THE NETHERLANDS:

COUNTRY REPORT TO THE FAO INTERNATIONAL TECHNICAL CONFERENCE ON PLANT GENETIC RESOURCES

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Note by FAO

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CHAPTER 1
Introduction

The present report provides an overview of plant genetic resources conservation in the Netherlands, as requested by the Food and Agricultural Organisation of the United Nations (FAO). It is prepared as part of the preparatory activities for the International Conference and Programme for Plant Genetic Resources, initiated by the FAO in response to the Biodiversity Convention of 1992. The objective of these and other country reports is to provide the basic building blocks of a report on the State of the world's Plant Genetic Resources which in its turn will serve as background document for a Global Plan of Action. Hence the present report is not an output in itself, but part of a process. The outline follows closely guidelines provided by the FAO to facilitate access to information and cross reference with other reports.

Plant genetic resources are defined in the FAO Undertaking as follows:

> "Plant genetic resources means the reproductive or vegetative propagating material of the following categories of plants:
>
> **i.** cultivated varieties (cultivars) in current use and newly developed varieties;
>
> **ii.** obsolete cultivars;
>
> **iii.** primitive cultivars (land races);
>
> **iv.** wild and weed species, near relatives of cultivated varieties;
>
> **v.** special genetic stocks including elite and current breeders' lines and mutants."

Theoretically, through new developments in biotechnology the border line between genetic diversity useful to crop improvement and total biodiversity has become diffuse. However, in practice most plantbreeding and genebank programmes (national and international) still consider the traditional definition based on evolutionary taxonomic relationships to be relevant. The scope of the present report nevertheless is somewhat wider. It includes forest genetic resources and some information on various plant collection and conservation activities which may serve other purposes (research, ecosystem rehabilitation etc.) than only crop improvement *in senso strictu.*

1.1 COUNTRY PROFILE

The Netherlands is situated in Western Europe, in the delta of the rivers Rhine and Maas. It borders on Belgium in the South, Germany in the East and on the North Sea in the West and North. It has a temperate climate due to the influence of the Gulf Stream with an even rainfall throughout the year (app. 800 mm per year). The total area of the Netherlands covers 41,526 km^2. Of this area about 18% is water. Of the total land area (34,000 km^2) about 60% is used for agricultural purposes, 10% is forest and the remaining 30% is used for human habitation and infrastructure. The total population is 15.3 million. With approximately 450 people per km^2 (land) the Netherlands is a densely populated country.

The agricultural sector, including agro-industry and trade, is an important part of the national economy. Agriculture alone is responsible for 5% of GDP and 4.5% of employment. The agrosector as a whole, i.e. including agricultural trade and the food industry, contributes 11% to GDP and 10% to employment. The Netherlands is the world's third largest exporter of agricultural produce, after the United States and France. Important factors are a high level of organisation, an orientation on international markets and within Europe a unique geographical position allowing easy access to markets. In 1992 agricultural export value was US$ 36 billion. With an import value of US$ 21 billion, the agricultural trade surplus was US$ 15 billion.

The major export markets for Dutch agricultural produce are the countries of the European Union. Both for animal and plant production, exports are vital to economic prosperity. For most crops more than 50% of total production is exported. Vegetables grown under glass have the highest export dependency rate, 80%. Still, the Netherlands is also a major importer of agricultural products. These imports consist of raw materials for compound feed production, exotic fruit products, but also raw material for the food industry like coffee and cacao beans. Another reason for the large imports is the trading function of the Netherlands. Many products are imported and then exported again to neighbouring countries. Cut flowers, for instance, are flown in from all over the world to be auctioned in the Netherlands and then re-exported.

Of the total number of 120,000 farms about one fourth are run by part-time farmers. These are farmers that put more than half of their labour time in employment outside of the farm. Of the total number of farms 12% are arable farms, 20% horticulture, 10% intensive livestock, 46% grazing livestock and 12% mixed crop/livestock holdings. The total production value of Dutch agriculture was 36 billion guilders (app. US$ 21 billion) in 1992.

Of this total 60% is generated by livestock farming, 32% by horticulture and only 8% by arable farming. Arable farming has been declining steadily since the 1950s, when it still accounted for almost 20% of total production value. Horticulture has shown the largest growth, particularly in crops grown in greenhouses.

In arable farming the most important crops are potatoes (i.e. seed potatoes, ware potatoes and starch potatoes), sugar beet and grains. Potatoes generate the largest income per hectare. Thus farmers have an incentive to use intensive potato cultivation methods. These methods, however, together with the potato being a very vulnerable crop lead to a relatively high use of agrochemicals for pest control.

The Dutch horticultural sector is much more diverse, with the cultivation of vegetables, fruit, cut flowers, plants, garden trees and flower bulbs. Cut flowers and plants, both grown in green houses, generate almost half of all income in horticulture. The major flower crops are rose and chrysanthemum. Also many vegetable crops are grown under glass, like tomatoes, peppers, cucumbers and lettuce. The area under glass is steadily increasing.

Currently a major challenge for Dutch agriculture is the reduction of environmental pollution. In the livestock sector the main problems are caused by the manure surplus: more nutrients are spread on farm land than can be taken up by the plants (mainly grass and feed maize). Thus both surface and ground water is being polluted. In crop production the large use of chemical pesticides is increasingly causing environmental pollution. The reasons for the large use of pesticides are twofold. First, Dutch farmers use very intensive cultivation methods. If we take production value per hectare as a measure of intensity of production, Dutch agriculture is five times more intensive than the average in the European Union. The second reasons is related to the export of agricultural produce. Some importing countries have very strict phytosanitary regulations, demanding the imported products to be absolutely disease-free. Thus farmers may spray more than is needed from a cultivation perspective.

In reaction to the challenges of pollution, the Dutch government has implemented strict environmental policies. One of the main goals is a 50% reduction in pesticide use. Thus a large effort is devoted to developing improved cultivation methods and to breeding plant varieties with improved pest and disease resistance. Knowing that the Netherlands is a large seed exporter (it is the world's largest exporter of seed potatoes), these breeding efforts eventually may also lead to a reduction of environmental pollution in other parts of the world.

Dutch producers of propagation material have a strong position in the international seed market, both for horticultural and arable farming crops. For most crops, Dutch farmers mainly rely on domestic suppliers. For arable crops, Dutch seed companies, some owned by farmer cooperatives have a strong position on both the national and international market in seed potatoes, grasses, sugar beet and pulses. Although the Dutch market is relatively small, it is a very demanding market, thus challenging seed breeders to continuous variety improvement. For horticultural crops grown in green houses, Dutch seed companies are market leader. In the vegetable seed sector a number of national companies have become part of transnational seed companies. In 1992 the export value of Dutch agricultural seeds (sugar-beet, winter wheat, summer wheat, maize, grass seed and pulses) totalled $ 426 million and seed potatoes $ 278 million. The export of horticultural and flower seeds in 1992 represented a value of around $ 265 million ranking the Netherlands behind the USA as the second largest exporter. The Netherlands also has a dominant role in the export of flowering bulbs and rootstocks valued in 1992 at around $ 680 million.

