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

PORTUGAL

State of Plant Genetic Resources for Food and Agriculture in Portugal

Second Portuguese National Report on
Conservation and Sustainable Utilization
of Plant Genetic Resources for Food and Agriculture

Oeiras
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Note by FAO

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LIST OF ABBREVIATIONS AND ACRONYMS

ABS	Access and Benefit Sharing
AGRO	Programa Operacional de Agricultura e Desenvolvimento Rural
AL	Alentejo
ALG	Algarve
BI	Beira Interior
BCBA	Banco do Centro de Biotecnologia dos Açores
BL	Beira Litoral
BPGV	Banco Português de Germoplasma Vegetal
CBD	Convention on Biological Diversity
CGIAR	Centres of Consultative Group on International Agricultural Research
CIFC	Centro de Investigação de Ferrugens do Cafeeiro
CIMMYT	Centro Internacional de Melhoramento de Milho e Trigo
CNV	Catálogo Nacional de Variedades
CWR	Crop Wild Relatives
DGADR	Direcção Geral de Agricultura e do Desenvolvimento Rural
DGPC	Direcção Geral de Protecção de Culturas
DRAPA	Direcção Regional de Agricultura e Pescas do Alentejo
DRAPAlg	Direcção Regional de Agricultura e Pescas do Algarve
DRAPC	Direcção Regional de Agricultura e Pescas do Centro
DRAPN	Direcção Regional de Agricultura e Pescas do Norte
ECCDB	European Central Crop Database
ECPGR	European Cooperative Plant Genetic Resources
EDM	Entre Douro e Minho
ESAC	Escola Superior Agrária de Coimbra
ESAE	Escola Superior Agrária de Elvas
EU	European Union
EURISCO	European Search Catalogue
FAO	Food and Agriculture Organization
G	Large dimension
GPA	Global Plan of Action
ICARDA	International Centre for Agricultural Research in Dry Lands
ICN	Instituto da Conversão da Natureza (now ICNB)
IICT	Instituto de Investigação Científica e Tropical
INE	Instituto Nacional de Estatística
INETI	Instituto Nacional de Engenharia e Tecnologia Industrial
INIA	Instituto Nacional de Investigação Agrária
INIAP	Instituto Nacional de Investigação Agrária e das Pescas
INRB	Instituto Nacional de Recursos Biologicos
ISA	Instituto Superior de Agronomia
IPEN	International Plant Exchange Network
IRRI	International Rice Research Institute
IPM	Integrated Pest Management

ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
ITQB	Instituto de Tecnologia Química e Biolgica
M	Medium dimension
MAP	Medicinal and Aromatic Plants
MG	Very large dimension
MP	Very small dimension
NGO	Non Governmental Organization
OTE	Different type of farming
P	Small dimension
PAMAF	Programa de Apoio à Modernização da Agricultura
PDO	Protection of Denomination of Origin
PGRFA	Plant Genetic Resources for Food and Agriculture
RO	Ribatejo e Oeste
TMAD	Trás-os-Montes e Alto Douro
WFP	Wild Food Plants
WIEWS	World Information and Early Warning System

SECTION 1

EXECUTIVE SUMMARY

This report is a contribution for the assessment of the implementation of the Global Plan of Action, in Portugal, during the period 1996-2008. The report has an introduction to the agricultural sector in Portugal followed by eight Chapters that give information on several matters related to the subject of "plant genetic resources for food and agriculture". So, it is considered that the report could provide, in the near future, a good basis for national planning of activities on plant genetic resources.

Portugal, due to its geographical localization and geophysical conditions possesses a rich natural biodiversity. Furthermore, Portuguese agriculture has preserved along the centuries several landraces. In the last decade severe genetic erosion occurred in various Portuguese habitats due the urbanization pressure, tourism resorts and golf greens. The introduction of invasive species, has also greatly contributed to genetic erosion. Concerning the landraces, genetic erosion is due to replacement of traditional cultivars by commercial ones as, for example, the use of modern hybrids of maize and wheat. Farmers increasing age and retirement also contribute to loss of traditional cultivars.

A preliminary national inventory concerning the CWR was already concluded. However, this inventory needs to be validated and after that it will be necessary to identify which species should be given first priority for *in situ* conservation. The Portuguese on-farm inventory is under development.

Portuguese Institutions which maintain *ex situ* germplasm collections belong to the Ministries of Agricultural, Rural Development and Fisheries (MADRP) and of the Science and Technology. Since 1996 two additional genebanks were created: the Germplasm Bank ISOPlexis, from Madeira University and the "Banco do Centro de Biotecnologia dos Açores" (BCBA), from Azores University. During the last ten years a great effort concerning the documentation of the genebank collections was carried out. Passport information on genebank accessions has been uploaded in EURISCO and in some of the European Central Crop Data Base.

The main breeding activities are carried on at INIA, but are also performed at the Schools of Agriculture of several Universities. Cereals (wheat, barley, oats and triticale) breeding programme is the oldest one and it is directed to dry land plants, although recently it also focused on irrigation conditions. Maize breeding is directed for population improvement in open pollinated varieties with a quality-oriented perspective for human use. Rice ("carolino" type) breeding work making use of marker assisted selection has started to develop dwarf-yielding varieties, with blast resistance. Concerning grain legumes the main breeding objectives have been, resistance or high tolerance to *Ascochyta rabiei*, seed size (for chick pea), protein content and reduced amount of anti nutritious compounds (pea, lentil, *Lathyrus*).

Portugal subscribed the ITPGRFA in 2005 and, thus, is fully supportive of its objectives.

At present, the country is preparing the various issues arising in the context of policy, legislation and other measures for national implementation of the Treaty.

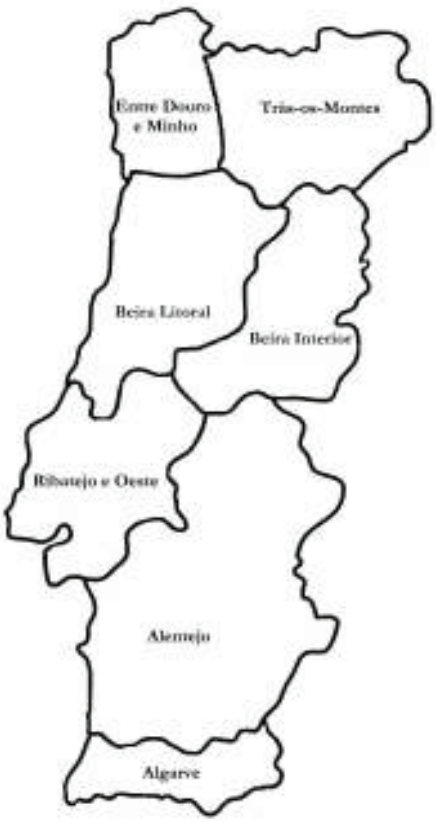
SECTION 2

INTRODUCTION TO THE COUNTRY AND THE AGRICULTURAL SECTOR

Portugal is a small country composed by both mainland and archipelagos territories. The mainland has the shape of a rectangle almost four times longer than wide (Fig.1) and it is located in the most western part of the Iberian Peninsula, in South-western Europe (latitude 37° - 42° N; longitude 9° - 6° W). The archipelagos Azores and Madeira are localized in the Atlantic Ocean.

The total area of Portugal is 91 734 km^2 corresponding 88 603 km^2 to the mainland, 2 335 km^2 to Azores and 796 km^2 to Madeira.

FIGURE 1
Map of Portugal mainland with indication of the Regional Agriculture Areas



Two distinct zones can be considered in the mainland: the "interior" with a climate of Mediterranean characteristics where human activity is mainly centred on the primary sector (with the exception of the Algarve Province, where tourism represents a very relevant economic activity) and the "littoral" with marked influence of the Atlantic climate, where are localized the biggest cities, such as Porto, Aveiro, Coimbra, Lisboa and Setúbal as well as about 90% of Portuguese industry.

About 38% of the mainland soils are occupied by forest, mainly in the centre and north of the country, and 44% by agriculture. However, this distribution does not reflect correctly the real soil potentialities since about 59% have a higher forestry capacity and only 26% a true agriculture capacity.

The climatic and agricultural characteristics, the low agricultural productivity and, consequently, the income as well as the major localization of the secondary and tertiary sectors in the littoral led to a highly asymmetric distribution of the

population as represented in Table 1. Portugal mainland, with a little more than 9 828 000 inhabitants has about 82% of its population localized in the littoral; of the remaining 1 737 000 inhabitants about 0.398 million live in the Algarve region (as referred above greatly dependent on the touristy activities), the remaining 1 339 000 inhabitants (14% of the population) live in the interior regions (Trás-os-Montes e Alto Douro, Beira Interior e Alentejo).

TABLE 1
Area and population of mainland Portugal distributed by the Regional Agricultural Areas

Agrarian Regions	Total Area (km^2)	Population	
		Total (n.°)	Density (inhab./km^2)
Entre Douro e Minho (EDM)	9 007.3	3 252 512	361
Trás-os-Montes e Alto Douro (TMAD)	12 272.7	439 410	36
Beira Litoral (BL)	11 712.3	1 405 090	120
Beira Interior (BI)	11 947.0	375 707	31
Ribatejo e Oeste (RO)	11 462.3	343 3781	300
Alentejo (ALE)	27 212.0	523 835	19
Algarve (ALG)	4 989.9	398 370	80
Mainland	**88 603.5**	**9 828 705**	**111**

According to: INE, 2002

1. Concise analysis of the Portuguese agriculture in the beginning of the XXI century, based on the identification and characterization of the farms

The analysis of agriculture in any region, country or economic bloc and a definition efficient and fair policies are greatly dependent on an in depth analysis of the characteristics of the main types of farming. So, the analysis of the Portuguese agriculture is based on the characteristics of the main types of Portuguese farms at the beginning of the 21st century.

