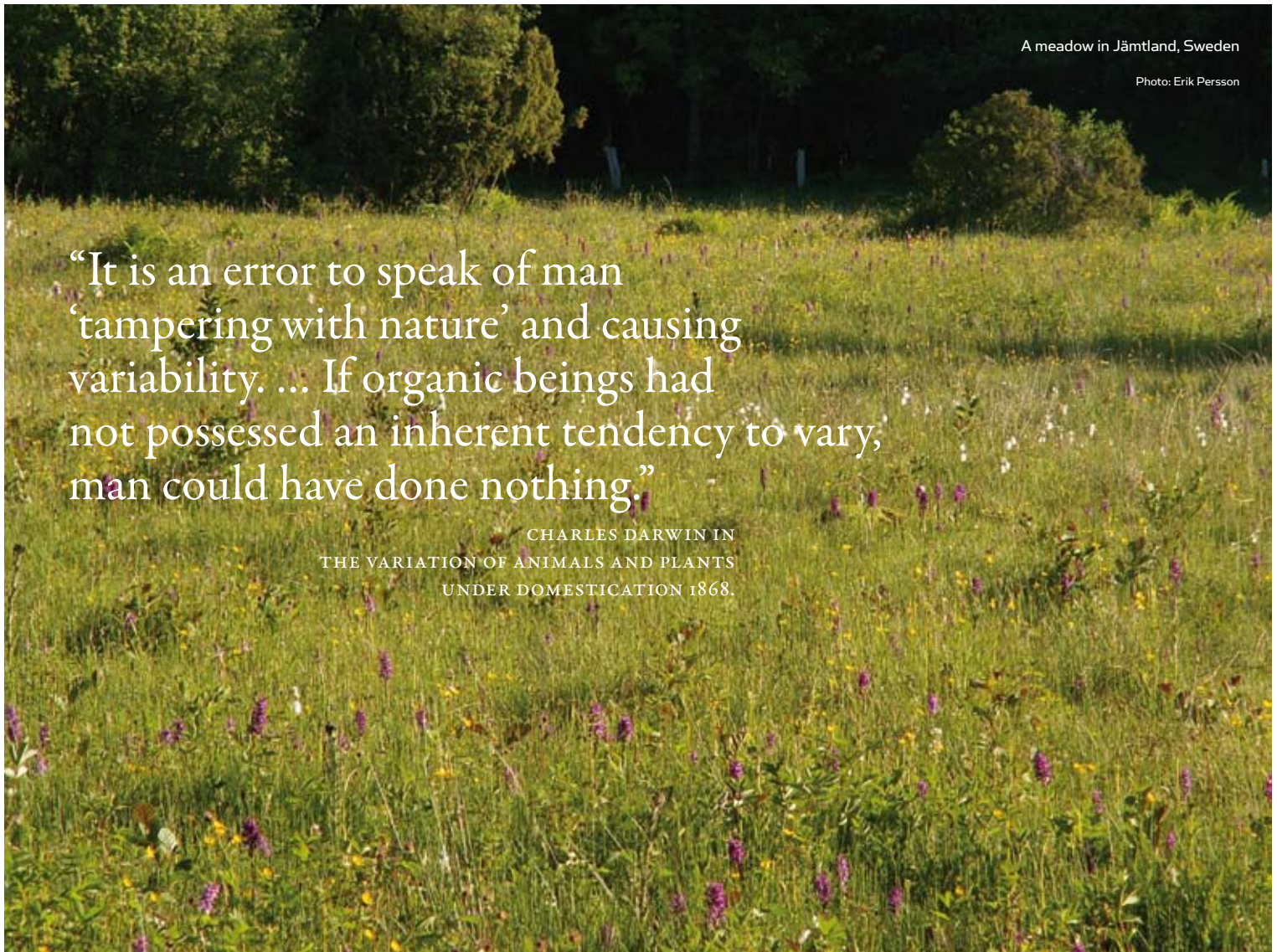
‘*In situ* conservation’ means to preserve something on site in its natural environment. Contrast with ‘*ex situ* conservation’, which means that something is preserved outside of its natural environment (for instance in a genebank).

“It is an error to speak of man ‘tampering with nature’ and causing variability. ... If organic beings had not possessed an inherent tendency to vary, man could have done nothing.”

CHARLES DARWIN IN
THE VARIATION OF ANIMALS AND PLANTS
UNDER DOMESTICATION 1868.

A meadow in Jämtland, Sweden

Photo: Erik Persson





◀ Entrance of the Seed Vault.

▼ NordGen's staff handling the deposited seed boxes in the Vault.

Photos: Mari Tefre and Dag Terje Filip Endresen



Svalbard Global Seed Vault is the ultimate safety net for the world's crop diversity, and is located in the mountains near Longyearbyen on Svalbard, at 78° north. The Seed Vault aims at safeguarding the world's most important plant genetic resources for food and agriculture with a maximum level of security. The Seed Vault offers free-of-charge back-up for the seed collections held in numerous genebanks around the world.