CHAPTER 2
Indigenous Plant Genetic Resources

From an estimated total of 1,400 indigenous vascular plant species, at least 240 taxa do have economic value because of their relevance as (progenitors or close relatives of) human food plants, spices, fodder crop and host plants of honey bees, medicinal plants, for fire wood and timber production, as natural dyes, tannins, pesticides or perfumes, and because of their ornamental value. Furthermore, because of their ecological value derived from data on rarity on a global or national scale and decline, 408 species of vascular plants ("target species") have been selected by the Dutch government for special protection. Apart from the vascular plants, some representatives of the c. 4,000 fungi taxa, c. 670 lichen species, c. 440 moss species and c. 120 liverwort species may also have some actual or potential economic and ecological significance.

2.1 FOREST GENETIC RESOURCES

Almost one half of the number of the 240 vascular plant species mentioned above occurs in forests and woodlands, i.e. in the tree layer or in the understorey layer. For an overwhelming majority of these forest species, the Netherlands constitutes a central, subcentral or marginal part of their distribution area. About one quarter of all forest species is considered to be threatened as they have been included in red lists. However also in many populations of indigenous trees and shrubs not on the red list genetic diversity has been seriously eroded and in many instances may originate from more recent introductions as part of reforestation.

Although nowadays only some 8% of the area is covered by forests, forest vegetation has dominated the post-glacial landscape before man's impact became as extensive as it is today. After human colonization habitat destruction of forests and woodlands has been immense in the Netherlands.

Habitat quality and genetic differentiation in trees and shrubs have been and are affected by the introduction of non-native, often more productive, plant material, unsuitable forest exploitation and management, and habitat fragmentation. Furthermore, genetic variation in understorey herbs is threatened due to atmospheric pollution, habitat fragmentation, forest management, and in some cases also due to the introduction of competitive,

non-native plant material. In general, forest plants are considered to be highly sensitive to isolation and habitat fragmentation. Therefore, the (genetic) condition of many native forest species is considered very critical, although some of the species are still quite common. Very often it is uncertain what the origin of the plant material is due to commercial introduction.

2.2 OTHER WILD SPECIES AND WILD RELATIVES OF CROP PLANTS

In most habitats, progenitors and wild relatives of commercial, agricultural, forest, pastoral, or medicinal plants are found. Apart from forests (see previous section), they occur in coastal and saline habitats, fresh water wetlands, heathlands, various grasslands on acidic, neutral and alkaline substrates, arable fields and other communities of disturbed soils, forest margins, etc. Only a limited number of species with a central and subcentral distribution in the Netherlands occur in low frequency. Exceptions are e.g. *Artemisia absinthium, Lepidium spec., Satureja vulgaris*, and *Rosa pimpinellifolia*.

As holds for the Dutch nature as a whole, most of these habitats suffer strongly from atmospheric pollution by acidifying and eutrophicating substances, unfavourable water management, habitat fragmentation, unsuitable natural resources management, etc. There is some evidence that in wild populations of some native Dutch species genetic variability is low, most probably due to habitat fragmentation and isolation.

2.3 LANDRACES (FARMERS' VARIETIES) AND OLD CULTIVARS

The agriculture in the Netherlands is almost totally based on the use of modern improved varieties supplied by commercial plantbreeding and seed production. Also home gardens rely mainly on commercial varieties. Trade in traditional varieties is discouraged by seed regulatory frameworks in national seed legislation.

CHAPTER 3
National Conservation Activities

The Netherlands, considering its limited size, high human population density and geographic location and in spite of considerable habitat degradation, still maintains considerable biodiversity. As has been mentioned above, it includes many thousands of plant species. Furthermore, 180 species of breeding birds and roughly 60 species of mammals occur. Only a few if any of these species are endemic. However, some species are confined to the atlantic conditions with a precipitation surplus and therefore nutrient poor substrates. Therefore, the distribution areas of many of these species and of species of saline habitats are fairly limited and vulnerable.

For species with a predominantly continental, mediterranean and boreal distribution the Netherlands constitute a rather marginal part of their habitat. It is not surprising that the open nature of the country as an estuary of a number of large rivers does not lead to isolation and the occurrence of endemic species. In addition, the Netherlands is situated at the West-Palearctic migration route of many bird species and thus temporary home of many passing bird species requiring appropriate feeding grounds.

As was already pointed out above, the landscape of the Netherlands is largely the result of human interference. All pristine woodlands and bogs have disappeared. Without a high level of management the low lying clay and peat areas would look different from what they are today. Even the less productive sandy regions are largely transformed. In short, agriculture is the dominant activity responsible for the current landscape of the Netherlands.

The Dutch governmental policy focuses on:

- Integration of agriculture and nature management.
- A reduction of environmental pollution (National Environmental Policy Plan).
- An improved local and regional water management.
- The creation of new natural habitats and of a coherent, main ecological network for the Netherlands (Nature Policy Plan).
- The maintenance and restoration of still existing natural values (Nature Policy Plan).
- The conservation of identified species (Nature Policy Plan).

The main ecological network may lead to a better exchange between populations and therefore to less genetic erosion on various spatial scales.

The ecological basis of the Dutch policy is that the conservation and restoration of natural processes may provide the best starting point for a durable conservation of biodiversity. In the draft policy document on target ecosystems ("Concept nota Ecosysteemvisies"), the natural quality of ecosystems is defined as "the contribution it renders in a manner as natural as possible to national and international biodiversity". These natural processes have been interpreted to hydrological regimes, geomorphological processes and nutrient cycling, herbivory, etc. on various temporal and spatial scales. The significance of ecosystems and their underlying processes for nature protection is derived from the (potential) occurrence of the "target species" mentioned before.

As an example of the consequences of the policy to restore natural processes, the establishment of forest reserves may be mentioned, in which the management of some 60 forest stands throughout the country has been abandoned to allow natural rejuvenation and mortality to occur. However, either it is uncertain whether the plant material in these reserves is indigenous or plant material is most probably not native. Changes in forest structure and composition are monitored.

Government and provincial authorities are jointly responsible for nature policies and their implementation. The Nature Policy Plan recognizes three areas of concern: Environment-Water-Nature. It indicates the relevance of nature to various sectors of human activity and their obligations, such as those of agriculture, recreation, infrastructure, defense and others. The policies are executed through for instance the Nature Protection Law, National Parks, land ownership, management subsidies etc.

3.1 PLANT GENETIC RESOURCES

Formal Dutch policies and regulations on biodiversity, unlike the Biodiversity convention are restricted to natural biodiversity. Hence they do not so far include plant genetic resources as generated and/or used by agriculture. However, following the ratification of the Biodiversity convention by the Netherlands, the need for additional policy and legal measures with regard to Plant Genetic Resources for Agriculture and food (PGRFA) are recognized and under review. Meanwhile however the Netherlands has traditionally been involved in collecting and maintaining a broader range of plant materials

than just PGRFA. The forestry sector has depended heavily on seeds of a number of tree species introduced from other countries to the point where material of natural Dutch origin of many of the common forest species is considered to be rare. Precise data on this however is lacking.

