

COUNTRY REPORT ON THE STATE OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

SWEDEN



The 2nd Report on the State of the World's PGRFA

–

Sweden

Up-dated amendment to the 1994 Country Report



Compiled by Jens Weibull, SLU/Swedish Biodiversity Centre

Note by FAO

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SECTION 1

READER'S INSTRUCTION

The current country report to the 2nd State of the World's Plant Genetic Resources for Food and Agriculture is not a full and comprehensive coverage of all aspects of Swedish PGRFA, but rather a brief update of certain important changes that have taken place since the previous report. The 1994 report is available at http://www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPS/Pgrfa/index_e.htm.



CHANGES IN USE OF AGRICULTURAL LAND

Data presented in this report include changes during the period 1994-2006 and are based on official statistics (Statistics Sweden). During this period the total cultivated land area has decreased by 4.3% and was by the end of 2006 2.66 million hectares (ha). Major changes in crop production is given in table 1.

TABLE 1
Existing collection in Gene Bank

Crop	Increase	Decrease
Winter wheat	50%	
Spring barley		30%
Spring oat		40%
Spring turnip rape		77%
Forage grasses and legumes	8%	

Some other crops, such as winter barley and winter rye have also decreased in acreage, but as they have always been minor crops these changes have little relative effect on the total agricultural area. Winter and spring oilseed rape decreased rapidly in acreage during the late 1990s but are now grown at more than 80% of their 1994 figures. In comparison, linseed showed a steep rise in popularity in 1999 (35 000 ha) but has now fallen back to less than 10 000 hectares. Small grain legumes (field pea, field bean and vetch) showed an almost 10-fold increase from 1994 (5 000 ha) to 1998 (48 000 ha) but has since stabilised around 30 000 ha or c. 1% of the total agricultural area.

The most dramatic change since 1994, however, has been the skyrocketing of land under fallow governed by the Common Agricultural Policy CAP of the EU. From c. 53 000 ha in 1994 the area increased to almost 280 000 ha only the year after and has since fluctuated around 310 000 ha or 11-12% of the total agricultural area. With current rising prices of small grains it is expected that the amount of fallow will again decrease.

The merging or rationalisation of farm enterprises has continued throughout the period resulting in an overall decrease of farms by c. 17% to a total of c. 75 800. Mean farm size is close to 38 hectares.

The trends in the commercial fruit production are that acreages of apple, pear and plum – in order of size – continues to decrease, while that of cherry fluctuates around 100-150 hectares. Commercial berry production, on the other hand, is slightly more stable or even rising. The most important crops are still strawberry, black currant and raspberry.

SECTION 3

CHANGES IN DIVERSITY OF CULTIVARS

The number of cultivars on the official variety list for agricultural crops (table 2) shows a slight increase since the first State of the World Report, and foreign varieties in particular. This is most likely an effect of Sweden being a member of the European Union, thereby adhering to the common European list of varieties. The number of cultivars on the list, however, does not state any-thing regarding the overall genetic diversity available or used.



TRENDS IN THE PLANT BREEDING SECTOR

Swedish commercial plant breeding has undergone considerable changes during recent years, mainly due to the fact that Sweden and the Nordic market is too small to subsist necessary on-going R&D activities. Competition abroad has also a strong impact. Non-viable breeding programmes (malting barley, *Salix* for biofuels, potato for the Swedish market, vegetables) have either been closed down or transferred to the Swedish University of Agricultural Sciences. Focus is now placed on the major agricultural crops.

Sweden is a country covering a large number of climate and day length zones, and with agriculture being important also in some areas north of the Arctic circle it is important to maintain plant breeding activities for marginal areas. The prevailing climatic trends with early season droughts, wetter conditions at the time of harvest and milder winters constitute a challenge that has to be taken seriously. A discussion is currently taking place to clarify the needs and opportunities for Swedish plant breeding, and the prospects for increased governmental support to public breeding.