Svalbard Global Seed Vault

SVALBARD IS A REMOTE AND SECURE yet accessible location. The safety of the seed samples is ensured by the thick sandstone rock surrounding them and their long-term survival is ensured by the permafrost conditions that will maintain the airtight seed samples well below freezing, even in the unlikely event that the mechanical cooling system (-18°C) should fail.

NordGen's operative responsibility for the Seed Vault is in accordance with an agreement between the funding partners, the Norwegian Ministry of Food and Agriculture and the Global Crop Diversity Trust, regarding management and operations.

SEED DEPOSITS IN 2009

The seeds are stored in the vault's second chamber (there are three chambers with a total capacity of 4.5 million seed samples). The total number of stored seed samples was 491,058 at the end of 2009, occupying a little more than a fifth of the total storage capacity of the chamber. 170,973 seed samples were deposited in 2009 by 18 institutions and no withdrawals of seed boxes were made. New depositor institutes included genebanks from Ireland, Switzerland, Taiwan and Ukraine.

NordGen organized six deposit openings in 2009, which provided several opportunities for potential depositors to organize seed shipments. Dates were arranged and settled in advance in consultation with depositors. Deposits of the CGIAR (Consultative Group on International Agricultural Research) institutions and of developing countries were financially supported by the Global Crop Diversity Trust (incl. standard boxes, packaging and shipping). OECD countries are expected to cover their own expenses. Deposits are accepted and included in the SGSV from 27 institutions to date. Ten of the 27 institutions are CGIAR centers. The CGIAR deposits and the deposits from non-OECD countries have been organized in close collaboration with the Trust.

NordGen maintains the publicly available database for the SGSV collection at www.nordgen.org/sgsv. The portal is linked to both NordGen's homepage and the official webpage of the Seed Vault maintained by the Ministry. The database is updated at every seed deposit event.

INTEREST FROM ALL OVER THE WORLD

The Global Seed Vault has stimulated considerable interest over the year. The highlight was in February when the one-year anniversary of its opening was celebrated. Around 60 key people from around the world gathered at Longyearbyen for the seminar "Frozen Seeds in a Frozen Mountain - Feeding a Warming World", which focused on climate change and genetic resources. The addresses were presented by estee-

med international experts. The experiences from the meeting were very positive and plans were made to arrange a similar high-level meeting every second year, based on a current topic of interest.

Other important events took place in early September when Ban Ki-Moon, Secretary General of the United Nations, visited Svalbard and the Vault with a large group of journalists. In mid-August representatives from the American Congress made a study visit to the Arctic, including to the Vault, and in mid-September a BBC-team visited Svalbard to make a special program about genetic resources with a major focus on conservation and utilization.

A STRICT VISITING POLICY FOR HIGH SECURITY

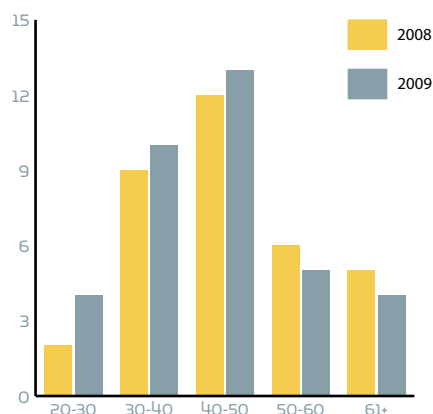
The Norwegian government, with approval from NordGen and The Global Crop Diversity Trust, has developed a visiting policy for the Vault. It clearly states the high security demands for visits and will be of great help in planning future visits. NordGen arranges visits, for example, when new shipments are expected. The aim is to have the Vault accessible to visitors 4-6 times a year on those occasions when NordGen staff members are present.

There are an increasing number of requests for visits, interviews or responses to particular questions connected with The Vault and more general comments on conservation and utilization of genetic resources. From the beginning of the year there have been around 100 inquiries from all over the world. There are many categories of prospective visitor to the Vault, including politicians, policy makers, donors, depositors, journalists from daily newspapers, periodicals and magazines, photo reporters, artists, scientists, students and the general public. Due to the strict visiting policy only a limited number can be accepted.

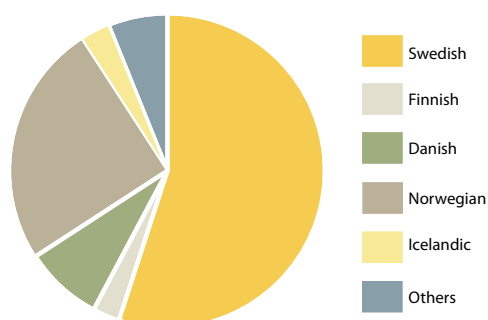
Roland von Bothmer



Facts and figures 2009



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 for food and agriculture. Forest trees are generally conserved in their natural environment – *in situ*, farm animals through sustainable breeding programs and plants *ex situ* by storing seeds in a genebank or maintaining vegetatively propagated material in clonal archives. In 2009 NordGen's mandate was expected to include environmental aspects of genetic resources management.