The methodology utilized was based on the work of Avillez *et al.* (2004) which utilizes the last general sensus of agriculture which took place in the year of 1999. The farms where classified and characterized according two main criteria: irrigation (meaning the importance of irrigation in the total agricultural area of the farm) and economic size of farms (representing the value of the farm total gross margin determined in European Size Units calculated from the standard gross margin (SGM) concerning the several crops and livestock enterprises).

Furthermore the representativity (% of Utilised Agricultural Area - UAA) of the different Type of farming (OTE), defined in terms of the relative importance of the different enterprises on the farm, is analysed for each regional agricultural areas from Portugal mainland.

Using the criteria defined above twenty five OTEs were identified in Portugal mainland. The distribution of the field observation is represented in Table 2. Most of the farms (87%) either dry land or employing irrigation are classified in the smaller economic size of farms (MP); those classified in the higher classes (G and MG) occupy about 68% of the total

UAA and originate the highest volume of SGM (54% of the total).

TABLE 2
Types of farm exploitation from Portugal mainland according to irrigation classes and economical dimension

Economic Dimension	Irrigation Classes					
	EAES	EAPdS	EAPrS	EAPrR	EAPdR	Total
	Number of Exploitations (%) per irrigation class					
MP	80.1	72.6	73.7	72.7	65.2	74.5
P	9.9	14.1	13.6	14.2	16.0	12.8
M	5.3	7.3	6.2	6.9	8.8	6.5
G	3.1	4.0	4.5	4.3	6.3	4.1
MG	1.6	2.0	2.0	2.0	3.8	2.1
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Economic Dimension	Irrigation Classes					
	EAES	EAPdS	EAPrS	EAPrR	EAPdR	Total
SAL (%) per irrigation class						
MP	19.1	15.2	29.7	31.7	24.0	19.4
P	10.1	9.5	14.4	14.5	12.7	10.6
M	13.3	10.4	11.4	12.3	11.3	11.9
G	22.4	16.8	13.4	14.7	15.5	18.8
MG	35.2	48.0	31.1	26.8	36.5	39.3
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
MB Total (%) per irrigation class						
MP	22.7	20.5	23.3	21.9	14.2	20.5
P	12.3	13.5	13.1	12.7	10.2	12.4
M	13.0	14.0	12.1	12.4	11.3	12.6
G	16.9	16.5	19.6	17.2	19.9	17.5
MG	35.0	35.5	31.8	35.9	46.5	36.9
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

According to: F. Avillez *et al.*, 2004

2. OTE distribution in the different regions

The distribution in the Portugal mainland agrarian regions of the different OTE (specialized or mixed) is represented in Table 3. It should be stressed the importance of the mixed farms (mixed livestock, crops and livestock or mixed cropping) in every region of the country with special occurrence in "Entre Douro e Minho" region.

Concerning the dairy farms they dominate in "Entre Douro e Minho" and "Beira Litoral" regions; fruit farms predominate in the "Algarve" region; grazing livestock farms in "Alentejo"; other field crops farms in "Beira Interior" and "Ribatejo e Oeste"; olives farms in "Trás-os-Montes e Alto Douro", "Beira Interior" and "Ribatejo e Oeste"; cattle-rearing and fattening farms in "Alentejo"; sheep, goats and other grazing livestock in "Beira Interior"; quality wine farms in "Entre Douro e Minho" and "Trás-os-Montes e Alto Douro" and vineyards (wine and table grapes) in "Ribatejo e Oeste".

TABLE 3
Different OTE and their distribution in agrarian regions

OTE	% SAU							Mainland
	EDM	TMAD	BL	BI	RO	ALE	ALG	
Permanent Crops	9.4	31.3	9.0	13.6	9.2	3.8	23.8	10.0
Vegetables and Flowers (open field and glass houses)	0.3	0.1	0.2	0.0	0.6	0.0	1.5	0.1
Rice	0.0	0.0	3.4	0.0	0.7	0.9	0.0	0.7
Arable Crops	0.3	0.3	4.1	0.7	7.9	15.1	1.7	9.2
Cattle Rearing and Fattening	3.5	4.1	1.4	4.5	6.5	10.9	1.8	7.8
Fresh Fruits (including Citrus)	0.4	1.3	1.3	1.3	6.2	0.2	30.0	1.9
Dry Fruits	0.0	4.3	0.1	0.2	0.0	0.0	6.3	0.8
Vegetables	0.0	0.0	0.0	0.0	3.9	0.3	0.1	0.6
Vegetables/Flowers (open field)	0.7	0.0	0.8	0.1	3.5	0.2	0.6	0.6
Olive Tree	0.0	6.9	0.7	7.0	6.0	3.3	0.7	4.1
Other Cultures	3.0	1.3	10.2	3.8	11.6	4.4	2.5	4.8
Wines and Table Grapes	0.3	0.5	0.2	0.3	9.9	0.7	1.3	1.6
Quality Wines	8.1	9.7	4.1	2.8	0.7	0.6	0.0	2.6
Dairy Farms	17.1	5.0	13.4	4.2	2.7	0.8	0.0	3.4
Pork/Poultry	0.2	0.9	5.3	0.4	3.1	3.3	2.4	2.5
Sheep and Goats	0.5	4.9	4.3	17.8	2.2	6.8	5.8	6.8
Dairy Farms	41.3	23.7	22.7	38.9	16.2	39.6	12.9	33.7
Policropping (except permanent crops)	14.7	5.7	18.9	4.2	9.2	9.0	8.5	8.9

According to: F. Avillez *et al.*, 2004

3. Portuguese forestry sector

The Portuguese Forestry is dominated by a relatively small number of species as can be seen on Table 4. In the mainland the most important species, by decreasing area of cultivation, are maritime pine (*Pinus pinaster*), cork oak (*Quercus suber*), eucalyptus (*Eucalyptus globules*) and holm oak (*Q. rotundifolia*).

Cork oak may be considered one of the most characteristic species and of the highest economical importance for the country, since it produces several goods in addition to cork.

Portugal is the main producer of cork and the cork oak forest constitute a very important ecosystem in the southern part of the country (Alentejo).

TABLE 4

Area of the forest species in Portugal mainland and their distribution in Agrarian Regions

Agrarian Areas	Pine		Cork oak	Eucalyptus	Oaks	Chestnut	Holm oak	Others
	Maritime	Stone						
Entre Douro e Minho	132.8	0.2	-	130.7	15.0	1.3	-	43.8
Trás-os-Montes e Alto Douro	112.8	0.1	21.3	12.4	46.5	32.4	20.4	33.8
Beira Litoral	336.2	1.0	0.1	151.8	24.4	3.1	0.5	18.1
Beira Interior	233.5	-	27.8	75.2	33.6	3.1	31.3	7.9
Ribatejo e Oeste	95.4	14.5	139.8	142.9	6.0	0.2	3.1	11.6
Alentejo	59.5	52.9	483.9	130.5	2.4	0.1	397.8	8.8
Algarve	6.0	9.0	39.8			0.2	8.6	5.4
Mainland	**976.2**	**77.7**	**712.7**	**672.1**	**130.9**	**40.4**	**461.7**	**129.4**

According to: Direcção Geral das Florestas, 1998

4. International trade

There is a great deficit in the trade balance of the Portugal mainland with a global "covering rate" (in 2004) of the order of 64.5%. The situation regarding agriculture, animal production, hunting and forestry is even less favourable with a "covering rate" of the order of 21%.

The agro-forestry sector has a negligible contribution to the international trade of the country representing nearly about 1.39% of the total exports and 4.26% of the total imports. About 70% of either imports and exports of food products and beverages are originated or addressed to the fifteen EU countries (1997). Spain occupies the 1st place (34% of imports and 23% of exports), then comes France (15% of imports and exports) and then United Kingdom (7% of imports and 10% of exports).

CHAPTER 1

THE STATE OF DIVERSITY

Portugal, due to its geographical localization and geophysical conditions possesses a rich natural biodiversity. Furthermore Portuguese agriculture has preserved along the centuries several landraces.

Cork oak (*Quercus suber*) is one of the species from the primordial Iberian forestry and at present is the tree most wide spread in the country, occupying the first place of the forestry area. The longevity of cork oak associated with its exploitation for cork confers a high stability to the cork oak ecosystem (the Montado) which has a very rich flora, namely of aromatic and medicinal plants and is also very rich in a diversity of mushrooms.

Maritime pine (*Pinus pinaster*) and the stone pine (*Pinus pinea*) are the most cultivated pines in mainland Portugal. The first one is considered native and the second one introduced at pré-historical times. Pine forests are also important ecosystems with high biodiversity and very important for the country. For this reason the forest of stone pine established in sandy soils are considered, by the European Union, an important habitat that was included in Natura 2000 network.

The chestnut (*Castanea sativa*) cultivation is of great importance in the North and Centre regions of Portugal and also in some small southern areas. It is explored for fruit and timber, as orchard stands and as coppice/high forest stands. According to the published data, there has been a continuous increase of chestnut area for fruit production since 1986, with the major increase being observed between 1998 and 2004, (19 881 ha reported in1998 rising to 30 227 ha in 2004). In 2004 the fruit production was 31 051 tons, with an average production of one ton per hectare (INE, 2004). The chestnut fruit plots are all privately owned, while chestnut coppice can be found in communal areas and chestnut high forest is distributed by communal areas and more recently in private property.

Riparian woods have high favourable conditions for the development of a great diversity of species. The number of species from those habitats, directly utilized by man or considered Crop Wild Relatives (CWR) of high economical value, represent several tens.

In the last decade severe genetic erosion occurred in the several Portuguese habitats due the urbanization pressure, tourism resorts and golf greens. The introduction of invasive species, has also greatly contributed to genetic erosion. In the riparian woods the threat results from the cleansing of the water lines.

Concerning the landraces, genetic erosion is due to replacement of traditional cultivars by commercial ones as, for example, the use of modern hybrids of maize and wheat.