SECTION 5

OTHER TRENDS IN RESEARCH AND PRE-BREEDING

The country has a long tradition of collaboration between commercial and public partners within the field of pre-breeding. With the recent changes (see 4) the future for collaborative efforts does not look as bright as earlier. Short-term research projects (maximum 4 years) are not sufficiently durable to solve difficult breeding challenges (climate changes, quality needs, pest and disease problems).

Current projects target a wide range of areas of which several aim at supporting a future sustainable agriculture (e.g. domestication of new crops, ecological growing, non-allergenic or health compounds). The knowledge of genetic diversity of crops and crop relatives is slowly growing, but research efforts within the field of gene pools and crop plant taxonomy is seriously lacking.



THE NATIONAL PGR PROGRAMME POM¹

6.1 Background and activities

In order to conserve and make sustainable use of our resources of cultivated plants, Sweden adopted in December 2000 a national Programme for the Diversity of Cultivated Plants (POM). Through this programme, work on cultivated plants is to be better coordinated and developed. During the period 2003-2007 a total of 31 million SEK has been invested in the programme. Although a major part of this has been used for the current national inventory (see below), POM is the sum of all activities carried out within the country and thus the total budget is larger than indicated.

The Programme for the Diversity of Cultivated Plants covers five major fields of work:

- Conservation of cultivated plants by collecting plants and describing them and by various other methods;
- Utilisation of cultivated plants by growing and plant breeding;
- Research and development work on such factors as the relationships between species and their genetic variation;
- Education and information for dissemination of knowledge and raising of public awareness; and,
- Co-operation in various international bodies.

TABLE 2

Diversity of cultivars of agricultural crops on the official Swedish Variety List 2008

Crop	Domestic	Foreign
Oat	16	3
Barley	22	10
Winter wheat	13	12
Spring wheat	10	1
Rye	11	2
Triticale	5	4
Small grains	77	32
Field pea	7	1
Field bean	1	0
Vetch	0	1
Pulses	8	2
Winter rape	7	5
Spring rape	12	0
Turnip rape	6	0
Brassica (oil)	25	5
Lucerne	2	0
Alsike clover	1	0
Red clover	12	2
White clover	5	1
Herbage legumes	20	3
Smooth brome	0	1
Cocksfoot	5	1
Meadow fescue	8	2

¹ The Swedish acronym for 'The Programme for the Diversity of Cultivated Plants'

Crop	Domestic	Foreign
Tall fescue	1	0
Red fescue	2	1
<i>Festulolium</i>	0	2
Westerwold ryegrass	2	1
Italian ryegrass	1	0
Perennial ryegrass	7	4
Hybrid ryegrass	2	1
Timothy	10	3
Smooth-stalked meadowgrass	3	0
Fodder grasses	41	16
Brown top	1	0
Creeping bent	1	0
Hard fescue	0	1
Red fescue	6	7
Perennial ryegrass	3	2
Timothy	1	0
Smooth-stalked meadowgrass	9	4
Rough-stalked meadowgrass	0	1
Turf grasses	21	15
Sugar beet	4	27
Potato	10	18
Vegetables	28	9
Total	234	127
Official variety list 2008, %	64.8	35.2
In comparison: certified seed 1993, %	78.0	22.0

6.2 Governance and co-ordination

As a consequence of Agenda 21 and the international commitment regarding sustainable development, Sweden adopted in 1999 a series of different so-called environmental quality objectives. One of these objectives² refers to the agricultural sector and reads 'A varied agricultural landscape'. One measure among several to accomplish this involves the formation and development of a national plant genetic resources programme. POM therefore has strong political support which is an asset for the overall management of the programme. While the Swedish Board of Agriculture, being the responsible sector agency, is supervising the programme the Swedish Biodiversity Centre has been granted the role of coordination. An advisory programme council consisting of representatives of all participating partners (table 3) meet twice per year.