Botanic gardens have held a prominent place in science in the Netherlands since the seventeenth century. Linnaeus worked for many years in the Netherlands, attracted by access to plants from many parts of the world. Tulips were first introduced into the botanical garden of the university of Leiden. Many present day commercially important ornamental plants were originally introduced as botanic specimen. The Hortus Botanicus of Amsterdam played a role in the introduction of oilpalm and Arabica coffee into the than Dutch East Indies (Indonesia). Generally the growing of plants in greenhouses, a major sector in Dutch economy, originated from experiences gained in growing tropical plants in various botanical gardens. Presently there are some 20 botanic gardens in the Netherlands under the umbrella of the Foundation of Dutch Botanic Gardens housing a collection of some 45,000 plants. During the past decades the role of botanic gardens has changed from pure taxonomic research to include conservation and more public and educational activities. However, its financial basis is extremely fragile. The foundation and thus the botanic gardens have been privatized and are expected to generate their own funding support after a transfer period of three years. Opportunities for botanic gardens to generate funds are however limited. It is ironic that an important tradition in the study and collecting of biodiversity in the Netherlands is threatened at a time when government authorities are considering the consequences of the ratification of the Biodiversity Convention.

3.2 IN SITU CONSERVATION

Natural occurring PGR of relative importance to plantbreeding is by and large restricted to a number of grass species, notably *Lolium perenne* for which the Netherlands forms part of a secondary region of diversity. Recent research has indicated that genetic diversity of at least *Lolium* and probably other grass species is adequately maintained in existing natural and protected grassland vegetation. However a monitoring system is still lacking. A number of other species related to crops, such as *Lactucas, Brassicas*, *Prunus*, various *Legumes* etc. are of minor significance as PGRFA. There are no specific *in situ* conservation activities directed at such species since conservation is assumed to take place through nature conservation programmes.

3.3 *EX SITU* COLLECTIONS

Since 1985 the Netherlands Ministry of Agriculture, Nature management and Fisheries (LNV) maintains the Centre for Genetic Resources, the Netherlands (CGN) which is designated as the national genebank for PGRFA. Since 1991 CGN forms part of the Centre of Plantbreeding and Reproduction Research (CPRO) of the Agricultural Research Department (DLO). CGN is fully funded by the Ministry LNV and has a status of independence from CPRO in budget and programme. The objectives, formally laid down in its charter state that "CGN forms the contribution of the Netherlands to the conservation of PGRFA in an international context". This means that it must adhere to all commitments and conventions to which the Netherlands government is a party, including the FAO undertaking and the Biodiversity Convention. The national status of CGN as the only government genebank for PGRFA is unchallenged and its importance has broad support at the policy level as part of agricultural research funded by the government.

Prior to the establishment of CGN, available collections at government institutes concerned with plantbreeding were primarily assembled as part of ongoing breeding programmes. Hence their scope was generally but not always limited to satisfying short term usefulness. However, since than the objectives have been broadened to include conservation of overall PGR.

3.4 CGN COLLECTIONS

Three main types of collections are distinguished: base, active and duplicate collections:

- **Base collection**: the main objective of a base collection is to represent the overall genetic diversity of a certain group of plants and to assure its availability for an unlimited period of time. It concerns crops for which CGN has accepted international responsibilities in the context of the worldwide network of base collections. This network is coordinated by the International Plant Genetic Resources Institute (IPGRI) in Rome, Italy.
- **Active collection:** active collections contain accessions representing a specific part of known genetic diversity for a certain group of plants. The primary objective of the collection is to cater to specific breeding objectives.
- **Duplicate collection:** a duplicate collection is a replicate base collection, stored at an alternative location, to prevent loss of valuable germplasm in case the base collection or part of it is destroyed.

Since its establishment the CGN has been provided with a substantial number of germplasm collections by breeding institutes of the Netherlands Agricultural Research Department (DLO) and Wageningen Agricultural University Wageningen (WAU). These collections represent the larger part of the present collections totalling approximately 15,000 accessions divided over 18 different crops (see Table 1). So far, new entries in the collection are mainly from working collections of various crops available in the Netherlands. Selective broadening of the collections was realized with material from commercial seed firms, notably cultivated material (varieties). Wild material was usually obtained from other genebanks, botanical gardens and from occasional collecting activities. CGN has participated in a number of collection programmes over the past years (Table 2) together with national programmes of the countries concerned and based on appropriate bilateral agreements.

The current number of accessions is 14,511. It is expected that in the next ten years the number of accessions will increase up to ± 30,000. This increase will partly come from some large vegetable collections from institutes in the Netherlands which are being included in the CGN collection: tomato (1,300 accessions), pepper (900 acc.), eggplant (400 acc.) and cucumber (1,000 acc.). Some other important existing collections will be expanded: onion/leek (+300 acc.), crucifers (+400 acc.), lettuce (+300 acc.), cereals (+1,500 acc.) and peas (+500 acc.).

Table 1 Status and priorities of CGN-collections

Crop	Species	Status collection	Priority	Number[1] of accessions
Lettuce	*Lactuca* spp	Base	1	1,630
Crucifers	*Brassica oleracea*	Base	1	527
	Brassica rapa	Working	2	338
	Raphanus sativus	Working	3	184
	Brassica napus	Working	2	84
	Overigen	Working	3	241
Potato	*Solanum* spp	Base	1	2,780
Beet	*Beta* spp	Base	1	1,920
Onion and Leek	*Allium* spp	Base	1/2	100
Tomato	*Lycopersicon* spp	Working	2	776*
Pepper	*Capsicum* spp	Working	2/3	*
Egg plant	*Solanum* spp	Working	3	*
Spinach	*Spinacia* spp	Working	2	363
Cucumber	*Cucumus sativus*	Working	3	*
Barley	*Hordeum* spp	Working	2	3,380

Crop	Species	Status collection	Priority	Number[1] of accessions
Wheat	*Triticum* spp	Working	3	5,090
Oats	*Avena* spp	Working	3	532
Maize	*Zea mays*	Working	2	448
Pulses	*Pisum* spp	Working	2	740
	Vicia faba	Working	3	607
	Lupinus spp	Working	3	41
Fodder crops	*Lolium* spp	Working	2	134
	Phleum spp	Working	3	34
	Dactylus glomerata	Working	3	28
	Trifolium spp	Working	3	137

1: Accessions included in the genebank up to 01.01.1995.
***: CPRO-DLO presently responsible for these collections but will be handled over to CGN in the near future.**

Decisions on where and what to collect are made on the basis of gaps in collections as identified by the international crop networks as exist for *Beta, Brassicas* and wild species of potato, or with institutes sharing base collection responsibility (*Allium*).

In the future more collection missions will probably be undertaken to collect wild (related) species and primitive landraces of various crops under bilateral or multilateral agreements.