Farmers increasing age and retirement also contribute to loss of traditional cultivars and for the abandonment of traditional farming systems (where landraces interact in policropping). It is considered that the next five years will be crucial for landraces conservation, since the number of traditional farmers will be dramatically reduced.

1.1 The state of diversity and relative importance of all major crops for food security

Two of the most important crops in Portugal are grapevine and olive tree.

Grapevine is important all over the country, where 340 cultivars are officially authorized for wine making. Besides these ones, ten other cultivars are important because they are used for direct eating. A national field collection was installed, during the 1990 decade, for preservation of the autochthonous cultivars. In order to maintain the genetic variability existing within the cultivars (clonal variability) a further 70 collections were established in the farmers´ fields.

Olive is grown in 9% of the agricultural area (INE, 2008), with several autochthonous varieties still grown in the mainland. Portuguese traditional cultivars, like Galega and Cordovil de Serpa, are being replaced by Spanish cultivars, particularly in the Alentejo region, due to higher yield and less susceptibility to abiotic stress. However, some large farms in Alentejo and Ribatejo (e.g. Herdade do Freixo do Meio and Companhia das Lezírias) have programmes for the preservation of traditional Portuguese cultivars.

Despite the genetic erosion that occurred during the last fifty years, there still is a great diversity of apple and pear landraces, mainly in the rural areas from the northern regions of the country. The cultivars most protected from erosion are those with high commercial value as for example, *Casanova de Alcobaça, Riscadinha de Palmela, Porta da Loja* and Bravo de Esmolfe for apples and *Carapinheira, S. Bartolomeu, Pérola, Amêndoa* and *Pêra Rocha* for pears.

Almonds accounts for 40% of all dry fruits production, covering an area around 37 000 ha. The main production areas are in Trás-os-Montes, especially in the hot lands, and in Algarve which is the traditional production area. In the past 15-20 years, Algarve has lost much almond area due to replacements by *Citrus* among other reasons.

In Trás-os-Montes almond trees are having an increasing importance for tourism, being already a factor of attraction to visit the region during blooming time. Especially in the Upper Douro river valley almond is a crop with a long tradition, however, because 50% of the orchards are older than 30 years, the productivity is quite low.

Cereals and pastures and forages are also major crops corresponding respectively to 11% and 59% of the agricultural area (see chapters 2 and 8).

Cereal landraces represent an important reservoir of biodiversity and source of interesting genes to introduce into modern cultivars.

1.2 The state of diversity and relative importance of minor crops and underutilized species for food security

Grass pea (*Lathyrus sativus*) is a neglected annual pulse crop belonging to the family *Fabaceae*. This species has been widely cultivated since antiquity for food and feed uses.

The most interesting traits of this crop are the adaptability to nearly all types of soils and the tolerance to adverse climatic conditions. Plant germplasm collections are important sources of diversity for plant breeders. At INIA[1] a *Lathyrus* breeding programme is carrying out.

1.3 The state of diversity of wild plants for food production

Riparian woody have several wild plants of food value. As examples we can refer the hazel nut (*Corylus avellana*), hops (*Humulus lupulus*), laurel (*Laurus nobilis*), cherry (*Prunus avium*), plum (*Prunus spinosa*), pear (*Pyrus bourgeana*), blackberry (*Rubus ulmifolius*), elder (*Sambucus nigra*), blueberry (*Vaccinium myrtillus*) and grapevine (*Vitis vinifera* subsp. *sylvestris*).

In addition to the woody species there are also herbaceous plants of importance as food plants, ornamentals or forages. As examples we can refer the strawberry (*Fragaria vesca*), the pennyroyal (*Mentha pulegium*), the watercress (*Rorippa nasturtium-aquaticum*), the narcissus (*Narcissus* spp.), and the clover (*Trifolium resupinatum*).

In the stone pine forestry's it is frequent to see the myrtle (*Myrtis comunis*), the lentisk pistache (*Pistacia lentiscus*), the wild olive tree (*Olea europaea* var. *sylvestris*) and the asparagus (*Asparagus* spp.).

[1] In this entire document INIA, INIAP and INRB represent the same Institution as a consequence of Government restructuring. INIA – until 2002/11/08, INIAP from 2002 until 2006/10/27 (DL n° 246/2002), and INRB from 2006 until the present (DL n° 209/2006).

CHAPTER 2

THE STATE OF *IN SITU* MANAGEMENT

Portugal, due to its geographical localization and geophysical conditions possesses a rich natural biodiversity. It is estimated that the Portuguese flora comprises about 3000 species. The Azores and Madeira Archipelagos are situated within the Macaronesian region having an important biodiversity, with respectively 68 and 123 endemic species.

In mainland the total area of protected areas plus Natura 2000 sites is equivalent to 2 017 803 ha. The Special Conservation Areas from Azores and Madeira is equivalent to 49 296 ha.

Portugal is an interesting case-study of adaptability of plant genetic resources for food and agriculture (PGRFA). Eurasian crops such, as wheat (*Triticum aestivum*) and barley (*Hordeum vulgare*), arrived in the Country between 3800 and 2500 BC, and olive tree and grapevine were greatly spread at Romans times. Similar adaptation occurred with New World crops, such as beans and maize. As a consequence, many landraces originated for each crop.

Despite the great importance of these landraces, their maintenance has been seriously threatened, especially since 1970's, when immigration was intensified and the land abandoned.

2.1 Plant genetic resources inventories and surveys

2.1.1 Traditional cultivars

The inventorying of traditional cultivars has been conducted by governmental Institutions (Research Institutes, Universities) and non governmental organizations (NGOs), always with the cooperation of the Agricultural Regional Services.

Olive tree and grapevine are important crops and several autochthonous varieties are still grown in the mainland. The most important regions for its cultivations are referred in Tables 5 and 6.

Recently (2000-2002), following the Global Plan of Action (FAO, 1996) a strategy Plan which aims to integrate the environmental components into the agricultural and forestry activities was established. One of the scheduled activities was the inventorying of traditional cultivars still grown by farmers.

More than one hundred of traditional fruit trees were inventoried specially of pear, apple, fig tree, cherry tree, chestnut tree, almond and carob tree.

Tables 7 and 8 summarize the most important regions for traditional apple and pear cultivation. However, these tables are not exhaustive and it is expected more complete information will soon be released.

TABLE 5
Traditional olive cultivars and the most important regions for their cultivation

Traditional name	Most important region(s) for the crop cultivation
Galega Vulgar (Galega)	Very common in the country
Carrasquenha	Alentejo
Redondil	Alentejo, Elvas
Azeitoneira (Azeiteira)	Alentejo, Campo Maior
Conserva de Elvas	Alentejo, Elvas
Galega Grada de Serpa	Alentejo, Serpa, Moura
Cordovil de Serpa	Alentejo, Serpa, Moura
Verdeal Alentejana (Verdeal de Serpa)	Alentejo, Serpa, Moura
Maçanilha Carrasquenha de Almendralejo	Alentejo
Cordovil de Castelo Branco	Beira Interior
Bical de Castelo Branco	Beira Interior
Maçanilha Algarvia	Algarve
Redondal	Trás-os-Montes
Verdeal Transmontana	Trás-os-Montes

Traditional name	Most important region(s) for the crop cultivation
Cobrançosa	Trás-os-Montes
Madural	Trás-os-Montes
Negrinha	Trás-os-Montes

According to: Leitão *et al.*, (1986)

TABLE 6
Autochthonous grapevine cultivars for wine making

Traditional name	Most important region(s) for the crop cultivation
Antão Vaz	Alentej
Arinto	In the whole country
Avesso	Minho
Azal	Amarante, Basto, Vale do Sousa
Baga	Bairrada
Bical	Beiras
Borraçal	Vinhos Verdes region
Castelão	Alentejo, Estremadura
Cerceal Branco	Beiras
Cercial	Bairrada
Diagalves	Alentejo
Encruzado	Dão
Espadeiro	Minho
Fernão Pires	Ribatejo
Folgasão	Trás-os-Montes
Malvasia Preta	Dão, Douro
Marufo	Beira Interior, Trás-os-Montes
Moreto	Alentejo
Rabo de Ovelha	All the country, particularly Alentejo, Ribatejo, Estremadura
Rabigato	Trás-os-Montes
Ramisco	Colares region (near Lisbon)
Sercial	Minho
Síria	Alentejo
Tinta Barroca	Douro
Tinta Caiada	Alentejo
Tinta Carvalha	Estremadura, Trás-os-Montes, Minho
Tinta Francisca	Douro
Tinto Cão	Douro
Touriga Franca	Douro
Touriga Nacional	Dão, Douro and during the last years the whole country
Trincadeira	Alentejo
Trincadeira das Pratas	Ribatejo
Vinhão	Minho
Viosinho	Douro
Vital	Estremadura

According to: Bohm (2007)

TABLE 7
Traditional apple cultivars

Traditional name	Most important region(s) for the crop cultivation
Bravo	Beira Litoral, Viseu, Esmolfe
Gigante do Douro	Beira Litoral, Viseu, Vousela
Maçã das Velhas	Beira Litoral, Viseu, Carregal do Sal
Riscadinha Chão da Cunha	Beira Litoral, Viseu, Mangualde
Verdeal de Bodiosa	Beira Litoral, Viseu, Bodiosa
Malápio da Ponte	Beira Litoral, Viseu, Mortágua
Pipo de Basto	Beira Litoral, Viseu, Lamego
Camoesa de Alcongosta	Beira Interior, Castelo Branco, Alcongosta
Maçã do Limoeiro	Entre Douro e Minho, Viana do Castelo, Melgaço
Pero de Coura (Pero Mulato)	Entre Douro e Minho, Braga
Porta da Loja	Entre Douro e Minho, Braga, Tibães
Malápio de Gouveia	Trás-os-Montes

According to: Crespi *et al.*, 2006; Godinho and Lampreia (2006)