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

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 characterizing genetic resources and developing specialized databases. 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 organized into three departments, Forest, Farm Animals and Plants. Forest and Farm Animals are co-located with the Center of Forest and Landscape at the University of Life Science in Ås, Norway, while the Plant and administration units are located in Sweden at the Alnarp campus of the Swedish Agricultural University (SLU).

INCOME	CONSERVATION	UTILIZATION	NETWORK/INFO	INTERNAT.	ADM.	TOTAL
NMR budget	3 469	2 191	7 303	1 095	4 199	18 257
Project means NMR	847	689	1 159			2 695
National support	502	317	1 058	159	608	2 644
External project means	69	297	617	10 367		11 350
Other sources	8	81	172	11	217	489
Total Income	4 895	3 575	10 309	11 632	5 024	35 435
Total Costs	5 085	3 697	10 918	11 699	5 353	36 752
ANNUAL BALANCE	-190	-122	-609	-67	-329	-1 317

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

NordGen has 36 employees, representing 27.1 person years, of which 3 are allocated to Farm Animals, 0.55 to Forest and 14.05 to Plants. According to the NMR regulations, the duration of contracts is a maximum of 8 years within a Nordic institution. During 2009 all Nordic countries were represented on the staff. The gender profile is close to 50% male and 50% female. The average age of the NordGen personnel is 45.2 years.

In 2009 one new position was established and new staff were hired; an environmental coordinator, and heads of Farm Animals and IT departments were replaced.

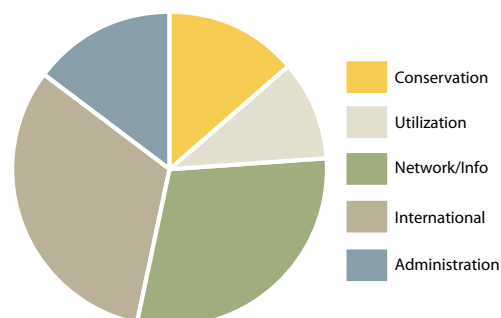
ECONOMIC REPORT

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

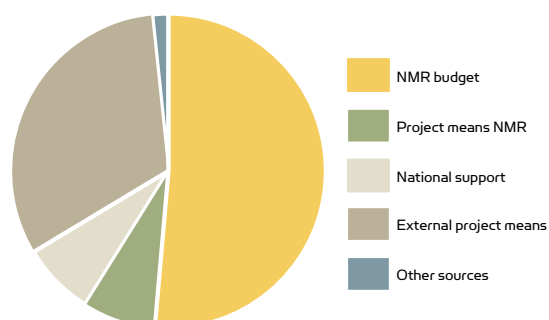
The budget component from NMR was 18.3 MSEK, while the NordGen turnover was 36.7 MSEK, resulting in a deficit of 1.3 MSEK (Table 1), which was mainly due to marketing and higher expenses connected with the seed bank in combination with postponed incomes. The various sources of finance and the costs divided among the five fields of activity are indicated in the following table and pie chart.

INTERNATIONAL PROJECTS, EXTERNAL FINANCE

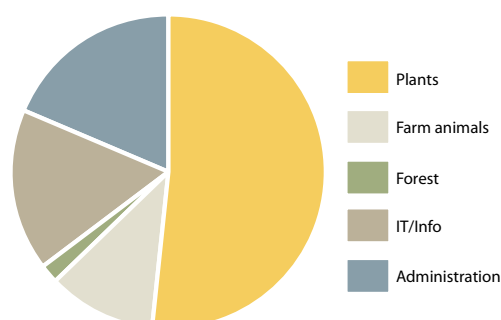
The Strategic Plan (2008-2012) states that all international projects shall be fully financed from external sources. In 2009 NordGen was engaged in four projects in developing countries or countries in transition in addition to involvement in the Svalbard Global Seed Vault (SGSV). See Table 2.



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	5 112	Nordic Development Agencies
SEEDNet – South East European Development Network on PGR	582	SIDA – Swedish International Development Agency
EAPGREN – Eastern African PGR Network	143	SIDA
CAC – Central Asian Countries Network	2 905	SIDA
SGSV – Svalbard Global Seed Vault	1 710	LMD – Ministry of Food and Agriculture, Norway Global Crop Diversity Trust
TOTAL	10 452	

Table 2

The NordGen forest unit was established in 2008 as a project of the Norwegian Genetic Resource Centre, at the Norwegian Forest and Landscape Institute in Ås. Personnel resources correspond to 55% of a person year and there are three part-time employees.