Table 2 Collection activities

Year	Country	Species	No. accessions
1980	Bolivia	Wild/primitive potatoes	317
1981	Pakistan	Wheat, Barley	790
1981-1984	Neth. Belgium	Cruciferous crops	900
1982-1983	Netherlands	*Allium*	285
1985-1986	Netherlands	Red clover	124
1985-1986	Egypt	*Allium, Brassica, Lactuca*	350
1987	Ireland	*Beta maritima*	38
1989	Spain/Portugal	*Beta, Lactuca, Euphorbia*	92
1990	Turkey	*Beta, Allium, Lactuca*	178
1990-1991	Russia	*Beta, Allium, Lactuca*	130
1993-1994	Bolivia	Wild species potato	76
1994	Italy	*Beta*	18

3.5 RATIONALIZATION OF COLLECTIONS

Rationalization of collections has become an important issue, since this leads to collections being organized so that utility and maintenance are optimized while maintaining its genetic diversity.

In the case of cross pollinating crops, samples with a corresponding genetic origin are bulked. For *Brassica oleracea*, *Allium cepa* and *Allium ampeloprasum* group Leek, farmers and breeders have made numerous selections, based on a limited number of heterogeneous cultivars. Hence, many selections share a common genetic background. Closely related material are grouped on the bases of historical evidence and morphological characteristics. Crop experts from private breeding firms, the Dutch cultivar registration service and the inspection service for vegetable and flower seeds assist in grouping the samples. The samples of a specific group are bulked in a joint regeneration. To maintain the total genetic variation of the compound sample, all samples of a group contribute an equal number of plants (at least 20) to the joint regeneration of at least 100 plants. The bulking of samples has resulted in a 50% reduction in collection size for cabbages, Brussels sprouts, onions and leek, all originating from the Netherlands.

Another aspect of rationalization is the splitting of heterogeneous samples in distinct homogeneous fractions. For self-pollinating crops, this approach can be used to simplify the description of accessions. Additional concepts for rationalization, such as core collections, are being studied and implemented.

For the crops represented in CGN, material developed in the Netherlands (landraces and varieties) are entered into the collection judged on their value as original genetic resources.

Base collection status for a crop/species is interpreted by CGN as a responsibility to establish a network of cooperating genebanks that have collections of such material supported by an international data base of that crop. Hence a de-centralised base collections managed by the network with joint decisions on such aspects as identifying duplicates and gaps in collection, collection strategies and activities, regeneration programmes and exchange, evaluation and so on. For base collection material, no selective judgement is made on their relative importance. The objective is a rational sampling of overall genetic diversity present in the crops/species, rather than their present presumed usefulness and insuring storage of duplicates in other genebanks. For *Beta* an international crop network of around 20 countries is operational including countries in Western Europe, the USA, Japan, China, India and Iran. Coordination of the network has been transferred from CGN to FAL-

Braunschweig (Germany) in 1991 while CGN started with the organisation of a similar network for *Brassicas.* For wild species of potato CGN cooperates with CIP (Peru) and the genebank at sturgeon Bay (USA). In working collections the more short term usefulness of material is of course an important consideration.

All material entered into the genebank is freely available to users in accordance with the FAO Undertaking. The stated policy of CGN is to promote international cooperation in the conservation of PGR at all levels.

Apart from conservation, access to and use of collection material is actively stimulated through the following activities:

- The development of a user friendly documentation system (GENIS).
- Making available on request data files.
- Publication of a series of CGN Crop Reviews describing the overall genepool and the kinds of material and information available to assist users in selective requests.
- Prepared sub-samples of all accessions enabling efficient distribution.

Table 3 gives the samples distributed over the period 1988 to 1994. On average 60% of the material was distributed to users in the Netherlands and 40% to users abroad.

The main users are research institutes, universities and both public and private plantbreeding. The aim is not in first instance to increase the number of distributed samples but rather to increase the usefulness of samples by effective use of the available information in the documentation system.

The present collections of the various crops reflect primarily material that was already available in the Netherlands. These collections are gradually rationalised. The aim is not to achieve self-sufficiency in PGR, but rather to contribute to adequate conservation in an international context. The assumption is that no country, except perhaps the very large can ever achieve any degree of self-sufficiency. Of course this policy is dependent on continued access to collections available in other countries as is *de facto* the present state of affairs with only a few exceptions.

The Netherlands is in principle prepared to transfer collections of certain crops to other genebanks on the basis of agreements that such collections are secure and continued access to such collections is maintained. This has actually been done with a number of collections. A good and well documented *Phaseolus* collection was handed over to CIAT (Columbia), a collection of wild *Cucumis* species was tranferred to the United States (NSSL,

Fort Collins) and Germany (ZIGuK, Gatersleben) and collections of *Daucus* and Egyptian *Raphanus* to England (HRI, Wellesbourne). The Netherlands is also prepared to release samples of its collection and the available documentation to the original countries of origin.

Table 3 Number of distributed samples per country and period, excluding CGN

Country	1988	1989	1990	1991	1992	1993	1994	Total
Australia	0	0	0	65	72	0	0	**137**
Austra	0	0	0	0	1	0	0	**1**
BRD	0	40	16	0	11	1	78	**146**
Belgium	0	0	3	0	0	0	7	**10**
Bulgaria	126	0	1	112	0	0	0	**239**
Canada	0	0	0	0	20	0	0	**20**
China	3	0	0	0	8	10	0	**21**
Croatia	0	0	0	0	0	4	3	**7**
Czech Rep.	0	0	0	0	0	0	3	**3**
Czechoslovakia	190	49	0	132	7	0	11	**389**
DDR	0	0	0	6	0	0	0	**6**
Denmark	0	0	0	16	0	0	170	**186**
Ethiopia	0	0	0	0	0	16	0	**16**
France	8	2	43	30	9	0	2	**94**
Germany	0	0	0	0	0	0	1	**1**
Greece	0	0	0	0	0	0	0	**0**
Hawaii	100	0	0	0	0	0	214	**314**
Hungary	0	0	0	37	3	1	0	**41**
India	31	0	0	0	0	3	0	**34**
Iraq	0	0	0	0	0	0	37	**37**
Ireland	0	0	0	0	0	0	0	**0**
Israel	0	0	0	0	2	0	0	**2**
Italy	2	0	0	0	0	13	9	**24**
Japan	0	0	0	0	200	3	166	**369**
Mexico	0	81	0	0	0	0	0	**81**
Netherlands	1,526	494	637	972	507	493	1,833	**6,462**
Norway	0	0	0	0	0	0	0	**0**
Philippines	0	0	24	0	0	0	0	**24**
Poland	0	0	0	3	0	1	0	**4**
Portugal	0	0	0	0	0	5	172	**177**
Rep. of Moldova	0	0	0	0	21	0	0	**21**
Romania	0	0	0	0	1	0	0	**8**
Russia	0	0	0	0	0	45	0	**45**
Spain	0	0	6	1	0	6	9	**22**
Sweden	0	0	1	13	0	0	0	**14**
Switzerland	0	0	0	0	0	0	0	**0**
Syria	0	0	0	0	0	0	8	**8**
Togo	0	0	0	9	6	0	0	**15**
Turkey	0	0	0	3	0	28	21	**52**

Country	1988	1989	1990	1991	1992	1993	1994	Total
USA	204	101	344	0	0	61	44	**754**
USSR	0	30	0	18	7	0	0	**55**
United Kingdom	0	0	3	4	0	57	174	**238**
Grand total	**2,190**	**797**	**1,078**	**1,421**	**875**	**747**	**2,962**	**10,070**

3.6 STORAGE FACILITIES

All collections are stored in freezer compartments of 90 m^3 of which presently three are in use, two at -20°C and one at +4°C located in a separate building together with a drying room (10 m^2, 16°C at 12% RH) and a working room (20 m^2). All safety precautions are installed to guarantee appropriate temperatures and humidity in accordance with internationally recommended standards at all times.

