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Note by FAO

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CHAPTER 1
Introduction to Portugal and its Agricultural Sector

1.1 SIZE AND LOCATION

Portugal is a small country with both continental and insular territories. The continental mainland, has the shape of a rectangle almost four times as higher than it is wide, and is located in the most western part of the Iberian peninsula, in south western Europe (latitude 37°-42° N; longitude 9°-6° W). The insular territories comprehend the Atlantic archipelagos of Azores and Madeira.

Portugal has a total area of 91,631 km^2, corresponding 88,500 km^2 to the mainland, 2,335 km^2 to the Azores, and 796 km^2 to Madeira.

1.2 PHYSIOGRAPHIC AND CLIMATIC FEATURES

Portuguese mainland are actually two different countries: the hinterland, typically Mediterranean, depending mostly on the primary sector (except for Algarve, where tourism is a relevant economical activity), and the seaside, with an Atlantic influence, where the major cities of Oporto, Aveiro, Coimbra, Lisbon and Setúbal, and more than 90% of the industry are located.

Around 36% of the mainland soils are occupied by forest, mainly on the central and northern part of the territory, being 46% of them dedicated to agriculture. Still, this share does not reflect Portuguese soils effective potentiality, which points to 59% of forestry aptitude, and only 26% of agricultural aptitude.

1.3 HUMAN POPULATION

The aforesaid, but mainly the climatic features, condition Portuguese agriculture and, as a result of its low global productivity and subsequent low incomes, determines a very unbalanced distribution of the population: with a total of a little under 9.5 millions, Portugal´s mainland has 81% of its population (7.6 millions) by the seaside, from Setúbal (some 30 km south of Lisbon) to the northern border of Rio Minho.

Of the remaining 1.75 millions, 0.34 millions are in the very special southern province of Algarve where, as referred, the economy relies mostly on tourism, leaving 1.4 millions of the population (15%) in the hinterland (Trás-os-Montes, Beira Interior and Alentejo).

The aforesaid situation is summed up in Table 1.

Table 1 Population and area of the continental Regional Directorates of Agriculture.

Regional Directorate	Area (ha)	Population	
		Total	Density *
Entre Douro e Minho	899,631	2,998,999	333,359
Trás-os-Montes	1,228,203	473,940	38,588
Beira Litoral	1,170,847	1,324,061	113,086
Beira Interior	1,195,722	397,480	33,242
Ribatejo e Oeste	1,192,703	3,292,118	276,022
Alentejo	2,692,997	543,442	20,179
Algarve	498,849	341,408	68,439

* **Inhabitant/km^2**

1.4 FARMING SYSTEMS

Farming systems differ from an intensive exploitation of the land wherever you can rely on irrigation water, to the extensive systems of southern dry land.

The first referred type occurs mainly on the central and northern parts of the country, currently associated with a great division of the land and its subsequent intensive labour and poor economic results; in the southern provinces of Alentejo and Ribatejo, you can find medium and big farms with high degrees of mechanization and other forms of technology, which makes it more competitive.

Extensive farming, relying almost exclusively on cereals and animal husbandry (beef or dairy cattle, sheep and goat, swine and, more recently, a resurgence of horse breeding), is characteristic of Alentejo and Ribatejo, as previously referred.

Table 2 Percentage of the active population engaged in the Agricultural Sector

Regional Directorate	Total	In agriculture	
		Total	%
Entre Douro e Minho	1,342,535	93,428	6.96
Trás-os-Montes	159,269	59,441	37.32
Beira Litoral	536,398	81,705	15.23
Beira Interior	141,104	29,747	21.08
Ribatejo e Oeste	1,425,451	66,441	4.66
Alentejo	200,484	45,592	22.74
Algarve	140,260	13,722	9.78

In Table 2 we can see the proportion of the active population engaged in the Agricultural Sector.

1.5 FOREIGN TRADE

Mainland´s commercial balance is strongly deficient, and foreign trade of agricultural crops and products is still less favorable than the global: 20.4% for agricultural trade, against 60.8% for total trade (referred to 1992).

Trade of agricultural sector is only a modest contribution to total trade: 1.8% of exports, and 5.5% of imports. Main exports are wine (58.9%) and fruits (14.1%); main imports are other plant products, including textile fibres and tobacco (44.5%) and cereals (31.3%). In this trade, 63.4% of the destinations, and 56.3% of the origins are member States of the European Union.

1.6 FOREST TYPES

Portuguese forest is dominated by a few number of species as patent on Table 3.

Table 3 Distribution of the forest species in Portugal according to the forest Services inventory 1993

Species	Area (ha)
Pinus pinaster	1,250,000
Quercus suber	664,000
Quercus rotundifolia	464,000
Eucalyptus globulus	385,000

Species	Area (ha)
Castanea sativa	31,000
Quercus sp.	112,000
Other conifers	91,000
Other broadleaves	77,000
Minor species	30,000

Cork oak can be considered the major species of the country. It is the one of higher multiple services, from cork production to fire protection, being a crucial species in an important part of the Portuguese ecosystems.

Although Portugal is mainly a country of Mediterranean climate, micro-climates of different shapes can be seen all over the country. This leads to the existence of pockets of marginal populations of several species, refuges of previous geological ranges, which main expression is nowadays in central Europe. Exquisite genetic resources may, therefore, exist in such conditions.

Quercus spp. are expanding wherever abandon of agriculture takes place. Pinus pinea has a sustained area, specially after its kernel raised in economic value.

Castanea sativa still faces some problems of *Phytophtora* attacks and its area shows no tendency to increase.

Ulmus is a species in great jeopardy, almost eradicated because of Dutch Elm Disease. However there is no specific programme for conservation of the remaining nucleus.

Minor species have their great threat on man activities.

Privates own 79% of the forest area, local communities 11.8%, industry 6.4%, and only 2.7% of the area is owned by the State.

Timber and cork are the more significant products although a slight decrease in total productions has been noted.

Forest fires represent a great damage to the sector in the country. In 1992, 23,215 fires consumed near 54,000 ha of woods, pastures and forests.

It is predictable that in the near future (due to the complementary measures associated with the Common Agriculture Policy of the EU, where some supports are granted to farmers who compromise to forest soils previously dedicated to agriculture) forest area will increase. Nevertheless, it is still too soon to allow any prediction with a minimum of trustworthiness.

1.7 AGRICULTURAL SECTOR

As it was already referred, small subsistence farms (some still in a stage of subsistence economy) proliferate in most of the central and northern part of the territory, while bigger and better structured commercial farms prevail on the southern regions of Alentejo and Ribatejo.

Almost 100% of the sector is privately owned, and there are no multinationals working directly in agriculture, in Portugal. However you can notice the existence of some of those companies in sectors immediately related to agriculture, namely as suppliers of production factors, and as buyers of farm products, mainly of cereals.

The evolution, from 1989 to 1992, of the apparent seed consumption by farmers can be seen in Table 4.

The decreasing tendency in the apparent seed consumption by farmers, reflects both the dependence on natural factors and on the present economical constraints.

As to seed supply, we can find a lot of sourced-on-farm seeds used, as far as autogamic cereals are concerned (maybe over 75/80%), but there is a strong tendency to lower those figures; other seeds, whenever the fixation of genetic characteristics is not guaranteed is nowadays mostly purchased from obtainers.

Table 4 Evolution, from 1989 to 1992, of the apparent seed consumption (expressed in 10^3 kg) by farmers in 1992

Crop	1989	1990	1991	1992
Wheat	49,055	31,635	44,943	38,221
Maize	9,733	9,886	9,807	8,148
Rye	13,554	18,893	10,825	9,388
Oat	10,946	7,521	7,890	6,439
Barley	6,893	6,665	6,498	6,658
Rice	4,725	4,752	4,702	2,967
Potato	169,577	169,287	156,558	152,040
Field bean	1,566	1,517	1,495	1,019
Chickpea	435	442	440	261

1.8 MAJOR LOSSES

Major losses lately observed, and apart from the forest fires already referred to, are due to climatic irregularities, characteristic of the Mediterranean region, namely the drought (that persistently affected Portugal for the last 4 years, with greater incidence in the southern region) and last year's (1994) frosts and late rains (affecting mostly fruits and fresh vegetables production).

CHAPTER 2
Indigenous Plant Genetic Resources

2.1 FOREST GENETIC RESOURCES

2.1.1 Status of important species.

All Portuguese forest tree species may be considered still in wild stage. Genetic domestication is still a rare issue on the general panorama of the forest species, contrary to horticulture or pomiculture.

Quercus suber. Because of the large economical incomes provided by cork, where Portugal dominates the world's production, it is the main economical species for the country. Furthermore, the species represents important ecological and social services specially in rural regions where human desertification trends are critical. It is still managed in stands of natural origin in the great majority of the country. It is submitted to agroforestry management in many cases. Artificial plantations are becoming relevant only in the last few years. The species benefits now of the regulation 2080 of the Common Agriculture Policy of the European Union for set aside on agricultural lands.

Pinus pinaster. It is the major species for Portugal, in area. Although there is a considerable artificial planting and sowing, natural regeneration is still the dominant way of the species' propagation in the country. In spite of severe punishment from forest fires in the last two decades, the species resists through profuse natural regeneration. The decrease of the species area is not due to any kind of decline rather to substitution for *Eucalyptus* and/or urban demands.

Castanea sativa. The area of the species did not increase but the trends of the last years are for some kind of sustainability. It still plays an important role on some rural economies.

Pinus pinea. The species has a stable area. It is a companion species to cork oak in many cases and it can take over the vacant places due to cork oak deaths.