NordGen Forest

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 on 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 participate in research and development projects. NordGen Forest includes two external bodies, each with members from all Nordic countries:

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

CONSERVATION OF FOREST GENETIC RESOURCES (FGR)

At its meeting in Iceland the Working Group on Genetic Resources discussed the efforts in afforestation and use of introduced tree species in the country. The use of exotic tree species in Nordic forestry is an important topic that will be followed up by NordGen Forest. The members of the Working Group take an active part in a project on the legal status of FGR that was started in 2009 in collaboration with The Fridtjof Nansen Institute in Norway. NordGen Forest participated in the preparation of a Nordic project on ash decline, which threatens the genetic resources of this species. A project application related to the Baltic Sea Strategy was sent to the Nordic Council of Ministers. It was entitled "Management and conservation of forest tree genetic resources in the Baltic Sea Region under changing climate conditions. Sub-project 1: Evolutionary genetic pockets for broadleaved tree species. Sub-project 2: Cooperation in breeding of Norway spruce."

SUSTAINABLE USE OF FGR

The Council had two meetings in 2009 and exchanged information about supply of seeds and seedlings and methods for regeneration, status of forest damage, research news and international matters. The 2009 conference was held in Bergen,

western Norway, with 45 Nordic participants and covered topics related to afforestation and regeneration. Climate and environmental issues were key points on the agenda. The thematic day "Increased forest production – new customer requirements, new seedlings, new techniques?" was held in Stockholm, with 50 Nordic participants. Another thematic day, with 45 participants, was organized in Denmark and entitled "Climate change and plantations in forest and landscape". NordGen Forest takes part in the preparation of recommendations to follow-up the Selfoss-declaration on forests, climate and water, which was developed by the Nordic ministers.

INFORMATION AND NETWORKING

The conference and thematic days are important information activities for NordGen Forest, and all presentations are available on the NordGen home page. Brief information newsletters have also been published.

INTERNATIONAL ACTIVITIES

Members of the Working Group and two of the employees are national representatives and have participated in activities of the European Forest Genetic Resources Program (EUFORGEN) and in the Commission for Genetic Resources for Food and Agriculture of FAO.



Tore Skroppa



Two adjacent ash trees, one with severe damage caused by ash dieback (*Chalara fraxinea*), and the other undamaged. Small picture: Typical necrosis caused by ash dieback.

NordGen Farm Animals had four employees in 2009: the sector leader, a senior advisor, a senior researcher and a senior consultant. The office is located at the Norwegian Forest and Landscape Institute in Ås, Norway. NordGen Farm Animals works to ensure genetic diversity in farm animal species and different breeds in the Nordic countries.

NordGen Farm Animals

NORDGEN FARM ANIMALS is mainly an information and competence center that aims, in various ways, at promoting Nordic and international cooperation in the sustainable use and conservation of genetic resources for the benefit of agriculture and food production.

Since NordGen is a new organization, there was a need to make new plans for activities and for the organizational structure. Operations and activities of NordGen animal species groups were evaluated using a questionnaire sent to the group members and the national coordinators for animal genetic resources. The evaluation pointed towards the need for change in the organization and has resulted in proposals for a new, more project-oriented structure for NordGen Farm Animals.

PROJECTS, WORKSHOPS AND SEMINARS

A seminar 'From theory to sustainable animal breeding' was organized on the 12th January in Ås, Norway. The seminar was held in honour of Erling Fimland, who retired as sector leader for NordGen Farm Animals. Approximately 70 people participated, many of whom were from outside the Nordic region.

In March 2009, a workshop on the EVA Program, which is used for animal breeding and conservation management of endangered breeds, was organized in collaboration with Aarhus University. The participants were not only from the Nordic and Baltic countries but also from other areas of Europe. The workshop resulted in the practical use of the EVA program for population management both within and outside the Nordic countries.

The fieldwork component of the project on the use of different cattle breeds in landscape management was completed in summer 2009. The Norwegian Bioforsk group conducted the practical research work.

There were 48 participants in a seminar on product development based on the old livestock breeds and their characteristics that was arranged at Stiklestad, Nord-Trøndelag, Norway (30.9. – 2.10.).

INTERNATIONAL ACTIVITIES

The Twelfth Regular Session of the Commission on Genetic Resources for Food and Agriculture was organized at the FAO headquarters in Rome, Italy (19.–23.10.). NordGen Farm Animals arranged a workshop during the Commission meeting (20.10.) and the new Danish and

Swedish national programs for the Conservation of Farm Animal Genetic Resources were presented.

Erling Fimland received EAAPs Distinguished Service Award at the EAAP conference (22.–28.8.) in Barcelona, Spain.

NETWORKING, INFORMATION AND COMMUNICATION

Cooperation among the Nordic coordinators for animal genetic resources began and a workshop on future opportunities for collaboration was organized at Kringler, in Norway (9.–10.6.). In addition, two other meetings were held during the year.