All collection samples are duplicated in other genebanks. Species for which CGN has accepted shared base collection responsibility have duplicated storage under institutional arrangements with HRI- Wellesbourne, UK (*Allium, Brassicas, Lactuca)* and FAL-Braunschweig, Germany (wild species potato and *Beta*). The holders of the base collection take full responsibility for viability testing and for regeneration if and when necessary.

CGN is still in the process of transferring existing working collections into the genebank following strict procedures with regard to rationalization of collections and satisfying accepted standards of viability and amount of seeds. The same applies to new materials obtained from collection activities or on the basis of exchange. Private plantbreeding companies have initially provided assistance at no cost in regeneration of accessions (notably wheat and maize) but at present available capacity at CGN for regeneration is adequate.

Storage capacity is adequate at present. However, if additional storage capacity is required, obtaining the necessary funds so far has not posed serious problems.

CGN is in the position to offer storage capacity to other genebanks under mutually agreed conditions without claiming access to such collections. If necessary it is willing to consider expansion of storage facilities if needed for such purposes.

The objective of the national genebank is long term. As stated before, its basic policy is to promote international cooperation in all aspects including transfer

to or acceptance of collections from other genebanks while maintaining free access.
While the national genebank covers only a limited number of crops, a strategic plan of action is presently being developed for a national biodiversity programme involving botanical gardens, arboreta, living collections and naturally occurring biodiversity. This programme will be submitted to parliament in 1995 and is expected to generate additional funding for its implementation.

3.7 DOCUMENTATION

The CGN collections are well documented; all data are computerized in a database called 'GENIS'. This database is based on the DBMS Oracle, and is documented in an elaborate data-dictionary.

The documentation system holds passport data, characterization data, evaluation data, but also data about the distribution of the accessions, the germinability and information about seed quantity and location.

All accessions are fully documented though the extent to which data are available varies between the samples.

Users are supplied with data in any form appropriate to their needs; in letters answering specific questions, in listings on paper, in ASCII files on floppy or via Email, or in DBase files on floppy or via Email. It is also possible for users to directly query the system, with help from staff members, while visiting CGN, though this is not recommended.

CGN, on request, contributed to all ECP/GR and other central crop databases. CGN created a central crop database on *Beta* and cultivated *Brassica* on its own initiative, but supported by the ECP/GR. CGN has published on these databases, and on the concepts behind creating and using such databases in general. By increasing the quality and accessibility of these databases, and by increasing the level of analysis of the data in them, the value of these databases are greatly enhanced.

CGN has no experience with documenting *in situ* PGR.

Documenting wild relatives causes no specific problems. Handling wild material requires specific expertise; taxonomic classification is more difficult than with the usual cultivated taxa. This applies particularly for the numerous

wild species of potato which are subject of a cooperative agreement with the Department of Plant Taxonomy of the Wageningen Agricultural University.

A backup of the database is made daily, and stored in a fire proof vault. This can be considered very safe.

3.8 EVALUATION AND CHARACTERISATION

Characterization and primary evaluation allow identification of a sample and a description of its genetic variation. If proper assessment of a descriptor requires expert knowledge, crop specialists are consulted. Where possible characterization and primary evaluation are carried out during regeneration. During these trials users are given the opportunity to view the collections.

Active participation of users in the evaluation of germplasm is encouraged, since CGN is not equipped to screen all the collections for properties such as disease resistance, chemical properties and physiological parameters. "Users" are primarily plantbreeders. In the Netherlands farmers do not play a role anymore in crop improvement. Field crops are screened for field resistance to some diseases during regeneration to provide preliminary indications. Evaluation and characterization data obtained during trials performed by users are returned, and recorded in the CGN information system GENIS-VAX. All information is freely available. All materials entered into the collection have been characterised.

Many decisions in genebank management are based on expectations about the genetic diversity in and between accessions and (parts of) collections. The most appropriate tool to determine genetic diversity is provided by biochemical analysis. The CGN has recently set up a facility for the analysis of iso-enzymes through electrophoresis.

3.9 DESCRIPTOR LISTS

A minimal descriptor list is developed for each crop based on IPGRI and UPOV descriptor lists, sometimes supplemented with our own descriptors Private and public breeders are usually consulted when a new descriptor list is developed.

The criteria for inclusion of a descriptor in a descriptor list are:

- Descriptor must have obvious discriminatory value.
- Descriptor score must be easy to reproduce.
- Descriptor should preferably be of interest to breeders (agronomic importance).
- Descriptor must be easy to score.

When descriptors are used from IPGRI descriptor lists, the same descriptor states (interpretation of scores) are usually maintained. Descriptor lists are occasionally reviewed to evaluate whether the descriptors included still meet the above mentioned criteria.

3.10 REGENERATION

Regeneration is the renewal of a seed sample by taking a random sample of seeds, sowing and growing the resulting plants under conditions so that the seeds harvested will possess the same characteristics as the original population. Regeneration of seeds takes place when the germination percentage has fallen below acceptable levels or shortage of seed occurs. As a rule, the germination percentage should be above 75-80%. Samples are marked for regeneration when seed is no longer available for distribution. The seed manager monitors all accessions for these criteria.

Most regenerations are carried out by CGN itself, although some are conducted in cooperation with private breeding firms who have similar regeneration procedures to those of CGN. Cooperation with these firms enables CGN to increase its capacity for seed regeneration. The available capacity is limited delaying uptake of collection material in the central collection, especially for crops requiring hand pollination or isolation (cross pollinated crops).

To minimize the impact that regenerations can have on the genetic identity of a seed sample, the frequency of regeneration is kept as low as possible.

A very important aspect of regeneration is the production of healthy, viable seeds. In general, regenerations under glass yield better quality seeds compared to accessions regenerated in the field.

Germplasm that is distributed by genebanks, is carefully checked for the presence of seed-borne pathogens and pests, so that it does not contribute to the spreading of diseases and pests. It should provide an uncontaminated basic stock for breeding programmes. CGN maintains a high standard of disease and pest control, including pathogens with no official quarantine status.

Full and accurate details of the regeneration history of every accession is stored in the documentation system

3.11 FOREST GENETIC RESOURCES

The genetic diversity of forest genetic resources in the Netherlands is a matter of concern that so far has received little attention. New initiatives are proposed to identify available genetic diversity in woody species in both natural stands and in production forests, but not yet implemented (see also chapter 2; forest genetic resources, chapter 3; use of forest genetic resources and chapter 4; private collections).