TABLE 8
Traditional pear cultivars

Traditional name	Most important region(s) for the crop cultivation
Bela de Junho	Trás-os-Montes, Bragança, Mirandela
Fim de Século	Trás-os-Montes, Bragança, Mirandela
Malheira	Trás-os-Montes, Bragança, Mirandela
Pêra Joaquina	Trás-os-Montes, Bragança, Mirandela
Pêra Marmelo	Trás-os-Montes, Bragança, Mirandela
Rabiça	Trás-os-Montes, Bragança, Mirandela
S. Bento	Trás-os-Montes, Bragança, Mirandela
Boticas Inverno	Trás-os-Montes, Vila Real, Boticas
Nacional	Trás-os-Montes, Vila Real
Boticas Inverno	Trás-os-Montes, Vila Real
Coradinha	Trás-os-Montes, Vila Real
Marmela	Trás-os-Montes, Vila Real, Boticas
Pêra Cabaça	Trás-os-Montes, Vila Real, Boticas
Perola	Trás-os-Montes, Vila Real, Boticas

According to: Crespi *et al.*, 2006; Godinho and Lampreia (2006)

From 2001-2006 a medicinal and aromatic plants (MAP) survey and inventorying was carried out in Entre Douro e Minho, Trás-os-Montes, Beira Litoral, Beira Interior, and Alentejo. The survey included information on indigenous knowledge, identification and assessment of threat to genetic diversity. Ecotypes of species from the genus *Mentha, Origanum, Thymus, Cynara, Foeniculum, Apium, Hypericum* and *Coriandrum* were identified as being threatened.

A surveying and inventorying (2004-2006) was conducted in Central and Northern Portugal concerning maize, common bean and rye. The survey included information on indigenous knowledge, identification and assessment of the threats to genetic diversity.

In the Azores and Madeira Archipelagos an inventorying of the traditional crops grown in the Islands was undertaken with the Project "Germobanco Agrícola da Macaronésia" (2002-2006). Tables 9 and 10 summarize the traditional cultivars that are still grown in the Islands.

TABLE 9
Traditional cultivars of several crops from the Azores Islands

Crop	Number of traditional cultivars
Apple (*Malus domestica*)	74
Pear (*Pyrus communis*)	19
Plum (*Prunus salicina*)	6
Chestnut tree (*Castanea sativa*)	15
Sweet potato (*Ipomoea batatas*)	30
Yam (*Colocasia esculenta*)	18
Milho (*Zea mays*)	14
Common bean (*Phaseolus vulgaris*)	17
Broad bean (*Vicia faba*)	1
Onion (*Allium cepa*)	1

TABLE 10
Traditional cultivars of several crops from the Madeira Islands

Crop	Number of traditional cultivars
Apple (*Malus domestica*)	20
Sweet potato (*Ipomoea batatas*)	37
Milho (*Zea mays*)	21
Common bean (*Phaseolus vulgaris*)	95
Wheat (*Triticum aestivum*)	47
Onion (*Allium cepa*)	9

The efforts developed by NGOs should also be referred. For instance, "Colher para Semear" is mostly active in inventorying and preserving traditional crops. It published a list of about 350 landraces of 22 species, yearly available to members. A Catalogue was also prepared for landraces of fourteen important crops of "Península de Setúbal", south of Lisbon.

In conclusion, the Portuguese on-farm inventory is under development but at present no information is available on line.

2.1.2 Crop wild relatives

Concerning the CWR, the surveying and inventorying of *Vitis vinifera* sp. sylvestris was carried out during the last ten years. This work has great difficulty, particularly because it has to deal with a small number of plants for each population (15 to 20 plants), and also because the plants are located outside protected areas (frequently in farming areas). At present, seven populations were already inventoried, all of them located in the Southern part of the Country (Castelo Branco and Alentejo regions).

More recently, the study of the geographic distribution and the ecology of *Beta* spp. have been started. Populations from each place are being characterized (effective population size, biology of the species)

A preliminary national inventory concerning the CWR was already concluded and is online at www.jb.ul.pt. This inventory needs to be validated and after that it will be necessary to identify which species should be given first priority for *in situ* conservation.

Concerning the collecting of wild materials for food, reference should be made to other taxonomical groups, namely, the fungi which include the wild mushroom used as food supply.

2.2 On-farm management and improvement of plant genetic resources for food and agriculture

Traditional cereals (wheat and maize) are still cultivated in Portugal (mainland, Azores and Madeira Islands). For instance, the traditional wheat Barbela is grown at Mogadouro and Bragança regions (North of the Country).

The most advanced work of on-farm conservation in Portugal refers to maize. The VASO project, a participatory breeding program was initiated in 1984 to improve maize landraces mainly used for bread production. The VASO project also aims to decrease the gaps in commercial value between hybrids and landraces.

Many common bean landraces are in use, in mainland north/central regions, Azores and Madeira Islands. Important examples are 'Papo de Rola', 'Patareco', 'Canário', 'Sete Semanas', 'Manata', 'Bencanta', 'Vagem Rajada' and 'Tarrestre'.

Concerning traditional vegetables, reference should be made to:

- Onion (*Allium cepa* L.) - 'Branca da Lezíria', 'Setúbal´, `Portuguesa', 'Vermelha de Povairão';
- Tomato (*Lycopersicon esculentum* Miller) - 'Pendura';
- Portuguese cabbages (*Brassica oleracea* L.) - 'Penca de Chaves', 'Penca de Mirandela', 'Penca da P voa Verde', traditionally being cultivated in the North of the Country;
- Turnip (*Brassica rapa* L. - 'Greleiro Senhora da Conceição', 'Gandra', 'Greleiro Temporão', 'São Cosme';
- Muskmelon (*Cucumis melo* L.) - 'Lagarto', 'Carrasco', 'Casca de Carvalho Fino', 'Casca de Carvalho Robusto', 'Casca de Carvalho Ponderado'.

More than 300 ancient grapevine varieties are still cultivated in Portugal. This situation is uncommon when comparing the grapevine with all the other main crops. Indeed, for the other crops the cultivated populations are predominantly modern varieties obtained through the genetic breeding. Modern Portuguese vineyards are mainly planted with 13 red cultivars (representing 90% of the area) and 3 white cultivars, while in the oldest vineyards it is still possible to identify a greater number. At present, the grapevine Portuguese trading laws have contributed to a lower utilization of some of the old traditional cultivars.

Despite the genetic erosion occurred during the last fifty years, a great diversity of apples and pears traditional cultivars is still being grown. Apple cultivars most protected from erosion are those with high commercial value, particularly, 'Bravo de Esmolfe', 'Riscadinha de Palmela' and 'Porta da Loja'. The first two are widespread and 'Porta da Loja' is mainly confined to the Minho region. 'Bravo de Esmolfe' is a Protected Denomination of Origin.

Pear sales in Portugal are based on 'Rocha' cultivar (75%), which originated in Sintra during the last century (Silva, 1996). As for apple, pear cultivars most protected from erosion are, those of high commercial value, particularly, 'Rocha', 'Carapinheira' and 'Perola'. Rocha is protected by Denomination of Origin.

In Trás-os-Montes there are local almond varieties, accounting for 45% of the total yield of the region, although 80 local varieties were already identified, of which only a minor part is represented in collections.

In Portugal there is no organized structure to implement the on-farm conservation of grapevine, olive tree and/or others fruit trees. Considering apple and pear there is a residual on-farm conservation effort at some homegardens.

Concerning the small scale seed production, incentives have been established (see Chapter 4) in order to promote:

- Markets for local varieties with Protected Denomination of Origin and for "diversity-rich" products (see Chapter 8);
- Organic farming;
- Strengthening of cooperation between producers.

2.3 *In situ* conservation of wild crop relatives and wild plants for food production

The *in situ* conservation of CWR and WFP is an area of nature conservation. At national level, there are a few legal bases for nature conservation policies. So, the greatest progress in the policy of nature conservation in Portugal took place in the 1990´s. Concerning the conservation of ecosystems should be referred the "Reserva Ecol gica Nacional (DL n° 93/90)", the successive definition of areas for the "Rede Natura 2000 (DL n° 140/99)", the extension of "Rede Nacional de Áreas Protegidas (DL n° 19/93)" and the "Lei de Bases do Ambiente", which by assigning terms and limitations to the use of soil and to human activities in certain areas of the country, contribute to the conservation of the genetic resources of those areas.

In what concerns the conservation of species, there is some laws (DL n° 139/89, DL n° 143/89, DL n°140/99, DL n° 169/2001 and DL n° 49/2005, the Berna Convention, the CITES) which contributes to the safeguard of forest species of economic value (e.g. *Quercus faginea, Q. rotundifolia, Q. suber, Fraxinus angustifolia, Alnus glutinosa, Castanea sativa*) and of ornamental species (*Ilex aquifolium*, *Narcissus* spp.). Recently, was published the Resolution n° 115 – A/2008 of the Council of Ministers which establishes the Plan for Natura 2000 Network for the mainland.

For some CWR it is considered to be urgent to protect the ecosystems where the species is found, as for example *Vitis vinifera* subsp. *sylvestris*.

In the last years a few projects concerning the assessment of CWR have been developed. The "European crop wild relative diversity assessment and conservation forum" received funding from the EU and "The wild relatives of Beta: genetic diversity assessment and biochemical studies" is being funded by the Portuguese Foundation for Science and Technology.