The animal species groups had a meeting and a seminar in Växjö, in Sweden (6.–7.5.) that took place at Ingelstad Agricultural College. The groups' future tasks and roles were discussed. The species groups had their second meeting of the year in connection with the seminar at Stiklestad (30.9. – 2.10.).

A new book 'Management and Exchange of Animal Genetic Resources – Nordic perspective' written by Asko Mäki-Tanila, Morten Walloe Tvedt, Hans Ekström and Erling Fimland was published. This report was based on a project 'Legal framework for the rights and exchange of animal genetic resources in the Nordic regions' funded by the Nordic Council of Ministers, the Norwegian Genetic Resource Center and NordGen. The project publication focuses on stakeholder needs for a legal framework and possibilities for assessing the value of sales and exchange of genetic material of farm animals in the Nordic region.

NordGen Farm Animals published one volume of the information bulletin 'Husdyr-Nytt' (Farm Animal News) and a new pamphlet on the activities of the section. Several web articles were also published.

Staff were engaged as an opponent at the Norwegian University of Life Science (UMB), Ås and as an assistant supervisor for a PhD student at UMB, and have lectured at the university.

Juha Kantanen



NordGen Plants had 13 employees in 2009, all located in Alnarp. NordGen Plants works with conservation and sustainable use of cultivated plants and their wild relatives. This includes both responsibility for managing the only Nordic seed genebank, characterizing and documenting the seeds, and general information work on the value and importance of plant genetic resources.

NordGen Plants

2009 WAS A BUSY YEAR for NordGen Plants. Implementing the developed strategies and getting the networks in place took time and effort. While taking care of the daily genebanking operations, several challenges were addressed and advances made. There is a need for better and larger facilities to accommodate the collections and for more efficient regeneration systems. This will require more up-to-date laboratory equipment for the characterization of PGR and a better platform for sustainable utilization of plant genetic resources. The laboratory strategy was finalized, and it became clear that substantial investment is urgently needed.

In order to make the anticipated progress, long-term funding will be necessary, as has been recognized for some time. Discussion of this, especially with regard to decisions that will affect long-term progress, is of vital importance to the future of NordGen Plants.

NEW GREENHOUSE PROVIDES MORE OPPORTUNITIES

During 2009 special attention was given to conservation work, especially to the challenges in maintaining an aging collection and addressing the acquisition drawback. During the regeneration strategy work it became clear that a thorough revision of impacts of the conservation work was required. During the year about 20% of the stored seeds were inventoried.

The regeneration work was continued, and based on the experiences from the previous year better planning and staffing made the work much smoother. The construction of a new greenhouse for regeneration was begun after a process of more than five years and this will provide us with the required facilities for some of the regeneration at Alnarp.

Concerning the conservation of potatoes, Lantmännen, who previously carried out this work for NordGen, stopped their operations and the *in vitro* cultures were transferred to NordGen, where we are awaiting the outcome of ongoing discussions before further initiatives can be taken. Collaboration with a network of institutions for

regeneration was developed that also involves seed-saver organizations.

COLLECTING MISSIONS

A collection of relic species in three regions of Denmark was carried out. This group of endangered cultivated plants was the focus of discussion that led to further successful work being initiated at the national level. Maintaining a certain level of collecting mission activities in the different countries is important for the conservation of Nordic plant genetic resources (PGR), especially in light of climate change and changes to agricultural structure.

Good collaboration with the Nordic national PGR programs continued, and access and benefit sharing and the implementation of a coherent standard Material Transfer Agreement (SMTA) were discussed.

WORKSHOPS AND PROJECTS

The four working groups of NordGen Plants are now successfully up and running. The working groups' mandate areas are:

- Cereals
- Forages, root, oil, fiber crops and grain legumes
- Vegetables, potatoes, herbs and medicinal plants
- Fruits, berries and ornamentals.

Regarding use of PGR in plant breeding, in collaboration with MTT, SLU and ECPGR, NordGen organized a European workshop on pre-breeding. The purposes were to initiate discussions on the possibility for collaboration at a European level and take the discussions on the Nordic level a step further. It is of utmost importance that a suitable structure for increased use of genetic resources is established for the benefit of the Nordic region, especially when taking the decline in plant breeding efforts into account.

The ongoing timothy project continues as planned, providing a good example of joint Nordic collaboration, combining utilization and conservation aspects. Other activities have continued and developed further, such as kitchen gardens and cultural history, as in "Grandmothers Garden", where a selection of historical vegetable varieties are displayed. This has created interest in using Nordic material and at the same time provided a platform for transferring information on the importance of genetic resources.

A further activity has addressed the needs of chefs and restaurants for access to interesting Nordic ingredients by initiating small-scale multiplication of particular crops and providing access to testing this material in return for providing evaluation data. Both activities have been well received, and have a much greater potential than can currently be realized.