***Quercus* spp..** *Besides Q. suber*, Portugal has the following species of *Quercus : Q. canariensis*, *Q. airensis*, *Q. rotundifolia; Q. pyrenaica; Q. robur; Q. coccifera (shrub); Q. lusitanica (shrub)* and *Q. faginea*.
Quercus spp. used to be the dominant tree species of the Portuguese forests. Exception to *Q. suber* and *Q. rotundifolia* where economical interest has been acting as a "protection", the rest of the species have their areas very reduced upon ancient epochs. *Q.pyrenaica* and *Q. robur* are experimenting an expansion due to the release of human pressures because of immigration. *Q. coccifera* is a shrub without problems. *Q.lusitanica* and *Q. faginea* are the ones in most dangerous situation. The populations of these species are limited to few scattered small groves, being quite plausible that marginal populations of unique adaptability has been lost.

Ulmus. Elm is a species in great jeopardy, almost eradicated because of Dutch Elm Disease (DED). However, there is no specific programme for conservation of the remaining nucleus.

2.1.2 Programmes and measures

Pinus pinaster. The genetic resources of the species may be considered well preserved, on one hand due to diversified management and ecological expansion, on the other hand due to the breeding programme it goes through since the last two decades. Breeding activities have been restricted into a minor part of its total range.

Quercus suber. It has been included for breeding only in the few last years. Therefore, impact on natural variability because of genetic improvement does not yet exist. Cork oak has a specific gene conservation programme which aim is joint breeding and gene conservation mainly through management of *in situ* Gene Resource Populations (GRP). The programme includes 11 GRP which selection has as scope to capture high levels of environmental and human management diversity.

Castanea sativa. There are efforts for hybridization for resistance to the ink disease.

Endemic species of the Azores Archipelago. A programme of repopulation of endemic species in the islands of S Miguel, Faial, Pico and Flores was endeavoured from 1991. After seed germination studies it was already possible, for some of them, a considerable success in their reintroduction in its the original habitat.

2.1.3 Species under genetic erosion

Quercus suber. Although the species maintains roughly the areas of the previous decades it is plausible that it lost considerable part upon centuries ago, when it was one of the dominant species of the wilderness that used to cover what is now the country's continental area. Furthermore, the species is showing abnormal rates of death in some parts of Portugal. For this two reasons, and having in mind its crucial ecological role, it shall be included as a threatened species.

Quercus faginea. Efforts to increase the area of this species are greatly needed.

Castanea sativa. The species still faces considerable attacks from *Phytophtora cinamomi* but populations show positive reaction with good survival rates.

***Ulmus* spp..** Due to DED, the species is in a great threat, near extinction. However there are still some small scattered nucleus which need urgent protection measures.

***Minor* species.** *Populus nigra*, *Prunus avium*, *Betula celtiberica*, *Ceratonia siliqua*, *Alnus glutinosa*, *Acer campestre*, *A. monspessulanum*, *A. pseudoplatanus*, *Phoebe indica*, *Octoea foentes*, *Fraxinus angustifolia*, *Taxus baccata*, *Pinus sylvestris*, *Quercus canariensis*, *juniperus communis*, *J. turbinata*, *J. oxycedrus*. In general these species face problems due to anthropogenic pressures, namely: substitution for other species of higher economic interest; agriculture and/or urbanism.

Danger is greater on riparian species which populations are in general more fragile because of the breeding system.

2.2 OTHER WILD SPECIES AND WILD RELATIVES OF CROP PLANTS

Amongst the country's natural vegetation, there is a wealth of relatives of crop plants and other wild species potentially important as agricultural, ornamental, forage and pastoral, and aromatic and medicinal plants.

2.2.1 Agricultural Plants

Included in the Portuguese spontaneous and sub-spontaneous flora, we may refer the following species with immediate agricultural interest or included in the gene-pool for breeding of cultivated plants:

Aegilops spp.
Allium spp.
A. senescens
A. ericetorum
A. schoenoprasum
A. scorzonerifolium
A. pruinatum
Amaranthus spp.
Anethum graveolens
Angelica angelicastrum
A. laevis
A. pachycarpa
Anthriscus spp.
Apium spp.
Asparagus spp.
Arbutus unedo
Artemisia absinthium
Arthrocnemum spp.
Aster tripolium
Atriplex spp.
Avena spp.
Beta macrocarpa
B. vulgaris ssp. *maritima*
Borago officinalis
Brassica barrelieri
B. nigra
B. oleracea
B. rapa
Capsicum spp.
Carthamus lanatus
Castanea crenata
C. sativa
Ceratonia siliqua
Chenopodium spp.
Cichorium intybus
C. endivia
Citrullus lanatus
Citrus spp.
Coriandrum sativum

Corylus avelana
Crithmum maritimum
Crocus spp.
Cucumis spp.
Cucurbita spp.
Cydonia oblonga
Cynara algarbiensis
C. cardunculus
C. tournefortii
Cytinus spp.
Cyperus esculentus
Daucus spp.
Diplotaxis spp.
Eriobotrya japonica
Eruca vesicaria ssp. *sativa*
Ficus carica
Foeniculum vulgare
Fragaria vesca
Hordeum spp.
Humulus lupulus
Juglans regia
Juniperus spp.
Lactuca spp.
Lathyrus spp.
Laurus azorica
L. nobilis
Lens nigricans
Lepidium spp.
Linum spp.
Lupinus spp.
Malus sylvestris
Malva spp.
Mentha spp.
Myrtus communis
Nasturtium officinale
Nigella spp.
Olea europaea var. sylvestris
Opuntia spp.
Origanum spp.
Papaver somniferum ssp. *setigerum*
Petroselinum spp.
Phalaris spp.
Physalis spp.
Pimpinella spp.
Pinus pinea

Pistacia lentiscus
P. terebinthus
Portulaca oleracea ssp. *oleracea*
Prunus spp.
P. padus
P. spinosa ssp. *insitioides*
Punica granatum
Pyrus bourgaeana
P. cordata
P. pyraster
Quercus spp.
Raphanus raphanistrum
Rubus spp.
Ruta spp.
Salicornia spp.
Salvia spp.
Scorzonera spp.
Secale cereale
Sinapis spp.
Spinacia spp.
Sorbus latifolia
S. torminalis
Stellaria spp.
Triticum spp.
Thymus spp.
Thymbra capitata
Urtica spp.
Valerianella spp.
Vicia spp.
Vitis vinifera.

Some of these species are subjected to accelerated genetic erosion. Among these, *Cynara tournefortii* and *Prunus spinosa* ssp. *insitioides* are considered as endangered species.

2.2.2 Ornamental Plants

Amongst the vast number of ornamental species of the Portuguese spontaneous and sub-spontaneous flora, a large number (included in about 44 families of Dicotyledons and 8 families of Monocotyledons) can be referred with immediate economical value, and many more may be added (included in about 60 families) as direct gene pool available for plant breeding.

Some of these species can strive fairly well within the national boundaries, still, other exist that are submitted to accelerated genetic erosion, particularly, in what concerns those with immediate economical potentialities. This is the case for the following species: *Myrica gale*, *Betula pubescens* ssp. *celtiberica*, *Urtica pilulifera*, *Dianthus* spp., *Anemone trifolia*, *Thalictrum flavum* ssp. *glaucum*, *Cistus palhinhae*, *Halimium* spp., *Helianthemum* spp., *Sedum* spp., *Saxifraga* spp., *Iberis* spp., *Alyssum serpyllifolium* ssp. *lusitanicum*, *Reseda* spp., *Euphorbia* spp., *Hypericum foliosum*, *Wahlenbergia hederacea*, *Jasione lusitanica*, *Pterocephalus* spp., *Corema album*, *Rhododendron ponticum* ssp. *boeticum*, *Gentiana lutea* ssp. *lutea*, *Teucrium* spp., *Armeria* spp., *Limonium* spp., *Antirrhinum* spp., *Linaria* spp., *Colchicum multiflorum*, *Scilla* spp. and *Narcissus spp.*.

2.2.3 Forage and Pastoral Plants

A great number of forage and pastoral crops in Portugal have been progressively evolved, through breeding, from the spontaneous varieties, forms and ecotypes, in the country. Other species are still directly utilized in its spontaneous status, either for cutting or grazing. Large areas, in Portugal, are still populated by plants with forage and pastoral potential.

Most of the wild and cultivated plants belongs to the botanical families of Gramineae and Leguminosae, the most relevant families for agriculture. This is the case for *Agropyron*, *Agrostis*, *Alopecurus*, *Anthoxanthum*, *Arrhenaterum*, *Avena*, *Avenula*, *Briza*, *Bromus*, *Cynodon*, *Cynosurus*, *Dactylis*, *Eragrostis*, *Festuca*, *Holcus*, *Hordeum*, *Lolium*, *Nardus*, *Piptatherum*, *Paspalum*, *Phalaris*, *Phleum*, *Poa and Trisetum*, *within the Gramineae family*, *and Anthyllis*, *Hedysarum*, *Lathyrus*, *Lotus*, *Lupinus*, *Medicago*, *Melilotus*, *Onobrychis*, *Ornithopus*, *Pisum*, *Scorpiurus*, *Trifolium* and *Vicia*, within the *Leguminosae* family.

Some genus include a great number of wild relative species, as in the case for *Avena*, *Bromus*, *Lathyrus*, *Lotus*, *Medicago*, *Vicia* and *Trifolium* (41 spontaneous species for the last genus).