2.4 Needs and priorities

- It is not clear which organization is responsible to conduct surveys and inventories; clarification should be done and the surveys and inventories should be coordinated at a national level;
- There is insufficient number of staff to conduct surveys and inventories and, frequently, staff does not have adequate skills to carry out these activities.
- There is also insufficient financial support, and it is considered that the government should provide financial support to continue the surveying and inventorying in the country because during the last ten years great genetic erosion has been observed. Plant over collecting, natural habitats degradation and abandonment of the traditional processes of agriculture are the presumed causes for species threatening.
- Furthermore, considering farmers high mean age, the next five years, will be crucial for landraces conservation, as well as for maintenance of traditional farming systems (where landraces interact in policropping).
- Referring to grapevine it is important to prospect autochthonous cultivars within grapevine marginal fields, probably the only place where it will be possible to find varieties that are not yet inventoried.
- The National conservation priorities have not yet been established.
- As the number of CWR included in the national inventory is very large, national priorities should be established. So, the selection of criteria (not yet defined) and the ranking of species according to defined criteria will be needed in order to focus future action in most threatened/important species.
- The characterization and evaluation of *in situ* populations of CWR and wild food plants (WFP), as well as the identification of the factors responsible for erosion are the subsequent phases for the implementation of the conservation measures.
- It is priority to prospect the wild grapevine and wild olive tree within the protected areas.
- The on-farm management of PGRFA should be considered as a high priority within the national activities.
- It is important to promote the conservation of CWR and WFP under a national cooperation and coordination.
- It is important to increase the research concerning CWR and WFP.
- It is important to promote the awareness about the environment, the importance of CWR and WFP.

CHAPTER 3

THE STATE OF *EX SITU* MANAGEMENT

Portuguese Institutions which maintain *ex situ* germplasm collections belong to the Ministries of Agricultural, Rural Development and Fisheries (MADRP) and of the Science and Technology.

During the last ten years were created the Germplasm Bank ISOPlexis, from Madeira University and the "Banco do Centro de Biotecnologia dos Açores" (BCBA), from Azores University.

3.1 The state of collections

3.1.1 Portuguese genebanks

The total number of *ex situ* accessions stored in the Portuguese gene banks is equivalent to 45 375 accessions. The Banco Português de Germoplasma Vegetal (BPGV) stores 32 345 accessions which represent 71.3% of the total.

As shown in Table 11, cereals constitute the major collection as they represent 59.7% of total number of accessions, followed by grain legumes (23.3%), pastures and forages (4.41%), vegetables (10.6%), fibber crops (0.39) and aromatic and medicinal plants (1.62%).

TABLE 11
Number of accessions per collection in the Portuguese genebanks

Collections	N° accessions	% total
Cereals	27 078	59.68
Grain Legumes	10 584	23.33
Pastures and Forages	2 002	4.41
Vegetables	4 790	10.56
Fibber Crops	175	0.39
Aromatic and Medicinal Plants	735	1.62
Tropical Fruits	11	0.02
Total	**45 375**	**100**

The composition of the crop collections is indicated in Table 12 and it can be seen that breeding material and landraces represent almost 95% of the accessions.

In general terms it can be said that during the past ten years some projects and activities have taken place in all Portuguese genebanks, in order to sustain the *ex situ* plant genetic collections. In this way it was possible to do partial regeneration, morphological characterization and multiplication of some accessions.

TABLE 12
Composition of the crop collections

Composition	Total N° accessions	% total
Landraces	16 068	35.41
Breeding material	26 931	59.35
Advanced cultivars	353	0.78
"Genepool"	366	0.81
Wild	1 657	3.65
Total	**45 375**	**100**

Concerning the field collections restricted funding made it difficult to do the management and the conservation of the several fruit collections. The grapevine was an exception since there was a partial funding for their management and conservation.

Botanical Gardens also face funding difficulties. However, "Jardim Botânico da Ajuda", had a specific programme that aims to the conservation of endemic and rare plants of the Centre and South of Portugal.

In what refers to the safety duplication, the situation is variable according to the Institutions holders. However, all the Institutions are attempting to increase the status of safety-duplication of the collections. So, at present the safety duplication is greater than was ten years ago. For some accessions there are safety duplicates in the country and in other European genebanks.

All the material resulting from collecting mission with International Institutions is duplicated in those Institutions.

TABLE 13
Number of safety duplications of accessions, by crop collection

Crop collection	Duplicated accessions	% Duplicated/total number
Cereals	1 304	4.8
Grain Legumes	2 669	25.2
Pastures and Forages	277	13.8
Vegetables	997	20.8
Fibber Crops	4	2.3
Aromatic and Medicinal Plants	236	32.1
Tropical Fruits	3	27.3

The number of duplicated accessions is indicated in Table 13. According to this table only 12% (5 489 accessions in 45 375) of the total number of accessions are duplicated in other national or international institutions. BPGV has 2 804 accessions duplicated; INIA has 2 639 accessions and Escola Superior Agrária de Elvas (ESAE) 46 accessions.

3.1.2 Field collections

3.1.2.1 Grapevine

For grapevine there is the National Ampelographic Collection, located at Dois Portos. There are also a few regional collections located in the main grapevine regions existing in the country, namely "Vinhos Verdes", "Douro", "Beira Interior", "Bairrada", "Dão", "Alentejo", "Algarve" and "Madeira".

In order to maintain the genetic variability existing within the grapevine cultivars (clonal variability) a further 73 collections were established in the farmers´ fields, each one with 200 clones/ population.

The safety duplication of collections of the grapevine cultivars has been guaranteed in the regional collections. Considering the clonal collections, the best clones are also safety duplicated.

3.1.2.2 Olive tree

For olive tree there are three reference collections: in Elvas (INIA) with 29 traditional varieties, in Mirandela ("Direcção Regional de Agricultura e Pescas do Norte", DRAPN) with 36 traditional varieties and in Santarém (Quinta dos Soitos) with 30 traditional varieties.

Some traditional varieties are not duplicated.

3.1.2.3 *Malus/Pyrus*

The main collections of *Malus* and *Pyrus* are respectively, located at "Estação Agrária de Viseu", Viseu, with 120 accessions and at Vidago with 180 accessions. Within these collections there are some synonyms.

In addition, there are also a few Regional collections, as for example, the apple collections located in "Minho" (50 accessions), "Beira Litoral" (20 accessions), "Beira Baixa" (30 accessions), "Algarve" (15 accessions) and "Ribatejo e Oeste" (100 accessions). Concerning the Regional pears collections, there are those located in "Trás-os-Montes" (115 accessions), "Minho" (75 accessions), "Beira Litoral" (60 accessions) and "Ribatejo e Oeste" (40 accessions).

There are also clonal collections of the pear "Pêra Rocha" and the apple "Bravo de Esmolfe" each one with 150 clones. The most recent clonal collection is that of the apple "Porta da Loja", located at the "Minho" region, with 20 accessions. These collections are in State fields and usually, are not duplicated.

3.1.2.4 *Prunus*

Concerning the *Prunus* there are several collections, but only that of apricot, located at DRAPN is a National collection. Collections of plums, apricots, cherry-tree and morello-tree are located at INIA (Alcobaça). There are almond collections in DRAPN, Direcção Regional de Agricultura e Pescas do Algarve (DRAPAlg), Direcção Regional de Agricultura e Pescas do Centro (DRAPC) and INIA (Alcobaça).

The characterization (morphological and molecular) of these collections has been recently partially carried out.

3.1.2.5 Other fruit trees

Collections of *Citrus*, Fig trees, Carob tree and Medlar tree are located in DRAPAlg

3.1.2.6 Coffea

"Centro de Investigação de Ferrugens do Cafeeiro (CIFC)", is a research Centre from "Instituto de Investigação Científica e Tropical (IICT)". CIFC has been carrying out research on the resistance of coffee (*Coffea arabica*) to the orange rust (*Hemileia vastatrix*). In CIFC there is a coffee germplasm collection.

3.2 Documentation

During the last ten years a great effort concerning the documentation of the genebank collections was carried out. At present all the genebank informations are computerized.

Different software is used: Access, Excel, File Maker Pro.

The National Ampelographic Collection is documented according to the international rules. The upgrading of the information is regular.

3.3 Planned and target collecting

The Portuguese Institutions have been undertaking collecting missions over the past ten years in order to improve *ex situ* plant genetic resources coverage (Table 14). For example, during the last ten years BPGV has undertaken 42 collecting missions. However, there are yet major gaps in the Portuguese plant genetic resources collections, particularly in the following groups of plants: aromatic and medicinal, pastures and forages and fibber crops.

Pastures and forages and vegetables contributed with the larger number of accessions.

TABLE 14
Samples for *ex situ* conservation collected in Portugal during the last 10 years

Crops	N° of Samples	% total
Cereals	270	8.4
Grain Legumes	614	19.1
Pastures and Forages	851	26.5
Vegetables	800	24.9
Fibbers	21	0.7

3.4 Roles of botanical gardens

The botanical gardens play a relevant role in the conservation of the flora from the country. Additionally, they undertake an important activity on the increasing of the public awareness about plants and their conservation.

As Portuguese Botanical Gardens should be referred the following: "Jardim Botânico da Ajuda", "Jardim Botânico da Madeira", "Jardim Botânico da Universidade de Trás os Montes e Alto Douro", "Jardim Botânico da Universidade de Coimbra", "Jardim Botânico da Universidade do Porto", "Jardim Botânico-Museu Nacional de Hist ria Natural", "Jardim Tropical" e "Parque Botânico da Tapada da Ajuda".

In "Jardim Botânico da Ajuda" there is a collection of aromatic and medicinal plants (about 100 species). This garden also has a collection of rare and endemic plants from Centre and Southern Portugal.

The "Jardim Botânico da Madeira" has a collection of 80 species of aromatic and medicinal plants traditionally utilized for cooking and popular medicine, in Madeira. The garden also contains fibber and oil crops and an *ex situ* collection of seeds from endemic and native plants from the Archipelagos of Madeira and Selvagens. One of the aims of these seeds

is to replant the species in their natural habitats.

The "Jardim Botânico da UTAD" has a collection of aromatic and medicinal plants representative of circa 32 botanical families. It also contains a collection of traditional cultivars of fruit trees, such as chestnut, apple, and pear. The chestnut collection aims to be a genetic reserve to safeguard the European chestnut variability. There is also in the garden a collection of *Vitaceae* which includes the grapevine cultivars utilized in the Douro region.