CHAPTER 4
In-Country Uses of Plant Genetic Resources

The Netherlands has traditionally been heavily involved in plantbreeding. In the late nineteenth century small seed firms started to supply seeds to farmers by selecting in locally available landraces of agricultural and horticultural crops and by multiplying local fruit varieties. As plantbreeding evolved as an applied science of genetics in the early twentieth century some of these local firms expanded, established proper breeding programmes and widened their use of genetic material beyond local landraces. At the same time government plantbreeding research started, supporting public plantbreeding and producing varieties of notably wheat and potatoes. After the 1940 rapid expansion of both public and private plantbreeding took place. Plant Breeders' Right legislation was adopted and the respective roles of the public and private sector were regulated. The development of varieties was largely left to the private sector while government supported plantbreeding institutes supplied research and base populations. This cooperation proved to be extremely effective and formed the basis of what is now a large and internationally oriented seed industry. In 1992 the export value of Dutch agricultural seeds (sugar-beet, winter wheat, summer wheat, maize, grass seed and pulses) totalled $ 426 million and seed potatoes $ 278 million. The export of horticultural and flower seeds in 1992 represented a value of around $ 265 million ranking the Netherlands after the USA as the second largest exporter. The Netherlands also has a dominant role in the export flowering bulbs and rootstocks valued in 1992 at around $ 680 million. The success of the seed industry is based on heavy investments in plantbreeding and internationalisation of markets. It is obvious that this only could be achieved by access to considerable genetic diversity.

Prior to establishment of CGN as the national genebank, government breeding institutes were the main source of genetic stocks for variety development in the private sector. Breeding programmes assemble as a routine working collections and all private companies therefor have such materials. However such collections rarely contain "unique" genetic diversity that is not also available in genebanks. Furthermore most commercial breeding depends to a large extend on already improved material, i.e. varieties available in the market or obsolete varieties. However this situation is changing since government breeding institutes have been reorganised and are now amalgamated in the Centre for Plantbreeding and Reproductive Research (CPRO-DLO). Research in this institute has shifted to more strategic and fundamental research (including biotechnology) at the expense of population

improvement. While detailed information is lacking, most breeding companies regularly request material from genebanks in other countries (mainly in Europe and North America) in addition to what is obtained from the national breeding institute and the genebank. In Table 3 accessions distributed by CGN to both public and private organisations is summarized over the period 1988 to 1994. When no suitable material can be provided, CGN as a service assist users in identifying other sources from which material may be obtained.

4.1 PRIVATE COLLECTIONS

There are only few private organisations involved in genetic resources collection *per sé*. One example is the Hortus Bulborum, housing an important collection of bulbous flower species, all of which are of European origin; *Tulipa* cultivars and species (1,200 accessions), *Narcissus* cultivars and spp. (70), and minor collections of *Hyacinthus* and *Fritillaria*. The hortus Bulborum closely cooperates with CGN in duplicating a core collection and in documentation. Collection material is made available to users, primarily by supplying pollen. A number of private persons hold smaller collections of such species.

A second example is "Het Hof van Eden" (the Court of Eden), run by a small NGO and claiming extensive collections of a broad range of species such as *Allium spp.* (600 accessions), *Beta spp.* (30), *Brassica spp.* (800), *Capsicum spp.* (400), *Chenopodium spp.* (400), *Cucumis spp.* (100), *Cucurbita spp.* (400), *Daucus spp.* (180), *Fragaria spp.* (400), *Hordeum spp.* (400), *Lactuca spp.* (450), *Lycopersicon* (700), *Phaseolus spp.* (600), *Pisum spp.* (600), *Raphanus spp.* (260), *Triticum spp.* (400), *Vicia spp.* (120) and some minor collections of other species. Emphasis is reported to be on landrace material of primarily European origin. Material is said to be documented but data are not available nor is information provided on the actual state of the collection, methods of regeneration and so on. Seeds are stored at ambient temperatures. Various attempts to provide more secure support to this possibly important collection failed so far because of different outlooks. Access to this collection is restricted and selected materials are made available through occasional catalogues, but outlets and facilities are limited.

Recently an interesting initiative was started to collect seeds of around 75 indigenous tree and shrub species in natural stands by a small private organisation named "Bronnen" (Resources). Bronnen does research on natural habitats and populations of native trees and shrubs, collects seeds and

maintains such materials in small living collections. All information collected is stored and made available on certain conditions to other organisations. Seeds are sold to users. This includes commercial tree nurseries for larger multiplication and sale of planting materials. The main users are provincial authorities, municipalities, the Land Planning Authority (Landinrichtingsdienst), private nature conservation organisations and so on involved in establishing plantings of such material; parks, waysides, landscape and forest rehabilitation programmes etc. This is an interesting and in the Dutch situation efficient form of *in situ* conservation. For threatened or rare species, the foundation is establishing seed gardens for both conservation and the harvesting of seeds.

All private breeding companies have working collections of crops. However, information on such collections is not readily available. These collections include breeding lines as well as more general PGR but probably seldom contain "unique" materials not available in genebanks. Arrangements exists whereby CGN is notified when collection materials are discarded for possible uptake in the national collection.

4.2 USE OF FOREST GENETIC RESOURCES

Collections of trees have been established at institute level in the Netherlands aiming to have a large variability for breeding purposes. Foreign material was collected together with indigenous sources. These collections are still maintained even though breeding operations are being limited. Relatively large *ex situ* collections of *Populous nigra* and several *Salix* species are in operation at tree level as well as at stoelbed level; the latter for multiplication purposes. On request propagation material is sent around the world for research purposes.

4.3 IMPROVING PGR UTILIZATION

As stated before, the Netherlands has a well developed public and private plantbreeding sector. There is close cooperation between both sectors. The genebank has good working relationships with many breeding companies who assist in the regeneration and characterisation of collection material. The advisory committee of the genebank includes the private sector and NGO's. The service function of the genebank has a high priority and is available to all

bona fide users regardless of type of organisation or nationality. A possible problem is that generally biosystematic research and population improvement is getting less attention in public supported research as more funds have gone to biotechnology. This problem is by no means unique to the Netherlands and is acerbated by overall reductions in public support of research in the Netherlands. On the other hand the private sector is making increased use of CGN collections and its documentation system presumably in part to fill this gap. The availability of such results however is often restricted and can not be enforced.

CHAPTER 5
National Goals, Policies, Programmes and Legislation

CGN is charged by the Ministry of Agriculture, Nature Management and Fisheries under special programme funding to serve as the national genebank for agricultural and horticultural crops. It is classified among services provided by the government. It forms part of the Service for Agricultural Research (Dienst Lanbbouwkundig Onderzoek - DLO) and is institutionalized within the Centre for Plantbreeding and Reproductive Research (CPRO). Within CPRO it has however a special status with its own budget and programme responsibility.

The genebank programme has not yet a legal status, but this is under review in order to satisfy the Biodiversity Convention. It is however not expected that this requires basic changes in present policies which can be summarised as follows:

- Promote international cooperation in the conservation of PGR.
- Promote open access to material and information of genebank collections.
- Promote cooperation with all public and private organisations involved in PGR conservation and use.
- Involve the private seed industry and NGO's in an advisory capacity.