Some of the wild relatives of crop species can be considered to be in risk of extinction, as is the case for *Festuca elegans*, *F. Henriquesii* and *F. Brigantina*, other may be considered as being in a situation of vulnerability, as is the case for *Avenula hackelii*, *A. delicatula*, *Festuca sumilusitana*, *F. durietagana*, *Holcus setiglumis*, *Melilotus segetalis* and *Pseudarrhenaterum palens*. Yet, none of these species are protected.

Amongst the forage and pastoral plants with particular economical relevance for edaphic and climatic situations similar to the most representatives in Portugal, we may refer the following genus:

Lupinus. Include six species in the autoctonous flora (or seven, according to the taxonomic criteria) with many differentiated ecotypes. Except for *L. cosentinii* (in a vulnerable situation due, mainly, to the urban pressure) and *L. micranthus*, which occur in restricted areas, the remaining species are widely represented in the country although their relatively reduced world areas of distribution (*L. hispanicus*, including *L. Rothmaleri*, is an Iberian endemic species, occurring only in Portugal and Spain).

Trifolium and Medicago. Where a wealth of genotypes can be found in its diversified species and ecotypes, which urge to prospect and preserve.

Dactylis, Lolium and Festuca, with great importance to the pastures composition, deserving particular attention in what concerns wild relatives and its ecological differentiations.

The ecotypes, either for cultivation, domestication or as gene donors, in plant breeding, are an invaluable source for adaptation, yield potential and biotic and abiotic stress resistance. However there is still a lack of knowledge of our spontaneous flora, particularly in what concerns ecotypes and obsolete landraces returned to the wild. It is urgent an increasing effort to the identification and safeguarding of our biodiversity.

2.2.4 Aromatic and Medicinal Plants

Within the spontaneous and sub-spontaneous Portuguese flora we may identify about five hundred aromatic and medicinal species. Some of these species can be alternative crops, particularly for sustainable agricultural systems and/or for the promotion of marginal lands. In many cases the plants maintain their wild status and for several species, despite the fact that they exist in relatively large amounts, very few people care to collect and preserve them. Genetic erosion in these type of plants is increasing, progressively, due to indescriminated collecting for commercial use, including export.

Some of these species are recognized as endangered, like *Paronychia argentea*, *Mandragora autumnalis*, *Paeonia officinalis*, *Melilitis melissophylium* and *Rosmarinus officinalis*.

It is very important the transfer of experience and technology with the different regional agricultural services and with other Mediterranean countries. Environment must be placed side by side with the demands for development and we must point out the interactions which affect the ecosystems and the foreseeable impact of the set-aside policy, from the total human-caused desertification of marginal lands where theses species are abundant.

Amongst the 93 families represented in the spontaneous and sub-spontaneous Portuguese flora, we may refer the following, as the most representatives: *Labiatae*, *Compositae*, *Umbeliferae*, *Myrtaceae*, *Oleaceae*, *Liliaceae*, *Rosaceae*, *Leguminosae*, *Rutaceae*, *Guttiferae*, *Iridaceae*, *Pinaceae*, *Cupressaceae*, *Lauraceae* and *Malvaceae*.

The most important genus on natural medicine and pharmacology

Aconitum
Arnica
Atropa
Calendula
Crataegus
Datura
Digitalis
Drosera
Geranium
Hieracimum
Hyoscyamus
Hypericum
Mentha
Mercurialis
Papaver
Potentilla
Plantago
Ranunculus
Ricinus
Rhus
Ruscus
Silybum
Solanum
Taraxacum
Tilia

Filipendula
Urginea
Vaccinium
Valeriana
Vinca

The species more commercialized

Atropa belladona
Datura spp.
Digitalis spp.
Plantago spp.
Valeriana spp.
Chamomilla spp.
Mentha spp.
Glycyrrihiza glabra
Ocimum basilicum
Origanum majorana
O. vulgare
Thymus spp.
Satureja spp.
Laurus nobilis
Rosmarinus officinalis
Myrtus communis
Eucaliptus globulus
Achillea spp.
Nepeta italica
Mentha citrata
Salvia sclarea
Coriandrum sativum
Artemisia vulgaris
Lavandula stoechas
Hypericum perforatum
Tilia spp.
Ruta chalepensis
R. montana
Capparis spinosa
Allium spp.
Scolymus hispanicus
Cynara scolymus
Valeriana spp.
Satureja calamintha
Mentha pulegium
Pimpinella spp.

Foeniculum vulgare

Using biological agricultural methods there are producers of:

Melissa officinalis
Mentha piperita
Lippia citriodora
Andropogon nardus
Salvia officinalis
Rosmarinus officinalis
Hypericum perforatum
Sambucus nigra
Lavandula pedunculata
Erica spp.
Thymus vulgaris
Urtica dioica
Hyssopus officinalis
Calendula arvensis
Petroselinum crispum
llium fistulosum
Laurus nobilis
Tilia cordata
Leonurus cardiaca

2.3 LANDRACES AND OLD CULTIVARS

Cereals

Research activities on cereal genetic resources are being carried out for a long time in several agricultural research institutions in Portugal. However a comprehensive planning involving every institution has not yet been stated up. Consequently from this situation emerges a huge lack of information and a non existence of a well programmed definition concerning to objectives and strategies. Therefore it is rather difficult, if not impossible, to mention all the research guidelines as well as the results achieved on that area.

However, it is worth to point out that some institutions are developing very interesting research activities on specific traits related to collecting, conservation, characterization and utilization of landraces and old cultivars. Simultaneously a few institutions are mainly engaged on plant breeding and many modern cultivars of triticale, bread wheat, durum wheat, oats, rye, maize and rice are continuously used by the farmers over the country.

Some landraces of wheat are still maintained and used by the farmers as:

- **'Barbela'.** Probably a native population of bread wheat from the high lands of NE Portugal;

- **'Preto Amarelo' and 'Lobeiro'.** Durum wheat landraces scarcely used by the farmers in Centre and South Portugal.

In what concerns landraces of Barley and Oats, several landraces are still used and widespread over the country. There is a tremendous lack of information specially on the characterization of those genetic resources.

For maize landraces we may enumerate: 'Amarelo Miúdo', 'Orelha de Lebre', 'Unha de Porco', 'Verdeal' and 'Milhão' are still used in the NW of Portugal, 'Zorrinho' and 'Ratinho' in Alentejo and 'Gigante' and 'Pichorro' at Aljezur, in Algarve.

The species *Secale cereale* shows itself in this country a very interesting natural genetic variation. Nowadays it is still possible to find, in specific agricultural spots mainly in small holdings located in the highlands, some landraces and old cultivars of rye which represents a unique genetic resource. The following rye landraces/old cultivars are still being used by farmers: 'Do Alto', 'Maia Barroso', 'Mirandela', 'Castelo Branco', 'Guarda', 'Marco de Canaveses', 'Temporão' and 'Estremoz'.

Forage crops

Both selected lines/populations from native species and improved cultivars are at moment used by farmers. Among the country's natural vegetation, wild progenitors of species of remarkable economical value, like *Vicia* spp., *Medicago* spp., *Lathyrus* spp., *Trifolium* spp., *Ornithopus* spp., *Lupinus* spp., *Lolium* spp., *Festuca* spp., *Phalaris* spp., *Dactylis spp.* are usually found in Portugal. The genetic variation of the mentioned species is very high all over the country, therefore some research breeding projects are manipulating intensively those native genetic resources.

Food legumes

Landraces of the species: *Cicer arietinum*, *Vicia faba* and *Phaseolus vulgaris* are most used by the farmers. Some widespread landraces are:

- *Cicer arietinum*: 'Barbacena', 'Montoito' and 'Gordo';
- *Vicia faba*: 'Cornichela', 'Do Algarve', 'Assaria' and 'Ratinha';
- *Phaseolus vulgaris*: 'Patareco', 'Cor de Cana', 'Manata', 'Bencanta', 'Foicinha', 'Maravilha de Portugal', 'Rei das Foices', 'Tripeiro' and 'Vagem Rajada'.

Breeding programmes of chickpea, pea, faba bean, lentils and beans are being carried out in a few research stations.

Vegetable crops

A lot of species of vegetable crops are systematically grown in this country. Both landraces and introduced cultivars are used by the farmers. The most important species are:

- *Allium cepa*, including the following landraces: 'Marova', 'Saloia', 'Setúbal', 'Casca Amarela' and 'Portuguesa';
- *Brassica oleracea*. Landraces: 'Couve Portuguesa', 'Galega de Folhas Lisas', 'Galega Frisada'; 'Penca de Chaves', 'Penca da Póvoa';
- *Brassica rapa*. Landraces: 'Roxo Comprido', 'Da Meda' and 'Greleiro Temporão';
- *Cucumis melo*. Landraces: 'Casca de Carvalho' and 'Palha Blanco';
- *Capsicum annuum*. Landrace: 'De Elvas';
- *Lycopersicon esculentum*. Landrace: 'Coração de Boi'.

Wine grapes

A large amount of different genotypes of wine grapes (*Vitis vinifera*) can be found in this country. The EC Genetic Resources Programme includes approximately 400 Portuguese wine grape landraces (castas). It is worth to consider that some specific wine grape landraces are per se responsible for famous and well-characterized wine types, f. i.: The landraces 'Loureiro' and 'Alvarinho' are obligatory used to make a white type of "green wine" (Vinho Verde) and the same does 'Vinhão' landrace to red type of "green wine".