3.5 Assessment of major *ex situ* needs

The main constraints for expanding *ex situ* conservation activities are:

- Lack of staff with appropriate training;
- Strong financial restrictions;
- Insufficient equipment and lack of facilities;
- Insufficient funds for on going maintenance costs of infrastructures;
- The conservation of plant genetic resources is still fragmented within the country;

The main priorities are:

- Establish an appropriate methodology for regeneration following the strategies set out by the Global Crop Diversity Trust in all the cases where they are defined;
- Reduce the existing unnecessary duplications;
- Develop research for future application of *in vitro* and cryopreservation technology for germplasm conservation activities;
- Launch an integrated approach for plant genetic resources conservation;
- Improve the national coordination;
- Maintain a user friendly documentation and information system;
- Develop and strengthen the cooperation between national and international institutions in order to sustain the *ex situ* collections;

CHAPTER 4

THE STATE OF USE

Portugal maintains the scientific and technical capacity to perform breeding activities on cereals, forages and grain legumes.

4.1 Distribution of plant genetic resources

The main breeding activities are being carried on at INIA, but are also performed at the Schools of Agriculture, particularly at ISA and UTAD.

There are plant breeding programmes for the *Triticeae* cereals (wheat, triticale and oats), for maize and for grain legumes (chickpea, pea, lentils), forages and grassland crops. Recently some efforts are being made in order to establish the rice breeding national programme.

For grapevine there is the National Grapevine Selection Programme coordinated by ISA (School of Agriculture of the Technical University of Lisbon). The development of this programme has the strong cooperation of researchers and technicians from the several Institutions that are concerned with grapevine: Universities and State Laboratories, nurseries and farmers. At present, the programme has already established 70 fields where it is maintained the clonal variability of the main Portuguese varieties for wine production (considered to be autochthonous to Portugal). Three additional fields were established for preservation of clonal variability of table grapes Ferral and D. Maria (an old variety obtained at INIA).

Cereals (wheat, barley, oats and triticale) breeding programme is the oldest one (circa 60 years) Initially, it was directed to dry land plants and only recently was focused on irrigation conditions. The main objective of the programme is the selection of variability and the inscription of new varieties in the catalogues of varieties (National or European).

For the breeding activities it is used material introduced with the international germplasm evaluation networks.

Maize breeding is directed for population improvement in open pollinated varieties with a quality-oriented perspective for human use. A participatory breeding approach is being conducted since 1985, in the Northwest Portugal, with the cooperation of farmers from this region. The farmer's seeds have the greatest importance as a source of germplasm material.

Portugal is the European country with the highest rice consumption per capita. The rice "carolino" type is the present priority and a selection process of varieties is being carried on. The Portuguese varieties have good grain quality, but are tall, very sensitive to blast and have low yield. A breeding work making use of Marker Assisted Selection has started to develop dwarf-yielding varieties, with blast resistance. In addition to the Portuguese material there are germplasm introductions from the main centres of rice research.

Concerning grain legumes the main breeding objectives have been, resistance or high tolerance to *Ascochyta rabiei*, seed size (for chick pea), protein content and reduced amount of anti nutritious compounds (pea, lentil, *Lathyrus*). For the breeding activities it is used material introduced with the international germplasm evaluation networks, but national germplasm also makes a great contribution.

4.2 Utilization and enhancing the use of plant genetic resources

Morphological characterization and evaluation of Portuguese germplasm collections are being performed by Institutions from the Ministries of Agriculture and Science and Technology. In INIA, UTAD, ISA, ITQB, Azores University and Madeira University molecular markers are being used. Studies on the tolerance/resistance to stresses biotic (e.g. *Ascochyta rabiei, Perycularia, Phytophthora cinnamomi, Fusicoccum amygdale*) and abiotic (drought and high temperature, high irradiation) have also been developed.

The incidence of allergic reactions to foods and of food intolerance has risen significantly in the last few decades. Wheat and soybeans are the most common plant foods that induce allergic reactions worldwide. In spite of this, soybean derived products continue to be increasingly used in a variety of food products, due to their well documented health benefits.

In Portugal, the Instituto Nacional de Saúde Dr. Ricardo Jorge (National Health Institute), in cooperation with ITQB, is doing research on the identification of allergens from soybean and maize.

Core collections existing in the Portuguese genebanks are only those of maize and rice, respectively with 394 accessions and 120 accessions. These collections were obtained as a result of the international cooperation established under the Council Regulation (EC) N° 1467/94 (see Chapter 6).

During the last ten years several varieties where inscribed in the National Catalogue of Varieties (CNV), demonstrating the importance of the utilization of plant genetic resources. Examples of improved varieties obtained during the last 10 years are: the bread wheat varieties "Jordão" (1996), "Ardila" (2002) and "Barbelinha" (2005), the durum wheat "Marialva" (1999), the "Santa Rita" oat (2002), the rye "Alvão" (1998), the triticale "Fronteira" (1999), the *Lathyrus cicer*, "Grão da Comenda"(2001) and "Grão da Gramicha"(2002), the chick pea "El Dorado" (2006) and "Elixir" (2006), the annual Medicago "Atalaia" (2002), the *Medicago* "Lentisco" (2002), the *Medicago truncatula* "Revilheira" (2002), the *Lupinus luteus* "Acos" (1996), the lens "Beleza" (1999), the portuguese cabbage "Penca de Chaves" (2005) and "Penca de Mirandela" (2006), the muskmelon "Carrasco" (2005), "Casca de Carvalho Fino" (2004) and "Casca de Carvalho Robusto" (2005).

4.3 Seed supply systems and the role of the markets

In Portugal the public and the private sectors are involved in the seed production. Only seeds that have been controlled, certified and authorized may be marketed. Variety Protection is granted on the basis of national law, in accordance with the UPOV Convention.

Seed quality standards (ISTA and nationally defined rules) and genetic purity standards (based on OECD scheme and on a nationally defined scheme) are applied to cereals, grain legumes, vegetables, forages, fibber crops, potato and beet.

It is compulsory to register in the CNV the varieties obtained by the breeders.

Concerning the market situation the approximate number of local certified varieties currently in the market and those with great economic potential for developing new markets are:

Common bean – 4 local varieties and well established markets; wheat – 1 local variety and only a few number of new markets; onion – 3 local varieties and only a small number of new markets; Portuguese cabbage – 3 local varieties and only a small number of new markets; faba bean – 1 local variety and only a small number of new markets; muskmelon – 5 local varieties and markets well established and in expansion; turnip – 4 local varieties and well established markets.

Trifolium resupinatum – 2 local varieties, well established markets, expanding markets and developing markets; a small number of new markets being developed for *Vicia sativa* (2 local varieties), *Vicia villosa* (2 local varieties), *Trifolium alexandrinum* (1 local variety), *Lupinus luteus* (2 local varieties) and *Lupinus albus* (1 local variety).

Incentives have been established in order to promote:

- Markets for local varieties with Protected Denomination of Origin (PDO) and for "diversity-rich" products (see Chapter 8);
- Organic farming;
- Strengthening of cooperation between producers.

4.4 Crop improvement programmes and food security

There are strong limitations in Portugal to develop with continuity a breeding programme. The number of plant breeders using conventional methodologies for each crop is too small and there is no organized structure that integrates the classical methodologies with the modern ones. Additional limitations are the lack of financial resources to carry out field and laboratory experiments, the cooperation among the several institutions and inadequate programmes coordination. A great limitation regards the field workers who are scarce due to lack of funds and difficulties of the State institutions to hire people.

CHAPTER 5

THE STATE OF NATIONAL PROGRAMMES, TRAINING NEEDS AND LEGISLATION

There is no Portuguese National Programme aimed at the conservation and utilization of PGRFA. The activities on PGRFA have been traditionally performed in variousInstitutions according to specific projects but without any national coordination. The most comprehensive effort to establish a national coordination of genetic resources activities was established in 1999 by Minister of Agriculture but without prosecution. However, regarding the specific activities of ECPGR, INIA has been successful in exerting some coordination, during the last ten years.

5.1 National programmes

INIA has performed activities on genetic resources, at the national and the international levels since the 1970´s. The first INIA´s responsibility at national level was to contribute to safeguard of PGRFA. In the beginning of 1980´s, INIA collected landraces of several crops (in mainland and the Azores and Madeira Islands), in order to complement the on-farm conservation; those samples were deposited in Portuguese genebanks.

During the last ten years various other institutions have also been contributed to collecting missions of PGRFA, to the *ex situ* conservation of PGRFA (in banks or field collections), to characterization and evaluation, to breeding activities and seed multiplication. As was already referred these activities were not coordinated at a national level.

In order to renew and to improve the coordination at the INIA level regarding the conservation, characterization and sustainable utilization of PGRFA, the President of INIA established, in 2003, a Steering Committee that represented the several INIA Research Stations and was composed by specialists in the several fields of genetic resources. This Committee substituted the previous Commission on Agrarian Genetic Resources, established in 1999.

The Steering Committee was a Platform that worked in a collegiate manner aiming at the integration of all activities on genetic resources. At the internal level it established the strategies that should be followed in MADRP in order to:

- Improve the performance of Institutions from the MADRP working on genetic resources through the exchange of knowledge, of ideas and information; Detect needs and failures at the scientific level;
- Suggest actions to be undertaken.

That Steering Committee was active until the time INIA became INRB (October 2006).

During the last ten years two programmes funded the activities on PGRFA. The "Programa de Apoio à Modernização Agrícola e Florestal (PAMAF)" running from 1995 until 1999 funded 12 projects and the "Programa Operacional de Agricultura e Desenvolvimento Rural (AGRO - medida 8.1)", running from 2001 until 2007 funded 25 projects.

5.2 Networks

The "Portuguese Network for Grapevine Selection" has been active for the last 30 years and has the cooperation of all the national stakeholders working on grapevine. The coordination of the network is under the responsibility of the School of Agriculture (Instituto Superior de Agronomia from Universidade Técnica de Lisboa).