INTERNATIONAL ACTIVITIES

NordGen Plants international engagements were increased in 2009 through attendance at the 12th regular session of FAO's Commission on Genetic Resources and the 3rd Governing Body meeting of the International Treaty. This work included reporting to the 2nd State of the World Report on PGR as well as participation in technical meetings.

The possibility for NordGen to attend, participate in and contribute to these international fora is important in order to be successful at the international level within our field of work, especially given NordGen's role as administrator of the Svalbard Global Seed Vault (SGSV).

At the European level, the AEGIS collaboration developed into a joint funding application to the EU, and some of the formal structures came into place under an advisory committee to which one of NordGen's employees was appointed. Engagement in development projects, financed by the Swedish International Development Cooperation Agency (SIDA) included:

- The **Central Asian Countries (CAC) project**. The uncertainty of participation of Kyrgyzstan was resolved and all processes are now up and running. The schedule is very tight; it is planned to establish new genebanks in only two years time.
- A 20-year collaboration with the **Southern Africa Development Community (SADC)**, with the objective to establish regional structures for plant genetic resources, was continued but is now close to being finalized. Increased focus was put on the out-phasing process.
- Courses and back-stopping activities were carried out for the **South East European Development Network on Plant Genetic Resources (SEEDnet)** project.

It is of great importance that NordGen is able to support international development and strategies to fulfill our role as a co-player in the international community. The change of focus of our funding agencies is a challenge for NordGen and for our future engagement in similar activities. NordGen's collaboration with the Vavilov Institute in Russia continued successfully as well as our collaboration with the PGR institutions in the Baltic states in a project financed by the Nordic Council of Ministers.

ENVIRONMENT AND *IN SITU* CONSERVATION

On 1st January 2009 NordGen took over the responsibility for environmental issues from the former Nordic Genetic Resource Council. This meant employment of an Environment Coordinator. The first important task was to establish the base for a Nordic coordination group on environmental issues, and a long process was finalized in September by the adoption of the mandate for this group, and the subsequent nominations of national members from both the environmental and agricultural sectors. The group had its first meeting in December. The main point of establishing a platform for mutual exchange of knowledge is to promote Nordic synergy and bridge the gaps that currently exist.

Some of the major topics of discussion are *in situ* conservation in protected areas and the formation of an Access and Benefit Sharing (ABS) framework. Both topics were addressed at the seminar "*In Situ* Conservation in Protected Areas" organized this autumn.



Morten Rasmussen

For the IT & Documentation section, the main projects in 2009 focused on user-friendly solutions for our own documentation system SESTO, as well as apple projects and the Svalbard Global Seed Vault's portal for seed depositors. The Communication section's aim is to make NordGen known as a professional, service-minded and communicative organization. IT and Communication worked closely together when developing NordGen's new website, launched in the beginning of the year.

IT and Communication

IT & Documentation

A MAIN RESPONSIBILITY of the IT & Documentation section of NordGen is development and maintenance of our documentation system SESTO. In 2009 considerable work was done on improving SESTO. The data model for characterization and evaluation data was upgraded to a forthcoming European standard and the interface for uploading and validating data was improved. We also worked hard to establish a common standard in the Nordic countries for documentation of vegetatively propagated material, consulting field genebanks and national programs. To streamline the workflow of handling seed orders and the required material transfer agreements (SMTA), a newly developed SESTO ordering module was launched.

Another important part of our work is freezer surveillance, and in 2009 we did a major upgrade of the surveillance system at NordGen's base storage facilities in Årsløv. For animal genetic resources, our Nordic-Baltic database of Farm Animals was upgraded and an English version was produced.

APPLE PROJECTS

A project was started on screening and documenting Danish apple varieties, for use in high quality apple juice production, where NordGen is a partner in cooperation with KU-LIFE and the Danish juice industry. Another apple project, The Danish Apple Key, developed by NordGen together with Copenhagen University, had its official premiere in October.

Management of the documentation for the Svalbard Global Seed Vault is an unremitting responsibility for the IT section. In 2009 the depositor's portal saw improvements in user interface and data validation. We have actively participated in the collaboration in the ECPGR framework among European genebanks, developed new standards for

germplasm documentation and participated as trainers at a European genebank documentation workshop in Prague.

At the end of the year we entered an agreement with the Global Biodiversity Information Facility (GBIF) for testing of GBIF documentation network technology, to be implemented in 2010. This involves setting up web-services at several European genebanks.