Many examples like that can be mentioned. As concerning to "Douro" red wine type, necessary grape wine landraces are: 'Touriga', 'Tinta Amarela', 'Tinta Pinheira' and 'Tinta Roriz'; To "Bairrada" red wine type, the used landraces are 'Baga' and 'Touriga Nacional'; to "Center" Region white wine type are very common the landraces: 'Arinto', 'Encruzado' and 'Fernão Pires'; considering the "Alentejo" Region, 'Roupeiro' landrace is, so far, the most used.

Citrus

Portugal was traditionally a country where *Citrus* production, specially for oranges, was of the highest quality in Europe (with São Miguel, in the Azores, and Setúbal, in the mainland, the most well-known places of production). However, the fact that citrus breeding is a difficult and time consuming task hampered the evolution of this fruit crops, in particular in what concerns its adaptation to modern agriculture and industry.

The designations of 'Baía' and 'Valência late' are the most common for the two main fruit types of orange, and both referred to varieties reintroduced in the country after being explored in different regions ('Baía' in Brazil and 'Valência late' in California). The variety 'Baía', also designated as 'Washington navel', has high quality for table fruit but not for industry (where its percentage in juices can not exceed 10%).

Other traditional orange varieties are: 'Dom João', 'Setúbal' and 'Vale de Besteiros'. As mandarin traditional varieties we may refer: 'Carvalhal' and 'Setubalense'. For all these citrus varieties, however, an adequate characterization study is needed.

In the market of propagating material (either private or official) there is now a number of foreign varieties, mainly from Spain.

Pomoideae

Among the *Pomoideae* there are a wealth of diversity, particularly in what concerns traditional varieties of pears and apples.

Traditional Portuguese varieties of pears are rather diversified in taste and fragrance, and most of them exhibit a fairly good resistance to the cryptogamic disease caused by Venturia pirina. Among the main Portuguese varieties we may refer the following: 'Rocha' (representing about 75% of the Portuguese production), 'Pérola' (still cultivated in a 0.9% proportion), 'Amendoa' and 'Carapinheira' (reduced to a proportion of 0.3% of the

Portuguese production) and more than two dozens of other, less common varieties nowadays.

Genetic diversity for apples in Portuguese plant material is not so rich as for pears, nevertheless, we may still find a great diversity of traditional varieties which are particularly distinguished by its rusticity and pulp softness. Namely: 'Bravo de Esmolfe' (representing about 0.3% of the Portuguese production), 'Casa Nova de Alcobaça' (representing about 0.2% of the Portuguese production), 'Cunha' (also designated by 'Riscadinha', representing about 0.06% of the Portuguese production) and, as for pears, more than two dozens of other, less common varieties.

A field collection of three trees for each variety is maintained in Alcobaça, at the National Fruit Trees Station (Estação Nacional de Fruticultura "Vieira Natividade"), both for pears and apples.

This material has been used in breeding, mainly for its adaptation traits, pulp texture and flavour. Some promising hybrids with exotic material being under observation.

Prunoideae

Among the *Prunoideae* special reference is due to peach, of which some traditional varieties are maintained in field collections at the Estação Nacional de Fruticultura "Vieira Natividade". This material is particularly relevant both by its good aptitude as stock material for grafting (namely by its resistance to nematodes, *Taphrina deformans*, *Agrobacterium tumefaciens*, low demand in vernalization, good germination faculty, high productivity and rusticity) as for direct fruit production (late maturing period and ability for vegetative growth at the end of season, which makes possible the maturation of late produced fruits, besides organoletic and reologic potentialities).

Prospects for landraces utilization

Some reasons can clear out on the use of landraces and old varieties by the farmers. Firstly, as a rule, those materials are used in particular in isolated places where a non advanced farming practices are adopted; secondly, due to the high adaptability and resistance to the different stresses the old cultivars can be grown under a low input system.

Cereals, horticultural, forage and food legumes genetic material collected in representative locations spread out in this country are being intensively searched for by prestigiated scientists belonging to several Universities and

agricultural research institutions. It is also important to point out the persistence and high level met in those different R&D projects considering the preservation and research on genetic resources area.

In general terms, high level and agricultural graduates follow in their own works the rules of sustainable agriculture. Consequently the plant genetic diversity studies consider persistently the general and specific constraints related to genetic resources. Several governmental institutions and structures are really engaged on that problem, the natural parks and protected areas are carrying on interesting prospective activities as plant genetic resources is considered.

CHAPTER 3
National Conservation Activities

3.1 *IN SITU* CONSERVATION ACTIVITIES

The national network of protected areas, where the collecting and introduction of plants is restricted, occupies around 5% of Portugal mainland. The level of restrictions applied within each protected area changes according to its status, which is defined based on its relevance to the nature conservation. In this network, the management responsibility is not only public, but also private, particularly for agriculture and forestry.

Still, in many habitats (some of them outside the protected network) endangered species are demanding for urgent conservation actions. Financial, bureaucratic or legal constrains, however, hinder for an adequate rescue action.

Conspicuous examples of threatened habitats can be seen as caused by quarries, urban expansion or, even, farming areas enclosing rare endemic species supported by a traditional land use which have been gradually disappearing with the introduction of more intensive, less sustainable agricultural systems.

There is however a growing concern for the *in situ* conservation of the autoctonous flora. The main project in this area is called "Geographical Distribution and Statute of Menace of the Species of the Flora to be Protected" (Distribuição Geográfica e Estatuto de Ameaça das Espécies da Flora a Proteger).This project is administered by the Nature Conservation Institute (ICN-Instituto da Conservação da Natureza-the governmental agency for wildlife and national parks), with the collaboration of several universities.

The project is running from 1994 and is partly sponsored by the European Community LIFE fund. It aims to built a comprehensive red list comprising: the name of the endangered plant species of Portugal mainland; its distribution; the threats to which it is exposed; a short description of its habitat; proposals for the adequate management for recovering and/or sustainable *in situ* conservation (with a special focus on practical measures) and; considerations for specific legislation.

This project, in the present phase, was settled for three year (lasting until the end of 1996), however, by its nature, it must be always considered as a "on-going project". Almost 240 species are being studied, including the Portuguese species listed in the Appendix I of "Bern Convention" and in Appendices II, IV and V of "Habitats" Directive 92/43/CEE. Following this project, future work will pay attention to species disjunctions, as a major feature for biodiversity measurement and its conservation.

In situ germplasm collections of economically important species are not frequent in Portugal. A good example of an exception, however, can be given for the conservation of genetic resources of Quercus suber, which is based on 10 populations of natural origin (therefore *in situ*) besides one population introduced there some decades ago (and so considered as *ex situ*).

These *in situ* collections cover the whole country (Table 5) and represent different situations of germplasm security.

Table 5 Gene Resources Populations for cork oak (Quercus suber) in Portugal

GRP	Latitude N	Longitude W	Altitude (m.a.s.l.)
Ermida-Gerês	41 42	8 07	700
Bornes	41 25	7 00	800-1,000
Alcobaça	39 29	9 00	130
Mora	38 56	8 20	100
Queluz	38 47	9 15	100
Setúbal	38 29	9 00	100
Arrábida	38 29	9 00	300-400
Stª Cacém	38 00	8 41	260
Contenda	38 07	7 02	300-400
Tavira	37 15	7 39	100
Silves	37 19	8 25	120

3.2 *EX SITU* COLLECTIONS

The main source of information used in the preparation of the present sub-chapter was the provisional National Information System on Plant Genetic Resources (SNIRGV), implemented by the National Institute of Agricultural Research (INIA-Instituto Nacional de Investigação Agrária). The System builds on a set of related databases holding data on the different national collections. The data to build the System was collated through a "National Survey on Plant Genetic Resources" recently realized. This Survey was the first comprehensive

and systematic one in the country and, although the response has been very positive and quick, there are still some Questionnaires to be received.

Two main goals can be identified that can justify the collecting, study and maintenance of a germplasm collection: The preservation of the biodiversity and its sustainable use.

Since long did the Portuguese breeders perceived the importance of such goals and if sometimes the first one (to preserve the biodiversity) was not met, as some valuable collections were irremediably lost, this was due to a different approach on the use of germplasm. In fact, the germplasm collecting was dictated, at earlier times, by the immediacy of its usefulness without the preoccupation of an integrated programme anticipating the sustainable use and the preservation of the biodiversity as a legacy for the benefit of present and future generations.

Fortunately this situation has drastically changed. Researchers in general, are concerned and aware of the importance of the preservation of biodiversity and the number of germplasm collections in the country has grown considerably.

At the moment thirty three collections were identified, holding a total of 29,208 accessions.

The Maize Genebank at Braga (Northern Portugal) was established in 1978. Its establishment was jointly financed by the Food and Agriculture Organization of the United Nations (FAO), the International Board for Plant Genetic Resources (IBPGR), presently IPGRI, and the Portuguese Government. Later, in September 1992, it was inaugurated as the "Portuguese Plant Germplasm Bank" (BPGV) and given the responsibility for collecting, maintaining and studying plant genetic resources in general, serving as the main Portuguese Germplasm Bank.

Since 1979 the Genebank is, simultaneously, part of the international network set up and co-ordinated by IPGRI and has the responsibility of serving as base collection for maize for the Mediterranean region. In a near future the BPGV is expected to hold duplicates of all the existing collections in the country. This Bank, alone, holds 10,774 accessions representing 36.8 % of the country's holdings.

Presently, the BPGV is under the umbrella of the Regional Directorate of Agriculture of Entre Douro e Minho (Northwest region of Portugal) who finances its on-going costs.

The composition of the national holdings, in terms of the different crops, is shown in Table 6.