The aim of the network is to define strategies for the valorisation of the Portuguese grapevine patrimony, through the definition of methodologies which should be followed in the grapevine clonal selection. The network intends to analyse the genetic variability within a population and correlate this information with the geographic localization.

The benefits derived from this network have been a contribution for preventing the genetic erosion that at present is menacing the traditional grapevine crop. In addition, the network has established field collections corresponding to the 70 most important Portuguese grapevines with the aim of preserving the genetic variability existing within each cultivar. Furthermore, the network intends to establish field collections for the other autochthonous cultivars.

This network has been receiving funding from projects under specific programmes launched by the MADRP.

From 2000-2002 a network which aims to integrate the environmental components into the agricultural and forestry.

In 2002 it was established the "Grapevine Network" for the characterization with molecular markers of the 341 grapevines cultivars, that are officially authorized for wine making (Official Journal, regulation n° 428/2000). The coordination of this group was under the supervision of INIA and had the participation of ISA, ITQB and UTAD.

The network aimed to discriminate the 341 grapevine cultivars, through microsatelites, to complement and test the morphological and isoenzymatic data already available and to identify the synonyms. Furthermore, it was intended to contribute with such important information for the preparation of the Catalogue of the Portuguese National Collection of grapevine cultivars.

The benefits derived from the network were the discrimination of the 341 cultivars and the identification of synonyms. In addition, the study produced information on the relationship existing between the 51 grapevine cultivars most utilized for wine production in Portugal and the cultivars from other important Mediterranean wine producing regions. The results of the SSRs were already partially integrated in the book "Portugal Vitícola – O Grande Livro das Castas", published in 2007.

From 2002-2005 the network received funding from – "Programa Agro 8.1".

In 2004 it was established "The National Network for the Conservation and Utilization of Aromatic and Medicinal Plants". The network was coordinated by BPGV with the participation of the Regional Services of Agriculture, DGPC, INIA, Universities, ICN, and farmers companies working with medicinal and aromatic plants.

The network aimed to do surveys, to perform systematic collecting missions, to collect anthropological information on the aromatic and medicinal species existing in different regions of the country, to conserve and to evaluate the collected germplasm. In addition, the network also aims to contribute to overtake the problem of indiscriminate harvest of wild plants which is a severe factor of genetic erosion.

The benefits derived from the network will be to do surveying and inventorying of aromatic and medicinal plants, to support planned wild plant harvesting and in this way contribute to the decrease of the genetic erosion, to improve the knowledge and to promote the public awareness of the importance of the conservation and sustainable utilization of aromatic and medicinal plants.

From 2004-2006 the network received funding from – "Programa Agro 8.1".

In 2004 it was established the "National Plant Genomic Platform" under the coordination of ITQB and with the participation of research groups on plant genomics from the Portuguese Universities and the State Laboratories (INIA, INETI and IICT). The network intended to develop activities within the domain of the plant genomics aiming to constitute a network of laboratories, duly coordinated, to structure a national research programme targeted to the Mediterranean crops with economic importance and also to contribute for the implementation of the international cooperation.

The main benefits were the national cooperation between research groups and their integration in European Projects funded by European Institutions.

The platform in itself did not yet receive any funding.

5.3 Education and training

Lack of trained staff is one limiting factor. So, further training and technical expertise could help the expansion of PGR activities.

5.4 National legislation

The Direcção Geral de Agricultura e Desenvolvimento Rural (DGADR) has the competence to establish national legislation concerning the registration and safeguard of landraces and of the indigenous knowledge. In addition, the DGADR establishes the national legislation on crop protection, on the quality of seed and on vegetative propagating material.

Concerning the crop protection there are the following laws:

- Production and circulation of plant material within the national territory and/or the EU and the import or export of plant material (DL n° 154/2005). In cases of forbidden import of some plant material, an exception should be taken if the material is to be used for research activities or for plant selection (DL n° 91/98).
- Import and commercialization of seeds, vegetables and other crops (DL n° 144/2005).

The legislation concerning varieties, seed quality and vegetative propagating material was transposed from EU laws. Reference should be made to the following laws:

- Rules referring to the National Catalogue of Varieties (DL n°154/2004).
- Production, control and commercialization of seeds from vegetables and other crops, ornamentals excluded (DL n°144/2005). In addition, this law foresees the transposition of the EU Directives, relating to the production, certification and commercialization of the conservation varieties.

- Production, certification and commercialization of potato seeds (DL n° n°216/2001).
- Production and commercialization of propagating material of ornamental plants (DL n° n°237/2000).
- Production, control, certification and commercialization of grapevine propagating material (DL n° 194/2006).
- Production, control, certification and commercialization of propagating materials of vegetables (seeds excluded) and propagation of fruit trees for fruit production (DL n° 329/2007).

The legislation concerning the plant breeder´s rights was implemented in 1990 (DL n° 213/1990). This legislation is in agreement with UPOV. The extension of the plant breeder´s rights to all the plant species was implemented in 2004 ("Portaria n°1418/2004").

It should be recalled that in addition to these laws there are other laws related to the natural habitats that aim the conservation of those habitats (see Chapter 2).

5.5 Needs and priorities

- Establish of a PGR Centre as an independent entity with its own funds from the national budget and with a national Committee on plant genetic resources that can coordinate the conservation and utilization of PGRFA;
- Improve the conservation activities in the country, according to the international rules;
- Fund to do the management and the conservation of the several field collections;
- Give training to post graduate researchers in breeding of priority crops;
- Give training in collecting missions and in *in situ* and *ex situ* conservation techniques;
- Implement a national documentation and information systems with adequate staff for the maintenance of the system.

CHAPTER 6

THE STATE OF REGIONAL AND INTERNATIONAL COLLABORATION

Collaboration between Portugal and international organizations and institutions has been, since long, a first priority.

INIA represents Portugal in the Commission of Genetic Resources for Food and Agriculture (FAO), in the European Union Committee for Genetic Resources and is also responsible for the connection with Bioversity International.

Bioversity International does an important contribution for the Portuguese PGRFA activities through the provision of high quality reference documentation in all areas of PGR work (e.g. descriptors, *ex situ* conservation techniques) and through the activities of the European Cooperative Programme on Plant Genetic Resources (ECPGR).

With regard to regional programmes the Council Regulations (EC) N° 1467/94 and N° 870/2004 have been of particular importance.

6.1 Regional and sub regional networks, international crop-specific networks and sub regional collaboration for maintaining *ex situ* collections

6.1.1 Regional programmes

Under Council Regulation (EC) N° 1467/94 Portugal participated in projects concerning Brassica, Cucumis melo, Grapevine, Maize and Rice genetic resources.

Under Council Regulation (EC) N° 870/2004 Portugal participates in projects on Grapevine and Rice genetic resources.

The projects related with Council Regulation (EC) N° 1467/94 and Council Regulation (EC) N° 870/2004 have been co-financed by the European Commission.

INIA participated in the project "European Plant Genetic Resources Information Infra Structure", funded by EU, running from 2000-2003. The project established an infrastructure for information on plant genetic resources (PGR) maintained *ex situ* in Europe and created a European PGR Search Catalogue (EURISCO) with passport data on *ex situ* collections maintained in Europe.

INIA participated in the project "European Crop Wild Relative Diversity Assessment and Conservation Forum", funded by EU, running from 2002-2005. The project aimed to ensure the long-term conservation and the increased utilization of Europe´s native plant genetic resources.

6.1.2 Regional networks

The European Cooperative Programme on Plant Genetic Resources (ECPGR), founded in 1980, is a collaborative Programme among most European Countries, aimed at facilitating the long-term conservation on a cooperative basis and the increased utilization of plant genetic resources in Europe. The Programme which is entirely financed by the participating countries operates through broadly focused Networks dealing with groups of crops or general themes related to plant genetic resources. At present, ECPGR has nine Networks (6 Crop Networks and 3 Thematic Networks). The activities of the Networks are implemented by Working Groups and Task Forces.

The participation of Portugal in the ECPGR is funded and coordinated by INIA. Portuguese representatives, from different National Institutions have been nominated for the following Working Groups: Cereals (INIA), Forages (INIA), Fibre Crops (INIA), Cucurbits (UTAD), Allium (BPGV), Brassica (UTAD), Grain Legumes (INIA), Prunus (ITQB), Vitis (INIA), Malus/Pyrus (UTAD), Medicinal and Aromatic Plants (BPGV), Documentation and Information (INIA), *In situ* conservation Taskforce (IICT) and On-farm Conservation and Management Taskforce (ESAC).

The European Central Crop Database for Cicer is maintained by INIA. The update of the Portuguese National Inventory at EURISCO is being carried out by the National Focal Point for Documentation (also from INIA).

6.1.3 International programmes

INIA has established good collaboration with the Centres of the Consultative Group on International Agricultural Research (CGIAR), particularly with Centro Internacional de Melhoramento de Milho e Trigo (CIMMYT) and the International Center for Agricultural Research in Dry Lands (ICARDA). Portugal has received samples of varieties for use in national breeding activities. During the last 5 years ITQB has also developed strong collaboration with International Rice Research Institute (IRRI).

6.1.4 International agreements

Portugal is Contracting Party to the Convention on Biological Diversity (CBD) since 1993 and approved the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) in 2005.

Bilateral agreements developed for PGR, like the institutional agreement for exchange of *Lupinus* germplasm, between INIA and the Department of Agriculture of Western Australia should be referred.

In the last ten years, the Madeira Genebank (ISOPlexis) participated in joint collecting missions for several plant species (landraces and wild plants), in Cape Vert, Guinea-Bissau, S. Tomé e Príncipe, Timor Leste, Spain, Italy, Poland, Canada and Peru.