Communication

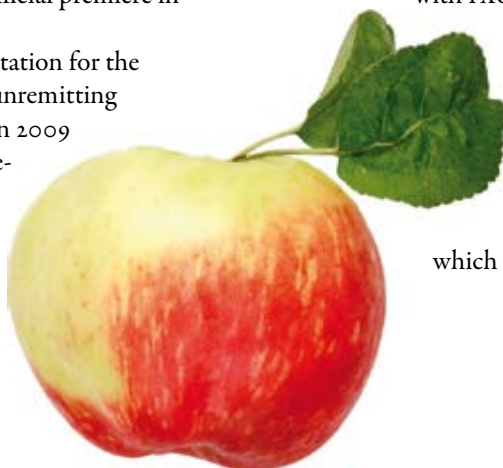
INFORMATION ACTIVITIES became more important in the organization during 2009 as we established new routines for internal and external communications in line with our aim to be a professional, service-minded and communicative organization. In order to achieve our goals we have had to turn ourselves inside-out to some extent as we have increased our efforts on streamlining internal communication. In addition, our participation in international events has been enhanced, particularly through increased demands placed on us by our head organization, the Nordic Council of Ministers.

The year began with the launch of our new website in January. It was created in Scandinavian (contributions in Danish, Norwegian and Swedish) and during the year we translated most of the content into English. The website is now more user-friendly than before, but the development continues.

INTERNATIONAL EVENTS

We participated in a number of international events during 2009. The Nordic Council of Ministers arranged a side-event at the UN conference on agriculture (CSD17) in which we were asked to participate. We also took part in several events in Rome in connection with FAO conferences. In December we participated at COP 15 under the flag of the Nordic Council of Ministers.

Our annual Open House attracted about a thousand curious visitors wanting to know more of our activities. The Night of Culture in Copenhagen, which was held in October, was another public event in which we participated.





▼ NordGen's Communication Coordinator talking to a participant at COP 15.

▼ NordGen's Morten Rasmussen talking to Cary Fowler, the Global Crop Diversity Trust, worried about the result in Copenhagen.

MEDIA INTEREST

NordGen received a lot of media attention in 2009, mostly in connection with to our commitment to the Svalbard Global Seed Vault. The seminar “Frozen Seeds in a Frozen Mountain – Feeding a Warming World” was arranged to celebrate the first anniversary of the opening of the Vault, which led to several articles, films, and TV programs being produced. The deposit openings were opportunities for journalists to accompany and interview the NordGen staff.

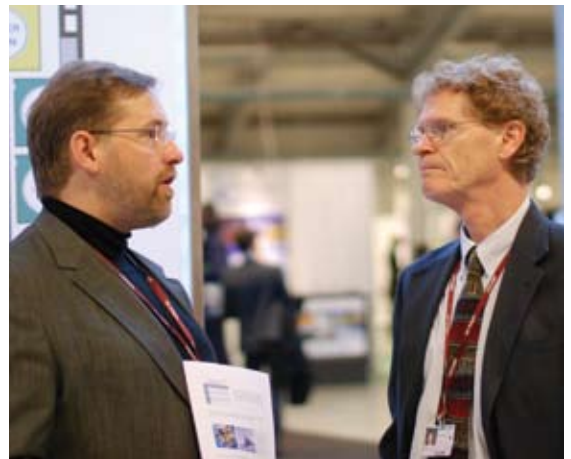
PUBLICATIONS

During 2009 we edited the following publications:

- Annual Review 2008 (English)
- Husdjursnytt (news from NordGen Farm Animals, Norwegian and Finnish)
- NordGen Farm Animals (4 pages, English)
- Food and sustainability (4 pages, English)
- About whole grains (4 Pages, Danish)
- Biodiversity – a key factor in a changing climate (4 pages, English)

All information materials are environment-friendly and can all be downloaded or ordered from our website.

*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	Mikko Peltonen / Merja Veteläinen Ministry of Agriculture and Forestry / MTT
ICELAND	
Áslaug Helgadóttir Agricultural University of Iceland	Dr. 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 Chairperson	Per Ståhl Skogforsk – the Forestry Research Institute of Sweden

The employee representative from NordGen was Agnese Kolodinska Brantestam.

Environment observer was Birthe Ivars/Johan Bodegård.