Table 6 Composition of the national holdings in terms of the different crop categories

Crop Category	% of Total
Cereals	43.3
Grain legumes	29.1
Forages	7.9
Vegetables	7.8
Grapes (wine and table)	4.1
Temperate fruits	2.7
Tropical fruits	0.9
Olive trees	0.4
Others*	3.8

***Medicinal and aromatic plants, fibres, ornamentals, culinary herbs, flavourings and miscellaneous crops**

It is important to determine the type of samples maintained in the national *ex situ* collections, especially whether they are wild or weedy species, landraces, advanced cultivars, etc. Of the 29208 accessions maintained in the national collections, 24268 accessions (83.9 % of the total) are identified according to the type.

In Table 7, the type and percentage of samples against the total of samples for which the type is known are summarized.

Table 7 Composition of the national holdings in terms of sample type

Sample Type	% of Total
Landraces	51.4
Breeding lines	16.9
Advanced cultivars	7.6
Wild/weedy species	7.4
Obsolete cultivars	6.5
Genetic stocks	5.3
Cultivated (unspecified)	3.7
Mutants	0.7
Introgressed forms	0.4

As previously said, it is expected that, in a near future, the BPGV will hold duplicates of all the existing collections in the country. Up-to-now, the duplication of the national collections was never done in a systematic and co-ordinated manner, thus, material maintained in the individual collections should be regarded as, chiefly, unique material.

It is generally felt, by the responsible for collections, that more collecting is needed. In the National Survey on Plant Genetic Resources Activities, several areas of the country, so as many economically important species, were identified as not being represented in any national collection. However, a national strategy for germplasm collecting should be based in a in-depth analysis of the existing material and related data. Only a careful analysis of the available passport data of the national holdings can lead to decisions based on solid arguments for the rationalization of collections and the maximization of the available human and financial resources.

3.3 STORAGE FACILITIES

The classification of storage is done by maintenance type: long-term seed storage (0ºC to -18ºC or below); medium-term seed storage (0ºC to 10ºC); short-term seed storage (> 10ºC); in vitro maintenance and; field collections.

Only three of the thirty-three collections existing in the country are kept under ambient temperatures, requiring urgent action, either by encouraging the safe duplication of the collections at risk or by the upgrade of the maintenance conditions or, preferably, both.

In table 8, the types of maintenance of the Portuguese collections, by conservation regime are summarized.

Table 8 Types of maintenance of the Portuguese collections, according to the conservation regime

Conservation Regime	Nº of Collections
Long-term	6
Medium-term	5
Short-term	4
In vitro	7
Field	18

The number of collections kept under different types of maintenance should not be summed as it would exceed the number of the existing collections. The data were interpreted, for this purpose, individually, and recorded as such. In

reality the same collection or material within the same collection can be kept under different conditions.

The number of accessions kept under each of the storage conditions is outlined in Table 9

Table 9 Number of accessions kept under each of the storage conditions

Conservation Regime	Nº of Accessions
Long-term	18845
Medium-term	10549
Short-term	4632
In vitro	1883
Field	3221

As said for the previous table, the number of accessions should not be summed as the data were analysed assuming that, when more than one maintenance category was given, the samples were stored in all the different ways and this, undoubtedly, have inflated some figures.

Together with the conservation temperatures and the seed moisture content, the type of packaging contributes, in a positive or negative manner, for the seed samples longevity, that is, the success or the failure of a germplasm conservation programme.

In table 10, the number of the different collections using the different types of packages (some collections use more than one type of packaging) are summarized.

Table 10 Number of the different collections using the different types of packages

Type of Packaging	Nº of Collections
Laminated aluminium packets	4
Cloth bags	4
Plastic bags*	4
Paper bags, cartons or boxes*	3
Glass vials	2
Unsealed cans	1

* **Still used in some working and active collections**

3.4 DOCUMENTATION

Documentation is an area where a great deficit of attention has been paid in Portugal. The lack of proper documentation systems is, undoubtedly, hampering the adequate management, use of the collections and the flow of information. The status of the documentation of the national collections and the institutions' capabilities for exchanging data through magnetic media is summarized in Table 11.

Table 11 Status of the documentation of the Portuguese plant germplasm collections and the institutions' capabilities for exchanging data through magnetic media

Status of the Documentation	Nº of Collections
Computerized	8
Manual	13
Hardware architecture	
Macintosh	3
IBM Compatible	7
Capability of information exchange	
by diskette	9

Some answers reported the use of the two hardware architecture, which, if summed, inflates the number of collections with computerized documentation.

3.5 EVALUATION AND CHARACTERIZATION

Although not much data are available on this two activities, at national level, it can be said that much more effort and financial resources has to be put on the characterization and evaluation of the national plant germplasm collections. The data available are a result of the "National Survey on Plant Genetic Resources Activities" and not all institutions have responded yet. Nevertheless, this first approach is clear in indicating that the percentage of samples characterized and evaluated is quite small when compared with the total holdings.

Portugal does not have a national policy for the characterization and the evaluation of germplasm collections. The majority of the national germplasm collections are working or active collections and thus, actively used in breeding programmes. Collections are characterized and evaluated according to the needs of the breeder in her/his search for new traits. In Table 12 it is outlined the status, to the best of our knowledge, of the characterization of the Portuguese plant germplasm collections.

Table 12 Status of the characterization of the Portuguese plant germplasm collections

Crop Category	Nº of Accessions	% of Total
Cereals	1159	9.1
Forages	503	21.7
Grain legumes	436	5.1
Grapes (wine and table)	134	11.0
Vegetables	132	5.7
Ornamentals	52	41.9

Except for the case of ornamentals, whose total holdings is very small, forages is the case were characterization is more advanced. Still, this progress represents a little more than 21%.

Besides the crops on Table 12, there are other under on-going characterization and evaluation. They were not included in the table because the number of accessions is not known. This is the case of *Citrus*, *Prunus* and *Ficus* which are being characterized using biomolecular markers and *Castanea*, *Prunus*, *Olea* and aromatic plants under chemical and morphological characterization.

On what descriptor lists are concerned, they vary from the IPGRI's Descriptors Lists, UPOV, OCDE and the National Catalogue of Varieties. This sector would certainly benefit from a standardization on the descriptor lists in use.

On what evaluation is concerned, the scenario does not change. Besides the little information yet available, much more human and financial resources are needed for this important task. In table 13 it is summarize the knowledge, up-to this date, on the evaluation of national collections.

Table 13 Status of the evaluation of the Portuguese plant germplasm collections

Crop Category	Nº of Accessions	% of Total
Cereals	1,133	8.9
Tropical fruits	115	40.0
Forages	88	3.8
Castanea *spp.*	9	11.8

Again, as in the previous assessment, the descriptors lists in use vary from the ones proposed by IPGRI, UPOV and OCDE.

3.6 REGENERATION

Although the importance of maintaining accessions' viability as high as possible is unquestionable, not only because of the costs it entails but as well as to limit the loss of genetic diversity, to avoid genetic erosion or genetic changes in the seeds, time comes when viability declines or seed stocks fall below acceptable quantity, therefore arising the need for regeneration.

As not much data is available on the regeneration of collections a realistic appreciation on the status of this activity cannot be done. The only data available reports the regeneration of seventy one accessions of cereals, forages and grain legumes.

The parameters that determines the need for regeneration is referred in only three cases. One reports that samples are regenerated when seed viability falls below 75%. In another case it is reported that samples are regenerated when seed viability is less than 80% and in the third case when viability falls below 20%. The third case is reportedly low because of the nature of the material it is dealt with. In this particular case is a collection of advanced cultivars of a specific vegetable crop and it is reported that the genetic basis of such collection is extremely narrow, thus the loss of genetic variability is not a primary concern. In table 14 it is outlined the regeneration status of the Portuguese plant germplasm collections.

Of the nine crop categories represented in the national collections, only three crop categories have gone through regeneration. Considering the number of accessions already regenerated, it can be said that regeneration has yet to commence, not only to rejuvenate the accessions but to get more seed stocks in order to facilitate the exchange, thus the use of plant genetic resources within the country and at international level.

Table 14 Status of the regeneration of the Portuguese plant germplasm collections

Crop Category	Nº of Accessions	% of Total
Cereals	30	0.23
Tropical fruits	30	0.35
Forages	11	0.47

3.7 FOREST GENETIC RESOURCES

As the border line between the Atlantic and the Mediterranean biogeographic regions runs through Portugal mainland, very interesting plant formations are

quite common, with the south and southwest boundaries of many European species placed in Portugal.

A project for mapping the wild and semi-wild vegetation of Portugal mainland is running until the end of 1996. This project, called "Cartography of Natural and Semi-Natural Vegetation of Portugal Mainland" (Cartografia da Vegetação Natural e Semi-Natural do Território Continental Português), is being carried out in cooperation by the Institute for Nature Conservation (Instituto da Conservação da Natureza), several Universities and the National Geographic Information Centre (Centro Nacional the Informação Geográfica), being partly sponsored by the "European Community LIFE Fund".

Other project in Forest Genetic Resources protection, underway in Portugal, is called "Monitoring and Valorization of Autoctonous Populations of Narcissus Species" (Monitorização e Valorização de Populações de Narcissus *spp*. Autóctones). In fact, the overcollecting of *Narcissus spp*. bulbs from the wild, mainly in the Natural Park "Serra da Estrela", is being controlled since 1992 and has almost ceased by now. The project aims to implement, as a sustainable alternative, the agricultural and technological bases for bulb cropping and preparing for export at the farming level.