² <http://miljomal.nu/english/english.php>



Table 3
Current partners of POM

The Swedish botanical gardens
The Swedish Biodiversity Centre (coordinating unit)
The Swedish open-air museums
The Swedish National Organisation of Leisure Gardening Societies
The Swedish Board of Agriculture (relevant agency)
The Federation of Swedish Farmers
The Swedish Environmental Protection Agency
Nordic Genetic Resource Centre, NordGen (former Nordic Gene Bank)
The National Heritage Board
The Swedish International Development Cooperation Agency
The Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas)
The Swedish University of Agricultural Sciences
The National Gardening Federation
The Swedish commercial plant breeding sector
The Swedish Pomological Society

6.3 Inventory of cultivated plants

An early priority issue for POM included a national inventory to be made of our cultivated plants and their relatives. A 10-year strategy was therefore been developed to lay down the priorities and technical details of how the inventory should be carried out. Focus was laid on crops that had not previously been targeted by the Nordic Genetic Resource Centre, NordGen (former Nordic Gene Bank).

In 2000, small-scale inventories were made on a trial basis of three groups of popular and well known cultivated plants with the aim of evaluating inventory techniques. For instance, inventories were made in limited areas of older varieties, unimproved varieties and varieties that were introduced early of daffodils and white narcissi (*Narcissus*), roses (*Rosa*) and turnips (*Brassica rapa ssp. rapa*). These inventories were then followed by more comprehensive inventories of other cultivated plants or plant groups.

Initially, redundant seed of old vegetable crops not previously conserved were collected and stored at the genebank. Subsequently other inventories have begun that include fruit and berry crops, perennial ornamentals, ornamental bulb and tuber plants, forage crops, ornamental trees and bushes, vegetatively propagated crops, and cultivated roses. For broadest possible impact, the general public have been invited to contribute knowledge and plants, and the response from the public has been very good. Altogether more than 500 private persons have been trained in techniques to inventory, identify and collect cultivated plants. Plant material is currently being collected for evaluation and comparison before final selection for long-term conservation in national collection will be made.

6.4 Future long-term conservation and access

Seed material conserved *ex situ* are maintained by NordGen and freely available under the regular SMTA following the Nordic Ministerial Declaration on access and rights to genetic resources in 2003³. This also includes vegetatively propagated material currently conserved *ex situ* in field gene banks or so-called clone archives. Access to non-annex 1 crops is made available through a certain NordGen MTA.

All material currently being collected in the on-going national inventory (herbaceous and woody ornamentals, fruits and berries, and certain vegetatively propagated crops) will, following evaluation and clone selection, be transferred to a central gene bank with back-up collections in clone archives. This material will be accessible through MTA agreements. Planting of the first genetic material in the central gene bank is scheduled for 2011.

³ <http://www.norden.org/pub/miljo/jordogskov/sk/ANP2004745.pdf>

SECTION 7

OTHER NATIONAL INVENTORIES

During 2002-2004 the Swedish Board of Agriculture and the County Administrative Boards carried out a survey of valuable semi-natural pastures and meadows in Sweden⁴. This survey describes environmental qualities related to semi-natural pastures and meadows such as type of habitat and values of flora, fauna, water or cultural heritage. It is to be used for following up and evaluating the Swedish Agro-Environmental and Rural Development Programme as well as the national environmental objective 'A varied agricultural landscape'. It will also be used as background material in communication between farmers and authorities as regards management of semi-natural meadows and pastures.

Detailed information of more than 270 000 hectares of valuable semi-natural meadows and pastures is available in the searchable database TUVVA (only in Swedish) including data on the occurrence of wild crop relatives.



⁴ http://www2.sjv.se/webdav/files/SJV/trycksaker/Pdf_rapporter/ra05_1.pdf

DEVELOPMENT OF ACTION PLANS

Many species that occur in the agro-ecosystem have suffered severely from the modernisation of agriculture through improved seed cleaning, use of herbicides and other cultivation techniques. Some of these species, in particular the grasses, are classified as wild crop relatives. In collaboration with regional authorities, the Swedish Environmental Protection Agency has during a number of years developed action plans to collect, conserve and re-introduce some of these threatened species. Seeds have been collected and are stored at NordGen. *In situ* arrangements are also established with farmers including so called 'allmogeåkrar' or old peasant fields that are rich in weeds. They serve an important educative role as exhibits for schools and the public.