At present the head of the PGR programme holds the title of director, but is accountable to the directors of CPRO and DLO on management aspects of the programme. Budget, including number of staff members is determined by the Ministry. The director of CGN is responsible for formulating the programme in line with the guidelines of the Ministry (through the Directorate of Science and Knowledge) and reports directly to both CPRO and the Ministry on the execution of the programme. An Advisory Committee consisting of representatives of the Ministry, the Wageningen agricultural University, Private Plantbreeding Industry and Non-Government Organisations has been appointed and meets once a year to discuss the programme. Policy coordination within the Ministry and with the genebank is realised through a special inter-divisional committee meeting regularly and amongst others supervising the writing of the present report. In the present situation, the director of the genebank is appointed by the director of CPRO, as are other staff members. So far these arrangements have worked reasonably well.

The government formally charged the genebank at its establishment "to render a contribution in an international context to the conservation of plant genetic resources compatible with the (role) of Dutch plant breeding ....". However, so far it has not indicated what it considers an appropriate level of structural funding to realize such an objective. A need is felt for policies to clarify working relationships and the status of the programme, especially in the context of present developments in agricultural research which are dominated by increased market orientation and reductions in public funding. So far, the adoption of the Biodiversity Convention has not resulted in tangible increased priority of genetic resources programmes. This means that such programmes at present do not receive preferential treatment in funding and may even face cut backs in their budgets. This is a matter of considerable concern.

5.1 TRAINING

CGN has a highly qualified staff in all operational aspects of a genebank; seed storage, collection management and documentation. Procedures and practices are described in the CGN Protocol which has been published and through IPGRI has been widely distributed to other genebanks. Over the years numerous requests for training have been received from many countries. However, due to only a very limited staff, CGN has not been in the position to offer such training on a regular basis. Training activities are limited to contributions to an International Plantbreeding Course organised yearly by the Wageningen International Agricultural Centre (IAC). In addition, under separate project funding (1994-1996) by the Ministry of Agriculture, training in documentation is provided to a number of East European countries. CGN would be willing to expand facilities for training if provided by additional (international) funding. Such funding should be of a structural nature for at least a number of years to allow employment of additional staff and preferably be done in cooperation with IPGRI and/or FAO.

CGN is routinely involved in raising awareness of the importance of PGR conservation through demonstrations and publications, directed at the public at large, policy makers and users of PGR. The Biodiversity Convention has raised PGR conservation to concern at policy levels. However, much remains to be done to translate increased appreciation of the need to conserve PGR into increased funding.

5.2 NATIONAL LEGISLATION

The Netherlands, being member of UPOV, has adopted Plant Breeders' Rights legislation, but, due to the so called breeders' exemption, this does not restrict the availability of protected varieties as a genetic resource for further breeding. However, as the exemption is unknown in the national patent law system, recent application of industrial patent regimes to products of biotechnology including genes transferred with such techniques potentially will limit their free availability in transgenic plants. But is has to be mentioned that, of course, in their original species, the free availability of these genes is not limited.

Trade in varieties of agricultural crops is controlled by community based seed regulatory frameworks in national seed legislation. As in all EU countries, varieties must undergo official tests before they are allowed to be marketed. The Council of the European Community has established a catalogue of varieties that may be produced as certified seeds, tested on criteria of distinctness, uniformity and stability (DUS). For arable crops, including potatoes, but not for vegetables and ornamental flowers, additional evidence is required that the variety has value for cultivation and use (VCU). The result of EU-policy concerning periodical revision of the catalogues is, that essentially old landraces have disappeared from the Dutch landscape, except for occasionally old cultivars of fruit trees found in home gardens and near farms. However, these regulations are under discussion with respect to localised use of vegetable landraces and amateur varieties.

Import and distribution of PGR in principle has to satisfy normal quarantine rules and legislation. Within the European Union quarantine regulations are being harmonised. A problem faced by all genebanks is that under the new set of rules, the sender of seeds of a number of crops must guarantee freedom of such material from all quarantine diseases in an accompanying plantpassport. Main crops in the CGN collection affected are potatoes, fruit bearing Solaneceae and peas. This means that all collection material of these crops has to be screened for quarantine diseases if such materials are to remain accessible to users. To achieve this will require considerable additional funding and adequate testing facilities. CGN is discussing the implementation of these rules in PGR with the Netherlands Plant Quarantine authorities. It seems evident that adjustments are required to at least facilitate the uptake of new collection materials and duplicating existing collections in other genebanks. It would suggest that this is a matter of international concern an should be addressed at that level. In the present state of uncertainty, CGN has started to prioritize material for testing and in 1994 has started on a modest programme in wild species of potato and peas.

The CGN does not sell seeds directly to growers and in fact formally would only be allowed to do so for accessions of seeds of varieties that feature on the European Common Catalogue for Agricultural and Horticultural Seeds, pending on arrangements with the original holders of such varieties. This regulation in essence precludes the sale of traditional landraces and obsolete varieties both by and to farmers and others. It essentially means that growers only have access to modern improved varieties. This regulation is challenged, especially by NGO's involved in the collection, conservation and distribution of traditional varieties.

CHAPTER 6
International Collaboration

The international context

The CGN accepts in full the FAO Undertaking on Plant Genetic Resources. All material in the collections is documented and available for *bona fide* users without restrictions.

International cooperation in the conservation of Plant Genetic Resources is considered essential. At the global level this is actively promoted through cooperation with IPGRI and FAO, amongst others by acceptance of base collection responsibility for a number of crops. Central to the approach is the establishment of crop-networks of genebanks holding collections of the particular crops and coordinated with the help of common international crop data bases.

The Netherlands is fully aware of its inability to be self-sufficient in plant genetic resources and in addition accepts an obligation to contribute to their conservation beyond its immediate needs. The present policies and practices are in principle totally compatible with the FAO Undertaking and the concept of PGR as a "Heritage of Mankind".

UNCED

The Netherlands has ratified the Biodiversity Convention and adopted Agenda 21 and has started to review the obligations and their implementation in a series of national policy papers. These include a Nature Policy Plan (Natuurbeleidsplan), the National Environment Plan 2 (Nationaal Milieubeleidsplan), A World of Difference (Een Wereld van Verschil), a foreign policy document on Biological Diversity and government position paper on Tropical Rainforest. An inter-departmental committee is preparing a Strategic Plan of Action for implementation to be presented to the government.

In the Netherlands nature conservation is concerned with both specific habitats and with total landscapes including agricultural lands. Plant genetic resources conservation is an integrated activity, but with its own objectives, methodologies and organisational structures though obviously part of overall biodiversity and related to nature conservation. Similarly it would appear that the Biological Diversity Forum could recognize the specific nature of plant genetic conservation and accept the FAO Commission as the main forum for

this well defined part of overall biodiversity. Agreements could be reached on how both fora could work together.