However, apart from infrequent examples, as the aforesaid and the previously referred to the *in situ Quercus suber* collections, forest genetic resources are not adequately safeguarded in Portugal, same species requiring urgent protecting measures, as is the case referred in Chapter 1, for *Castanea sativa*, *Ulmus* and other minor species.

Some non-governmental organizations are administrating nurseries for wild plants, such as *Quercus robur*, *Castanea sativa*, *Acer pseudoplatanus*, *Ilex aquifolium*, *Taxus baccata* and *Arbutus unedo*, which are later reintroduced in the nature.

The biodiversity measurements in Portugal have always been based mainly in species quantity and rarity, as it continue to be the rule. Genotipic variability assessment, particularly in what biomolecular techniques are concerned, is not yet being widely used for this purpose, but capability is being progressively implemented in order to, in a near future, these and other techniques contribute to provide increased accuracy in the evaluation of biodiversity.

CHAPTER 4
In-Country Uses of Plant Genetic Resources

In Portugal several institutions are dealing at different levels and materials with the genetic resources. However, it is felt a tremendous lack of coordination and free circulation of knowledge.

The "Portuguese Plant Germplasm Bank", located in Braga, is providing scientific assistance and genetic material to cereals, forage and food legumes improvement programmes, specially to the National Plant Breeding Station programme.

This genetic resource research is contributing very positively to the forage breeding programme and maize breeding programme.

4.1 CROP IMPROVEMENT PROGRAMMES

An important crop improvement programme is being carried out by the National Plant Breeding Station, located at Elvas. Specific projects consider the self-pollinated cereals (Wheat, Barley, Triticale and Oats); forage and grassland crops; pulses (Chickpea, Pea, Faba bean, Lentils); oil crops.

Certified Seed production till basic seed level, of the cultivars obtained in the National Plant Breeding Station and admitted to the National Variety Catalogue, are produced by the Station itself. Special regulation allows to sell pre-basis and basis seeds to public and private seed enterprises. The seed production system follows strictly the rules of EC legislation.

The main objectives of the National Plant Breeding Station depend on the EC agricultural policy and the on-going projects are based on principles of sustainable agriculture. Considering the huge national food deficit its programme looks for the selection of new varieties fitted to low-input agricultural systems, showing high yielding capacity, high yielding stability, and high quality.

The Maize Breeding Centre (NUMI-Núcleo de Melhoramento de Milho), working closely with the Portuguese Plant Germplasm Bank (BPGV-Banco Português de Germoplasma Vegetal), has two main breeding philosophies: one based on breeding for low-input agricultural system, for sustainable agriculture, by means of the on-farm research under the perspective of the

whole agricultural system (polygenic resistance mechanisms, intercroping, rotation, etc.); other based on the more traditional on-station research for high performances under high inputs.

Other important breeding activities are under way in Agricultural Universities and other INIA institutions, as is the case of National Fruit Trees Station (Estação Nacional de Fruticultura "Vieira Natividade"). This last mentioned institution, besides breeding activities, is responsible for assurance of a great part of the propagating material for farmers.

Plant breeding activities can be developed both by public, cooperative and private enterprises, however at moment almost all plant breeding institutes belong to the State.

The products of plant breeding are primarily submitted to the Government seed assessment and only the cultivars that show more interesting performance in the Official testing system are included in the National Catalogue and consequently allowed for trade. That is a safety process and, as rule, the seed from the Plant Improvement Centre to the farmer takes not much long time.

Very recently some agricultural producers associations are cooperating gradually in plant breeding and variety evaluation activities.

The improved varieties are available to all farmers.

It is recognized that the seed production and distribution should be improved whether a more efficient and well organized agricultural research system be implemented. Therefore is urgent to reorganize the R&D activities adopting a realistic and scientific experimental network, favouring the *in situ* agricultural research philosophy.

4.2 IMPROVING PGR UTILIZATION

As a consequence of the existent constraints set in the agricultural research system, the chain efforts from genetic resources activities to seed production/utilization system is negatively affected. It is largely accepted the needs for improving the generation of technology and gradually to reduce the consumption of time and money in order to the products and information available reach the farmers efficiently. It should be very important and desirable to set up a more interactive approach system to overcome the most negative constraints like the isolation and the barriers between the scientists and their institutions with the farmers.

4.3 USE OF FOREST GENETIC RESOURCES FOR SEED PRODUCTION/SUPPLY

Pinus pinaster. The selection of more than 50 seed stands under ecological adaptive traits and economical performances assures the needs of seed for the species. State institutions, namely Forest Services make regular use of these stands.

The species is included on the forestry legislation for reproductive material where category of selected is compulsory.

The species still benefits from seed orchards, provenance tests, progeny tests and clone archives, all under EFN scientific responsibility.

***Quercus suber* (cork oak).** The work and legislation on cork oak are in a backward state upon *Pinus pinaster*. The use of Gene Resources Populations is still in a primitive stage. The aim is to use some of them as seed sources.

CHAPTER 5
National Goals, Programmes and Legislation

Besides the activities of the Botanical Gardens, not turned to the utilization, the activities on PGR identification and conservation, in Portugal, have been traditionally performed according to specific research projects, after which, the scarce (if any) resources spent with conservation determines, in a large extent, its loss for future utilization. This is due to the lack of a national coordination institution which should provide for a national programme definition, specific legislation, adequate and opportune information and secure funding.

Important PGR activities are performed in several institutions within four Ministries, still lacking an adequate coordination both, at the inter- as at the intra-ministerial level. Within each Ministry we may identify different policies and degrees of coordination.

The most comprehensive effort for the proposition of a national coordination institution is now under way, as an initiative of the National Institute for Agricultural Research of the Ministry of Agriculture (INIA-Instituto Nacional de Investigação Agrária). A national consensus is now in an advanced stage of negotiation, but no formal coordination instrument is yet operative.

Besides the informal negotiations, the INIA has already implemented a provisional Documentation and Information Service on PGR in order to assist the Coordination Project elaboration, in particular, by the establishment of the national inventory of staff and structures involved on PGR activities and the national database on PGR.

Some sectoral national coordination, allowing for a more close inter-institutional collaboration, have been possible through the European Cooperative Programme for Crop Genetic Resources Networks (ECP/GR), namely in the fields of *Prunus*, *Brassica* and, just recently, Forage Crops.

In what concerns the non-governmental organizations and the commercial sector, there is not yet relevant activities in the PGR conservation and utilization, but they have been called, through their representatives, for participation in the informal negotiations convened by the INIA.

Recent changes in the agricultural policy, mainly as the result of the country's international commitments, is driving the attention to a greater valorization of our PGR in increasing the biodiversity of crop production, in particular for the high potential value of the autoctonous germplasm.

In the absence of specific legislation, exchange of PGR is only controlled by the national phyto-sanitary legislation, on the basis of the institutions policy which, as a rule, do not impose restrictions, on a *bona fide* bases.

A more appropriate picture of the programmes and legislation can be depicted from the state of affairs within each Ministry.

5.1 MINISTRY OF THE ENVIRONMENT AND NATURAL RESOURCES

At the Ministry of the Environment and Natural Resources (MARN-Ministério do Ambiente e dos Recursos Naturais) particular attention is paid to *in situ* conservation of endemic species, within which some wild relatives of economically important species are comprehended. *Ex situ* conservation of explants or seeds, as a complement, is not still performed in a systematic way.

Adequate skill has been progressively acquired by the specialized staff of the Ministry for *in situ* conservation techniques, and the Institute for Nature Conservation (ICN) is prepared for training and is able to offer courses in this subject.

Most of the present legislation flows from the international agreements, in particular UE legislation and the Convention for Biological Diversity (CBD).

5.2 MINISTRY OF EDUCATION

At the Ministry of Education (ME) the most frequent PGR activities are the *ex situ* field collections in Botanical Gardens, sometimes associated with *in vitro* and/or low-temperature seed conservation. However, in some Universities, relevant plant breeding activities are associated with PGR collecting and conservation, specially low-temperature seed conservation and *ex situ* field conservation. There is no specific budget for PGR activities, being the funding of these obtained within not specifically targeted research projects.

5.3 MINISTRY OF AGRICULTURE

At the Ministry of Agriculture (MA) we may identify the more systematic efforts in PGR conservation and utilization. However, there is still no formal coordination within the different institutions of the Ministry. Also here we may, so, identify different situations, according with the institution considered. The most relevant institutions of MA directly or indirectly involved in PGR activities are:

5.3.1 National Institute for Agricultural Research

The INIA involvement in PGR started in 1976, in the National Agricultural Station (EAN-Estação Agronómica Nacional) and was initially supported by FAO/IBPGR funding. A reduced governmental financing was subsequently granted as a pluri-annual project not renewed from 1991.

Long-term seed storage facilities were installed in Braga, in the Maize Breeding Department of INIA, with financial support of FAO/IBPGR, the Germplasm Bank so created was nominated, by IBPGR, as its "Maize Germplasm Bank for the Mediterranean Area". In 1992, this Germplasm Bank was officially inaugurated by the Minister for Agriculture with the designation of "Portuguese Plant Germplasm Bank" (BPGV-Banco Português de Germoplasma Vegetal).

This institution, in 1994, except for its senior staff, transited from the ENMP (INIA) to the Regional Directorate of Agriculture, under the same Ministry (MA). The BPGV has already experience in PGR training and has been offering relevant courses on PGR. Besides low-temperature seed conservation, the INIA is also concerned in other methods of PGR conservation.

In the EAN, most forms of *ex situ* PGR conservation is practiced, as is the case for:

1. *in vitro* conservation, in particular for virus free plants, specially for grapevine, potato and ornamentals, with financing support being granted by non specific research projects;
2. field conservation is done in experimental self-supported orchards, specially for grapevine and olive;
3. low-temperature seed conservation is done for most of the agricultural seed propagated species and its wild relatives, with financial support from non specific research projects.