SECTION 9

CAPACITY BUILDING

Courses within the field of genetic resources have been continuously taught at the Swedish University of Agricultural Sciences, both at undergraduate and graduate levels. Apart from these, the Swedish Development Agency Sida has funded several large programmes that specifically target conservation and sustainable use of genetic resources. Through these programmes a large number of students and gene bank staff from SE Europe and Africa have been given the opportunity to get training in Sweden. Moreover, Sida has also since many years been funding a two-year MSc programme in biodiversity at the Swedish Biodiversity Centre, as well as a course in proprietary science entitled 'Genetic Resources and Intellectual Property Rights'⁵.



⁵ Given in collaboration between Swedish Biodiversity Centre, Stockholm Environment Institute and Svalöf Consulting AB.

INTERNATIONAL COLLABORATION

As mentioned above, Sida has since long been funding several networks focussing on genetic resources matters. The long-term support to the SPGRC network in Southern Africa is expected to phase out by the end of 2009 and new networks include SEEDNet in former Yugoslavia and neighbouring countries, and EAPGREN in East Africa. A major thrust in Central Asia (Tajikistan, Kyrgyzstan) that was launched in 2007 will unfortunately have to close due to a recent change of priorities of Swedish recipient countries.

In April 2003, CBM as the coordinating unit of POM organised the first European Workshop for national PGR programmes⁶ gathering more than 100 participants from the whole European PGR community. One important outcome of the meeting was the so-called 'Alnarp Statement' calling for sustainable conservation and use of European genetic resources. A follow-up workshop was held in November 2006 in Luxembourg under the theme 'National Plant Genetic Resources Programmes: from research to policy-making' and organised by the Centre de Recherche Public Gabriel Lippmann.

The European collaboration through ECPGR is most important for POM. The development of AEGIS – A European Genebank Integrated System – is of high priority for Sweden, as are its commitments within the Global Crop Diversity Trust and other international obligations within the sector. Sweden has been a major donor to the Trust. There is a possibility that the country's regional and international commitments will increase within the next 5-10 years, and particularly in regions or countries having difficulties in realising the FAO GPA.

CONCLUDING REMARKS: NATIONAL NEEDS AND OPPORTUNITIES



The importance of PGRFA for sustainable agriculture

With rather few exceptions (many forage grasses and herbaceous legumes, some soft berries), Sweden depends heavily on genetic resources from abroad. To that extent, Swedish breeders have effectively made use of the large germplasm collections of the CGIAR system or other material that is freely available. National collecting has put specific emphasis on wild relatives of the forage crops. Through the common Nordic platform NordGen, Sweden is a strong advocate for unrestricted access to genetic resources and will strive to broaden the range of species that are to be placed under the Multilateral System.

Research and development

Sustained funding for research, development and pre-breeding is necessary for optimising future Swedish plant breeding and crop production. A range of challenges lie ahead, incl. adaptation breeding for the northern regions and for climate change, breeding for a more low-resource and sustainable agriculture with more focus on quality and health, new technical applications (oils) and biofuels. Areas of research that need enforcement include cultivated plant taxonomy and gene pools, analysis of genetic variability and its distribution across the country, and development of alternative and cost-efficient conservation methods. Ways to fund some of these areas could be sought at the regional/Nordic or European level. The genetic resources (i.e. NordGen and the uni-versities) and the plant breeding communities would benefit from much closer collaboration.

Capacity building

Sweden is facing a major generation shift in plant science that needs to be addressed. Plant science and plant breeding research must be launched as prosperous roads for young students. National competence in taxonomy and nomenclature of cultivated plants is seriously eroding. More emphasis should be placed on training in the highly complex area of proprietary science. Linkages should be sought and inter-disciplinary programmes established with less orthodox partners such as *inter alia* the food industry, schools and universities of health science and culinary arts, archaeology, anthropology and socio-economy.