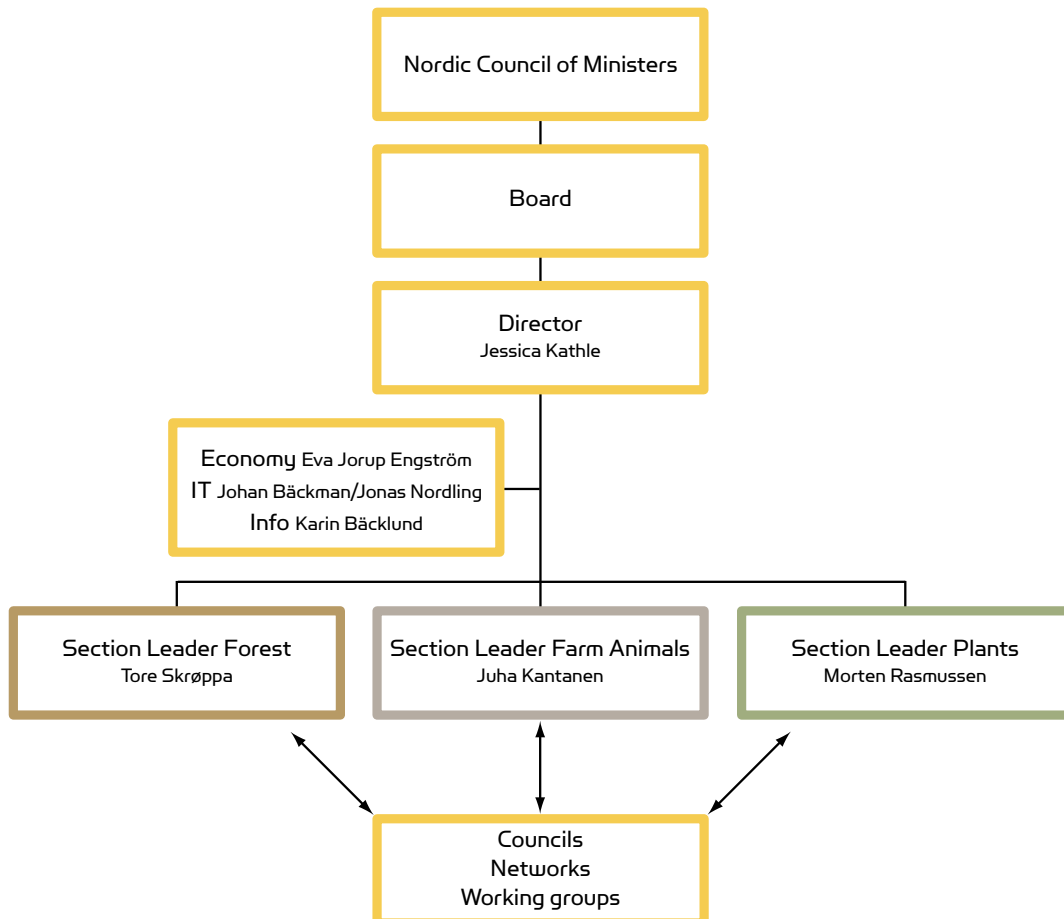
The representative from the Nordic Council of Ministers was Mads Randbøll Wolff, Senior Adviser, and Tryggvi Felixson, Head of Section, was deputy.

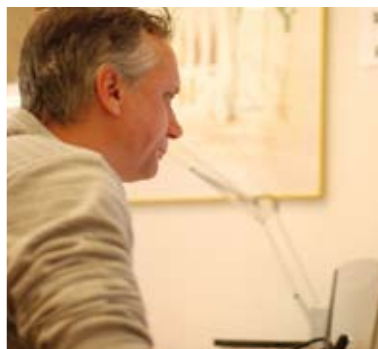
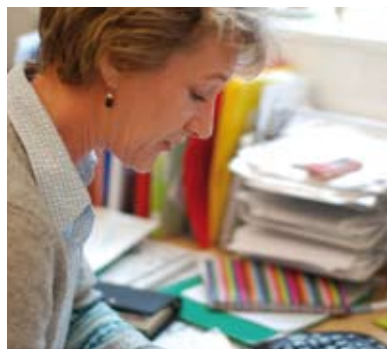
The board met four times in 2009.



THE NORDGEN BOARD. From the left: Mads Randbøll Wolff, Birthe Ivars, Jessica Kathle, Agnese Kolodinska Brantestam, Áslaug Helgadóttir, Tuula Pehu, Ylva Tilander, Grethe Tarp and Per Harald Grue.

The NordGen organization





Staff 2009

Director	Jessica Kathle
Economy Manager	Eva Jorup Engström
Economy Assistant	Carina Frankel
Administrative Coordinator	Annica Nilsson
Administrative Coordinator	Kolbrún Árnadóttir (from June)
Management Advisor	Martin C Rasmussen (until August)
Communication Coordinator	Karin Bäcklund
IT Manager	Johan Bäckman/Jonas Nordling
PhD student, outreach	Dag Terje Filip Endresen
Service Administrator	Lars Falk
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)
Deputy Scientist	Magnus Göransson (replacing Lena Ansebo)
Senior Scientist	Kristiina Antonius (until May)
PhD student	Lena Dafgård/Mabande
Seed Store Officer	Simon Jeppson (on parental leave from August)
Deputy Seed Store Officer	Malin Dörre (replacing Simon Jeppson)
Seed Store Technician	Eva Johnsson
Laboratory Technician	Pia Ohlsson
Laboratory Technician/ Project Manager	Alfia Khairullina
Senior Scientist	Agnese Kolodinska Brantestam
Senior advisor	Lene Krøl Andersen (on parental leave from April)
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 Fimland
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 and Erika Weström

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Climate Compensated Paper



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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