In what concerns grapevine, olive-trees and other fruit-trees conservation, three other INIA institutions are particularly involved in field conservation, respectively: the National Grapevine and Wine Station (Estação Vitivinícola Nacional), which maintains a national collection, in close collaboration with EAN and the Regional Directorates of Agriculture.

The National Fruit Trees Station "Vieira Natividade" (ENFVN-Estação Nacional de Fruticultura "Vieira Natividade"), with its specialized departments, maintaining field national collections of Olive, *Prunoideae*, *Pomoideae*, *Citrus* and other fruit species and wild relatives.

In these institutions the expertise goes to field conservation techniques and there is adequate knowledge and conditions for training and implementation of relevant courses on PGR field conservation. However, no budget is attached specifically to the conservation practice.

Field conservation, both *in situ* and *ex situ*, is practiced as the main method by the National Forest Station, of the INIA (EFN-Estação Florestal Nacional) which, as previously referred, is responsible for field collections of *Pinus pinea* and *Quercus suber*.

5.3.2 Institute for the Protection of Food and Agricultural Production

The activity of the Institute for the Protection of Food and Agricultural Production (IPPAA-Instituto para a Protecção da Produção Agro-Alimentar) concerns the PGR in so far as it is engaged with the national legislation on crop protection and seed and propagation material quality.

All the imported plant material, directed towards scientific research (including the phyto-genetic resources) or any other purpose must obey to the national legislation about phyto-sanitary protection, namely the Order 154/94 of 28/05 and the Regulations 344/94 of 01/06 and 731/94 of 12/08, which transpose to the national law the principal Communitary Directives published until now about the subject, namely the Directive 77/93/EEC and its last alteration published on in the Directive 94/12/EEC.

Although, and as foreseen in the article 13 of the Order 154/94 of 28/05, the Directive Council of the IPPAA, national organism responsible for the plant protection sector, may allow derogation's to the prohibitions made at the annexes I, II and IV of above mentioned Order, allowing the entrance in the country, to plant material, that in other way could not be done. To the solicitation of the above mentioned derogation's, should the interested organisms validate their request, supplying the following information among other: genus, species and variety of the plant material (if it is possible),

quantity, local of destination and the maintenance conditions of the referred material. In case of being authorized the import of the plant material, once its entrance in the country, it should be object of inspection and accompaniment by phyto-sanitary inspectors, authorized for that purpose.

As to the plant material exported from Portugal, the determination of the conditions that it should obey is a competence of the responsible authorities of the importer country and Portuguese phyto-sanitary inspectors should verify if it obeys to the necessary specifications, to issue a passport or phyto-sanitary certificate depending on whether the destination country is an UE member or other country.

Portuguese legislation about phyto-sanitary protection applies to *in vitro* material, plants or parts of plants and to certain seeds. Presently, in the UE, special legislation is being prepared concerning the entry and circulation of material to trials and scientific research, so being included PGR. The accomplishment of the established measures of national legislation about phyto-sanitary protection, does not take any delays or material losses, as long as the importing entities correctly accomplish their role foreseen in the law.

Presently there is no need of implementing more restrictive legislation about this subject, and this last only transposes to Portuguese law the communitary legislation, which reflects and protects each member state's interests.

Like in the phyto-sanitary protection measures, also the production and commercialization of varieties of agricultural and vegetable species included in the Common Catalogue, is ruled by legislation established in the Community and transposed to the national legislation (Directives 66/400/EEC, 66/401/EEC, 66/402/EEC, 66/403/EEC, 66/404/EEC, 70/457/EEC, 70/458/EEC and 69/208/EEC), which establishes that only the species included in the Common Catalogue are able to be marketed, and that the production of seeds is authorized only to varieties registered in the National Catalogue of Varieties.

Portugal has in force legislation about plant breeder's rights protection since 1990, which is in agreement with UPOV Convention of 1961, as reviewed in 1978. Although the country is not yet an UPOV member, national legislation about the subject (Order 213/90 and Regulations 949/90 and 379/93) was submitted in April of 1994, upon approval of the UPOV Council, having received a favourable voting.

At the moment is still running the adhesion process, which shall be conclude in a short term, and the country will become a member of the UPOV.

Breeder's rights national legislation does not exercise any direct influence on the genetic resources national programme, looking however its incentive and promotion.

The seed, seed-potato and other propagation material qualities are controled according to the rules of the European Union.

5.3.3 Regional Directorates of Agriculture

PGR activities by the Regional Directorates of Agriculture are not a rule, though they are considered, in the informal negotiations convened by the INIA, as priority for the farmers engagement in the PGR conservation and utilization.

Two exceptions can be referred for the Regional Directorates of Agriculture:

1. The Regional Directorate of Agriculture of the Northwest of Portugal (DRAEDM-Direcção Regional de Agricultura de Entre Douro e Minho), granting an annual budget of 10,000,000 PTE to the BPGV;
2. the Regional Directorate of Agriculture of the Northeast of Portugal (DRATM-Direcção Regional de Agricultura de Trás-os-Montes), granting an annual budget of and 10,600,000 PTE to the PGR activities.

5.4 MINISTRY OF THE TERRITORIAL PLANING AND ADMINISTRATION

Two institutions of this Ministry are also involved in PGR activities, this is the Tropical Scientific Research Institute (IICT-Instituto de Investigação Científica Tropical) which maintains a Botanical Garden for exotic species and the Coffee Rust Research Centre (CEFC-Centro de Estudo das Ferrugens do Cafeeiro).

5.5 MOST IMPORTANT AREAS OF INTERVENTION

According to the situation referred in the previous chapters, we may identify the following situations where urgent action is required

1. accelerated erosion of landraces genetic resurces, demanding for immediate collecting, characterization and conservation;

2. erosion of wild plant genetic resources, demanding for identification of endangered genotypes, particularly wild relatives of cultivated species or potentially economical species;

3. lack of an adequate network of *in situ* conservation areas, allowing for continuation of autoctonous germplasm diversification in nature and on farm;

4. lack of an adequate network of germplasm banks allowing for conservation of present diversity and quick exchange of PGR.

CHAPTER 6
International Collaboration

Collaboration between Portugal and international organizations and institutions in other countries has been a priority since long.

Portugal adhered to the "International Undertaking on Plant Genetic Resources" in 1983, becoming then a member of the FAO Commission on PGR.

In the 13th of June 1992, at the time of the "United Nations Conference on Environment and Development" (UNCED), Portugal became a signatory of the "Convention on Biological Diversity.

This engagement in the UN initiatives shows the political recognition of the PGR relevance. However, there has been no internal financial commitment nor structural implementation which would allow for the necessary coordination.

Therefore, the "conservation and sustainable utilization of PGR for food and sustainable agriculture", so as the "conservation of biological diversity" (as referred in Chapters 14 and 15 of Agenda 21), have been only considered in the legislative and normative measures concerning the environment and the agricultural production.

A fruitful collaboration with FAO/IBPGR was started in 1977 when those international Organizations sent an expert to assist Portuguese scientists in the collecting of plant genetic resources.

During the following two years several collecting missions were organized with financial support of FAO/IBPGR. This process reached its highest point when, in 1979, the Genebank at Braga accepted the responsibility to act as base collection for Maize of the Mediterranean region, in an international network of base collections (vide Chapter 3).

Besides its auspicious collaboration with the International Board for Plant Genetic Resources / International Plant Genetic Resources Institute (IBPGR/IPGRI) (namely within the ECP/GR, and the "European Programme for Forest Genetic Resources" (EUFORGEN), of which Portugal is member since their implementation, respectively in 1980 and 1993) so as with the "Centro Internacional de Mejoramiento de Maiz y Trigo" (CIMMYT) and ICARDA, Portugal is not yet a donor member of the CGIAR.

Within the ECP/GR, Portugal is now engaged in the following working groups: *Brassica*, *Prunus* and Forage Crops. Under the umbrella of EUFORGEN Portugal has a representative in the *Quercus suber* working group. Besides those two working groups of the ECP/GR, Portugal has representatives in the Rocket Genetic Resources Network, that is a working group of the project "Conservation and Use of Underutilized Mediterranean Species, coordinated by IPGRI.

These have been, certainly, good steps forward, however, full benefits from these regional intergovernmental initiatives are only to be expected with the implementation of a national coordination system.

This function of promoting international coordination is envisaged as one of the most relevant for that organization, nevertheless, an important role should yet be played by IPGRI in promoting the necessary technology transfer and supporting (technically and financially, when appropriate) PGR activities in developing countries.

Also productive has been the collaboration with CIMMYT and ICARDA.

An important exchange of germplasm, particularly of advanced bred lines, allowed for the production of new improved cultivars. On the other hand, some Portuguese landraces and bred material were included in the CIMMYT and ICARDA germplasm collections and in some of the genotypes produced by them.

The recent European Community Programme on Genetic Resources for Agriculture, may play an important role in propitiating conditions for the establishment of a national coordinating system and programme on PGR. However, except for the groups already internally organized (as, for instance, within ECP/GR, EUFORGEN, International Olive Council, etc.), may not be relevant enough to Portugal due, precisely, to the lack of an appropriate internal coordinating structure capable of implementing and managing a National Programme on Plant Genetic Resources.

Other example of systematic international collaboration can be referred for the Olive PGR, both within regional as within world wide organizations.