FAO global system

The Netherlands is a member of the FAO Commission and adheres to all conditions of the FAO Undertaking. International cooperation and shared responsibilities in conservation with other national programmes are central to the objectives of the Netherlands programme. Any reservations to the Undertaking concerned adherence to national legislation, such as embodied in Plant Breeder' Rights and industrial patenting regimes.

The Netherlands has supported in principle the need for an International Fund or rather the need for additional international funding to realize PGR conservation worldwide. The main objective for such a fund would be to strengthen conservation activities in still existing centres of diversity. It expects to be primarily a donor to such a fund and not so much a beneficiary except in very special cases where it can contribute specific services that fall outside its national responsibility and mandate.

The Netherlands has only had *ad hoc* collaboration with the FAO on technical issues and is a main donor of the FAO field programme.

CGIAR

The Netherlands is a main donor to the CGIAR and has given some priority in its funding to IPGRI, contributing $1 million in 1995. CGN has good working relationships with CIP which includes cooperation on developing a world data base for potato and exchange of collection material both ways. Breeding companies have occasionally received accessions of the CIP genebank, while CIP has used Dutch varieties in its programmes. Wheat and maize breeders have received materials from CIMMYT. Detailed information on exchanges with private companies is lacking. CGN has transferred its total bean collection to CIAT.

In general, contacts with genebanks within the CGIAR are identical to contacts with other genebanks and they are not a major source of new materials.

As a donor to CGIAR the Netherlands has for some time argued that there is a need for a system-wide programme, harmonizing PGR programmes, especially in the area of documentation and with a coordinating role by IPGRI. Also funding and reporting should be done across centres. In addition to specific crop mandates, the various CGIAR institutes should through their respective genebank programmes provide overall technical support to national

genebanks in their regions. Such a CGIAR system-wide programme would provide a solid internationally funded PGR programme linked to national programmes. It is noted with considerable satisfaction that finally the first steps in this direction haven been taken.

Regional research centres

As with all other genebanks, normal contacts are maintained with such regional centres as AVRDC.

Within Europe, CGN is promoting international cooperation and argues for an integrated programme. A promising development is the start in 1995 of a programme by the Commission of the European Union to support cooperation in PGR conservation and evaluation between member states.

Regional and bilateral cooperation

At the regional level, the CGN participates in the European Cooperative Programme on Plant Genetic Resources Networks (ECP/GR) coordinated by IPGRI, linking programmes in both Eastern and Western Europe. Based on a formal agreement between the Netherlands and Germany both countries are jointly running genebank programmes for *Beta* and wild species of potato, while a similar cooperation for *Brassica* is under discussion. There is an institutional agreement between CGN and the genebank of Horticultural Research International (Wellesbourne, UK.) on the joint management of collections of *Allium, Lactuca* and horticultural *Brassicas*.

CHAPTER 7
National Needs and Opportunities

Over the past 10 years work on plant genetic resources in the Netherlands has evolved from essentially working collections to a proper genebank programme concerned with sampling overall genetic diversity for long term conservation of a number of crops for which it has accepted responsibilities in the IPGRI global system of base collections. The context has therefore changed. From providing support to national programmes, the main objective is now to contribute to conserving total genepools in an international context. CGN does not attempt to necessarily broaden its own collections, but has pioneered a de-centralised approach involving the establishment of networks of participating genebanks linked by international crop data bases. The total complex of participating collections form the base collection, managed through the crop data base with coordinated action among partner genebanks to insure a minimum of 2 separately stored samples for each accession, identification of gaps in collection, promoting joint collection activities and so on. In concert with this approach is emphasis on rationalizing collections by appropriate sampling. Methodology is developed for sampling core collections for specific purposes, to provide users with a maximum of diversity for specific objectives and increase the effectiveness of evaluation.

Increased awareness in society of the importance of genetic diversity conservation is leading to initiatives in the private sector as mentioned in this report.

Long term opportunities and needs are listed below:

7.1 OPPORTUNITIES

General:

- Contribute to the wider utilization of genetic diversity, both in plantbreeding and by growers.

Collection:

- Contribute to methodology in collection management.

Documentation:

- Contribute to methodology in documentation for genebanks.

Utilization:

- Improve access to and the effectiveness of distributed collection materials.
- Improve the overall quality of collections by rational sampling of genepools of selected crops/species.
- Promote international cooperation and exchange and provide appropriate services to users.

7.2 NEEDS

Funding:

- Increased priority for genetic conservation translated in additional funding, both nationally and internationally.
- Structural funding to better coordinate crop networks.
- Means to broaden conservation to include vegetatively propagated materials (tissue culture, crio preservation, living collections).
- Increased facilities for estimating genetic variation in and between samples.
- Means to broaden selective evaluation to better understand the distribution of characters of interest in genepools.

In total this means that the past utilitarian approach should be widened to include conservation for the sake of conservation *per sé.*

Access:

- Maintenance of open exchange of genetic resources as embodied in the FAO Undertaking while spreading their benefits.
- Adjustment in intellectual property regimes to improve equity in compensation and maximize availability of genetic diversity.

Training:

- Means to provide regular training in areas of special competence coordinated at some international level.

CHAPTER 8
Proposals for a Global Plan of Action

A global plan of action should be an expression of genetic resources as a "Heritage of Mankind" and a shared responsibility for its conservation, while recognizing the principle of national sovereignty over such resources. Hence long term conservation of overall genetic diversity as an international concern should be separated from short term accessibility determined at the national level. Expectations are, that as plantbreeding develops, the advantages of having access to total genepools across national boundaries is so convincing that ultimately most countries will take that into account in their decisions on issues of access.

The Netherlands supports in general the recommendations for a global plan of action as formulated by the Keystone International Dialogue Series on Plant Genetic Resources (Report of the Oslo Plenary Session, Keystone Center 1991).

A global plan of action should thus include the following:

- A broad and global inventarisation of still existing plant genetic resources, both *ex situ* and *in situ*.
- A loose organisational structure at four levels; global, regional, national and community. All parts are in fact already in place, i.e. the CGIAR system - a number of regional genebanks/programmes - national programmes and, perhaps less developed, community programmes.
- A description of the actual and possibly adjusted respective roles of the four levels and how they can jointly cover genetic conservation globally while maintaining independence in operational aspects (hence no new and formal management structure).
- Inventorize the needs of all parts to achieve a reasonable level of operational capacity based on their potential contribution to the overall system. This specifically means that national, regional and community programmes should get support (technical and financial) on some agreed criteria to include the amount of genetic diversity within their responsibility, the level of economic development and so on. Countries should however remain financially responsible for the genebank support required for their own breeding programmes.

- An internationally funded financing agency governed by an Intergovernmental Council responsible for distributing additional funding, advised by a technical committee of respected and recognized experts. The funding agency could report to an appropriate intergovernmental body, such as the FAO Commission or whatever is agreed upon as part of the Biodiversity Convention.

As stated throughout this report, the general policy of the Netherlands is guided by recognition of the advantages of international cooperation in the conservation of plant genetic resources in support of world food supply now and in the future. It requires a system that promotes access to total genepools by both public and private plantbreeding while promoting equity in benefits to the original holders of genetic diversity at the national and community level.