In the first mentioned level, a series of exotic field collections were assembled in our country, specifically with adaptation purposes, under the collaboration established within the FAO European Cooperative Olive Network.

Other collections are now in implementation, specially a national field collection, and an international network of Olive PGR, under the collaboration within the International Olive Council (COI-Conselho Oleícola Internacional).

In what concerns forests, until recently genetic resources was a distant concept in Portuguese practices. Resolution 2 of the Ministerial Conferences for the Protection of Forest in Europe, held in Strasbourg in 1990 and Helsinki in 1994, were the moving engine. Being a member of EU, Portugal saw great opportunities for cooperation in forest research projects. Within other international programmes, as EUFORGEN, Portugal is developing its cooperation in Forest Genetic Resources with North African countries.

In the sequence of the relationships within the international organizations, some bilateral agreements developed for PGR, particularly included in research projects not specifically conceived for this particular aim.

Because of this situation, most of the international collaboration, concerning PGR collecting, conservation and utilization, has been developed under bilateral institutional agreements, assuming the "mankind heritage concept" of PGR.

This is the case of numerous examples as:

- the institutional agreements, for exchange of Lupinus germplasm, between the National Agricultural Research Station (EAN-Estação Agronómica Nacional) and the Department of Agriculture of Western Australia;
- the joint collecting missions for several plant species (landraces and wild progenitors) held in the Iberian Peninsula by EAN, for Portugal, and Plant Genetic Resources Center of the National Institute for Food and Agricultural Technology Research (CRFG/INITAA-Centro de Recursos Fitogenéticos do Instituto Nacional de Investigaciones y Tecnologia Agraria y Alimentaria), for Spain, with financial support of FAO/IBPGR;
- the strategy of the Portuguese Plant Germplasm Bank (BPGV) is based on three main links: Africa, America and Asia. This strategy was proposed to IPGRI jointly with UK and, since 1990, a protocol of cooperation has been implemented between the Portuguese Plant Germplasm Bank (BPGV) and the Horticulture Research International (HRI) and several collecting missions jointly organized and carried out by these institutions. Besides this, a joint mission with scientists from the N.I. Vavilov Institute of Plant Industry and from the BPGV was organized and carried out in the Madeira archipelago;
- the fruitful cooperation between BPGV and CENARGEN (Brazil), namely information and material exchange and training;

- the on-going exchange of material between the Botanic Garden of Ajuda (Jardim Botânico da Ajuda) and the territories of Macau (Câmara das Ilhas de Taipa e Coloane).

Several other bilateral contacts among national institutions or individuals with foreign institutions and individual researchers are a normal feature in the day-to-day activities. However, due to the more informal nature of this contacts, it is difficult to give examples and to quantify them.

CHAPTER 7
National Needs and Opportunities

By its particular geographic situation, a wealth of plant germplasm diversity developed in Portugal. Furthermore, the early enterprise of the discoveries' era and the long-lasting permanence in overseas territories promoted a wide introduction of exotic germplasm.

Portugal has traditionally been liberal with this natural and historical man improved heritage, and remarkable examples of bred varieties of forage, grain legumes, horticultural, cereal and other crops can be referred, for many countries, which have resulted from (or at least incorporates) germplasm collected in Portugal.

Recognizing the relevance of this material to the welfare of the mankind, Portugal is willing to continue and improve its availability in a sustainable way, for which a remarkable effort in the identification, collecting and characterization is urgent.

The most needed National Coordination is under way, and a high investment will be necessary to carry out, in due time, the urgent task of safeguarding landraces still existing (under increased risk of complete loss) and valuable germplasm of wild relatives of cultivated plants, in many cases confined to narrow areas of subsistence.

Besides low-temperature seed conservation, very convenient for most plant species, it is necessary to increase forms of dynamic germplasm conservation, as it is the case for field conservation, in general, and *in situ* conservation, in particular. Under this way of PGR conservation, we consider that:

1. there is an urgent need for "on farm" conservation of genotype diversity of cultivated species, for which traditional farming systems (probably with minor adaptations, when considered as convenient), including the whole crop rotations and inter-cropping, should be subsidized, and;
2. some urban and other social pressures over wild relatives of the cultivated plants urges for the recognition and protection of specific areas for *in situ* conservation which, on the other hand, require adequate concern about social, financial and legal (like land ownership) problems.

For most of the cultivated species there is a fairly good adaptation to sustainable farming systems, in particular for its buffering against yearly variations (insurance value, as referred in FAO Doc. CPGR-Ex1/94/5 Supp.)

and this is a desirable feature within the modern trends for agriculture in surplus industrial areas.

In what concerns wild relatives of cultivated species, most of them may subsist in wide spread habitats, but some of them are now confined to very restricted areas which urged to be specifically protected for its subsistence, for its information value (as referred in FAO Doc. CPGR-Ex1/94/5 Supp.). This problem is particularly stringent in the Algarve province, submitted to progressively increased urbanization pressures, but also applies to other regions of the country, specially in the littoral.

Another priority for the country is the rejuvenation of PGR in low-temperature seed conservation and its full characterization, in order to allow for the identification of the changing desirable options for plant breeding, in particular for the broadening of the genetic bases of the cultivated species. This most needed aspect of biodiversification in agriculture, should also be complemented by new crops introduction, so from the domestication of autoctonous wild species, as from the introduction of environmentally innocuous exotic species. By its particular climatic conditions, Portugal can take profit from the high commercial value of some sub-tropical plants (in particular fruits and nuts) and from the high photosynthetic potential of C4 macrothermic plants.

Evaluation of the actual agricultural potential, as alternative crops or genotypes, is required for:

1. wild autoctonous species, both for human consumption or animal feeding;
2. landraces, as a source for breeding material or directly for alternative sustainable farming systems and
3. exotic germplasm, also as a source for breeding material or for crop diversification after assessment of its eventual environmental impact.

The present economical interdependency with other countries, the changing demands of agricultural products and the increased pressure of environmental constrains, may demand an extra effort from the plant breeders, for which an increased availability of PGR is called for.

So, a comprehensive and easily accessible documentation system is essential, in order to achieve such desirable PGR availability.

CHAPTER 8
Proposals for a Global Plan of Action

The highly dependent situation of most of the countries in the germplasm originated in other regions makes necessary the improvement and sustainability of germplasm availability, in order to allow for a quicker adequacy and endurance of the crop production in the different parts of the world.

Adequacy of crop production should mean: firstly, as a priority target of a global plan of action, the rapid reduction of food shortage in critical areas of the Globe; secondly, reduction of the environmental aggression and surplus, with its inherent reflection on farmers welfare, in the more developed countries.

This means that priority should be granted to the safe technology transfer to developing countries, allowing for its self-sufficiency in food production balance. Germplasm availability should be than sought in its different perspectives, namely:

1. by the knowledge of the existent genetic potential, requiring systematic prospecting in farms and nature, adequate collecting and full characterization;
2. by the maintenance of adequate stocks of exchangeable propagation material.

Technology transfer to developing countries must envisage, as a priority, an adequate production of diversified food products (under the genetic and the dietetic point of view), in harmony with traditional farming systems, after a judicious appraisal of its real value and social relevance.

According to the aforesaid, it would be a priority, for the following years of the Global Plan of Action, to achieve the following goals:

- Reinforce the sustainability of national structures and human skill for the implementation of scientific and technical capabilities (both in conservation as in utilization), where it is insufficient.
- Reinforcement of the network of regional international institutions to foster the national scientific and technical capabilities, and monitoring situations where PGR may be in jeopardy.

- Encouragement and reinforcement of the present bilateral or multilateral agreements aimed to build capacity for the conservation and sustainable utilization of PGR.

The reduction of the environmental aggression and local situations of non economical surplus require a plant breeding philosophy of polygenic buffering against biotic and abiotic stress, allowing for less capital intensive production systems and, so, reducing environmental impact and production cost. This desideratum can hardly be achieved by mutation breeding or gene transfer, demanding for systematic screening of genotypes, under adequate selection mechanisms.

According to this, it would be necessary to achieve the following goals:

- comprehensive identification, characterization, conservation and documentation of the landraces and old cultivars still in culture;
- comprehensive identification, characterization, conservation and documentation of the whole gene pool concerned with cultivated species;
- prospecting of the potential of wild plants for food and agriculture.

In order to achieve these goals, appropriate measures for the fair and equitable sharing of benefits should be devised, having in mind that PGR from any country, in the long run, are invaluable for them as for any other country.

The estimation of economic incentives to the farmers (to continue developing and conserving the diverse PGR for food and agriculture) so as to the agents of plant breeding technology (to produce more adequate genotypes and to develop improved conservation and utilization technologies) should be assessed in practical promotional terms.

The involvement of communities or countries in the betterment and safeguarding of PGR, should be supported by adequate funding and/or technology transfer which must be assessed on the based of:

- the national recognition of the value, for present and future generations, of PGR for Food and Agriculture;
- the national commitment in the objectives of the Global Plan;
- the amount technically required to endeavour adequate measures;
- the overall resources of the country.

Recognizing the need for conciliating the free access to PGR with the sovereign rights of the nations, we advocate an internationally based information network in association with a nationally based conservation network.

Regional multilateral mechanisms can be desired for conservation (particularly for safe duplication), however national capability for adequate conservation of autoctonous germplasm, either *in situ* or *ex situ*, should be implemented, wherever it does not exist.

The international information network should be sought in the present trends of a centralized directional information and local specific information (by crops, group of crops, species, group of species, etc.).

The provisioning of the required resources should be assigned according with the overall resources of the country, having in mind the importance of PGR on food production and welfare.

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