6.2 The global system for the conservation and use of plant genetic resources

Portugal is a member of the FAO Commission on Genetic Resources for Food and Agriculture (CGRFA) and is a Contracting Party of the ITPGRFA (since 2005). The country has already benefited from its participation in the CGRFA meeting and in the 1st and 2nd Governing Body meetings. From those meetings information concerning the PGRFA conservation in other countries In addition, the meetings also enabled to establish contacts and to exchange ideas.

INIA represents Portugal in the CGRFA and in the ITPGRFA Governing Body.

The participation of Portugal on the World Information and Early Warning System on Plant Genetic Resources for Food and Agriculture (WIEWS) from FAO is also through INIA.

WIEWS has been established by FAO, as a world-wide dynamic mechanism to foster information exchange among Member Countries and as an instrument for the periodic assessment of the State of the World PGRFA and to alert the international community about threats of erosion of PGRFA.

Recently, INIA coordinated the evaluation of the progress made in Portugal, during the last ten years, on the implementation of the Global Plan of Action (GPA). That evaluation was done through the national GPA information sharing mechanism operated through the web-based FAO (WIEWS).

Portugal participated, in 2007, in the "Global Collaborative *Ex situ* Conservation Strategies for Food Legumes (chickpea, lentils, faba beans and grasspea) Meeting", organized by the Global Crop Diversity Trust at the International Centre for Agricultural Research in Dry Areas (ICARDA). The outcomes of the meeting were:

- The identification and assessment of key global, regional and national collections of food legumes genetic resources;
- the identification of critical overlaps and gaps in existing collections;
- the recommendations for increased collaboration and sharing of responsibilities, leading to more effective and efficient conservation and greater utilization;
- the identification of major needs and opportunities for upgrading key collections and building the capacity managers to maintain and distribute them efficiently and effectively over the long term.

One of faba bean Portuguese collection was considered a key collection.

6.3 Assessment of major needs to improve international collaboration

- International collaboration on conservation activities should be implemented;
- Cooperation between national and international institutions to sustain *ex situ* collections should be developed and strengthened;
- Advanced programmes (educational) in cooperation with relevant regional and international academic institutions should be developed.

CHAPTER 7

ACCESS TO PLANT GENETIC RESOURCES AND SHARING OF BENEFITS DERIVED FROM THEIR USE, AND FARMERS´RIGHTS

7.1 Changes in the international legal and policy framework in relation to access and benefit sharing for genetic resources

Access, exchange and benefit sharing are important subjects concerning the management of PGRFA.

Portugal is Contracting Part to the Convention on Biological Diversity (CBD) since 1993 and approved the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) in 2005. Portugal is also member of the International Union for the Protection of New Varieties of Plants (UPOV) since 1995.

The CBD covers all biodiversity and provides general principles for access and benefit-sharing concerning materials accessed after the coming into force of the CBD.

The ITPGRFA establishes a multilateral system for selected crops (Annex 1) and sets rules for access and benefit sharing for these materials.

UPOV provides intellectual property protection specifically adapted for the process of plant breeding and has been developed with the aim of encouraging breeders to develop new varieties of plants.

7.2 Access to plant genetic resources

Portugal in the last years subscribed the CBD and the ITPGRFA and, thus, is fully supportive of their objectives. However, Portugal did not yet develop specific regulations, within the scope of CBD, on access to PGR within its territory. So, the access requires bilateral negotiations according to mutually agreed terms.

Referring to the Treaty, Portugal will follow the Multilateral System of Access and Benefit Sharing concerning germplasm referred in the Annex 1. So, germplasm will be registered to the Multilateral System and the Portuguese genebanks will use the Standard Material Transfer Agreement. At present, the country is considering the various issues arising in the context of policy, legislation and other measures for national implementation of the Treaty.

The majority of the Portuguese Botanic Gardens are registered in the International Plant Exchange Network (IPEN), carrying on the access and exchange of plant material according to the Access and Benefit Sharing (ABS) elements of the CBD as set out in Article 15.

Concerning the access on plant germplasm collecting and transfer, the FAO International Code of Conduct is followed. Some rules are established to collect PGRFA in Portugal. Indeed, an official request should be addressed to the President of INIA. In the request, mention should be made to the species that it is intended to collect. Portuguese experts on the genus must go along during the collecting mission. A Material Transfer Agreement should be signed.

Researchers have access to germplasm according to their needs.

Farmers buy seeds or, instead, save and re-use seeds or propagating material from their harvests.

In Portugal, only seeds that have been controlled, certified and authorized may be marketed. Variety Protection is granted on the basis of national law, in accordance with the UPOV Convention.

7.3 Benefits derived from the use of plant genetic resources

Benefits arising from the utilisation of PGRFA include non-monetary benefits such as free access to material. These benefits shall be shared fairly and equitably through the exchange of information, transfer of technology and improvement of capacity building.

There are also monetary benefits, which are royalties, arising from commercialisation of varieties obtained through breeding.

7.4 Financing plant genetic resources activities

The main funding for plant genetic resources activities comes from the Ministry of Agriculture. The Ministry of Science also participate in funding but only in projects considered to have a major component of basic research. Usually, project funding is for a period of 3 years, and no guarantee exists for continuation of this funding. So, in general, the funding is very irregular.

Specifically, concerning the plant breeding activities there are some funds that result from the trading of seeds and variety royalties.

7.5 Implementation of Farmers´ Rights

Portugal approved the Treaty in 2005, which recognizes the rights of farmers to benefit from the resources they develop and to protect associated traditional knowledge.

In Portugal, the opportunity of farmers to participate in making decisions, at the national level, on matters related to the conservation and sustainable use of PGRFA is limited. An experience of a project in which a farmer participates in the decision is the VASO project, with the supervision of the INIA (see chapters 2 and 4).

This project is a participatory breeding approach with a scientist-farmer partnership that has been developed at Sousa Valley during the last 25 years. This project supports an "integrant" model where the "centre of the system" is the local farmer and not the scientist, who must work according to the farmer's preferences and decisions. The project aims on the improvement of open-pollinated varieties (mainly maize in a quality-oriented perspective for human use) that favour diversity and the on-farm conservation of landraces.

Portugal is preparing a regulation concerning the landraces registration and the recognition of traditional knowledge associated with the landraces cropping (Regulation n° 118).

CHAPTER 8

THE CONTRIBUTION OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE MANAGEMENT TO FOOD SECURITY AND SUSTAINABLE DEVELOPMENT

It is globally recognized that it is essential to provide food security in the long term. The thousands of different crop varieties that have been developed over centuries by farmers and plant breeders, together with their wild relatives, carry the genes that allow humanity to tailor its future plant food supply.

At present, it is given emphasis on foods which can promote well-being and health, helping to reduce the risk of disease (functional foods). So, plant diversity can contribute to modern diets and present studies reveal the interesting potential of the genetic resources that are maintained in plant genetic resources collections.

8.1 Contribution to agriculture sustainability

Agricultural activity contributes to food production and could play a key role in the preservation of biodiversity and environment conservation. One of main purposes of Common Agriculture Policy is the sustainable development of the rural areas and the promotion of sustainable agricultural production.

The relevance of agro-forestry management is crucial for nature preservation. Santos *et al.*, (2006) have shown that in 90% of the Natura 2000 area (which occupies 20.5% of the area of mainland Portugal) there is a higher association between the natural ecosystems preserved and the agro-forestry management followed. Agricultural abandonment can have negative effects in nature conservation. As examples, can be referred:

- The abandonment and reconvention of extensive cereal cultivation leads to the habitat reduction of the steppe fauna;
- The decline of cork oak forest leads to reduction in the associated biodiversity;
- The abandonment of herding has a negative impact in biodiversity;
- The abandonment of agro-forestry areas leads to increased danger of fires.

In these extensive systems the genetic resources are very important with relevance for autochthonous cultivars namely species of grasslands, cereal landraces (wheat, maize and rye) and even some forest species as, for instance, chestnut and carob trees.

The "Programa Nacional do Desenvolvimento Rural do Continente" supports the conservation of plant genetic resources for food and agriculture variability, the promotion of local varieties and the valorisation of the indigenous knowledge. It is, at present in implementation an inventorying of the national local varieties erosion for the main crops.

Portuguese agriculture needs to pursue a balanced and sustainable development. In fact, considering the production processes it is being observed the increasing of environmental sustainable practices. Indeed, in Portugal, organic farming area and the number of farmers, who converted their fields to this kind of production, are increasing since the beginning of 1990. In 1993 the area was 2 799 ha and in 2006 it was 214 232 ha, corresponding to 6% of the total area utilized for agriculture. In 1995, the Trás-os-Montes region (Northeast Country) was leading with 41 % of the organic farming area in the country. Since the publication of the regulation CE n° 1804/99, Alentejo region (South of Lisbon) became the biggest area with organic farming (62%). The main crops are pastures and forages (60.8% of total area) and next arable crops (16.5%). However, it should be stressed that 53.4% of organic farmers have olive trees.

Concerning the Integrated Pest Management (IPM) the area where it is used has been growing since 1994 and in 2003 was 143 203 ha. The most representative crops of IPM are grapevine, olive tree and fruits (apple tree, pear tree, and orange tree)

8.2 Contribution to food security

Portugal produces only a certain amount of the foods that should be most consumed for a healthy diet (cereals and vegetables) and imports the remaining. So, for the access and stability to the food supply the country is dependent on the international market, mainly European market.

Between the quinquennials 1980-1984 and 1999-203 it was observed an alteration in the food habits both in quantity and composition. The *per capita* calories consumption increase 20% (beverages excluded), what corresponds to a daily increment of 34% proteins, 11% carbohydrates and 6% fat. The gross annual per capita consumption grain legumes, roots and tubers diminished from 142 to 109 kg, both the consumption of vegetables increased 36% and that of fruits doubled (from 64 to 129 kg *per capita*/year) corresponding in 68.5% to apples, citric fruits, pear, peach and grapes. The national production did not fulfil this increase in fruit consumption and the national self-supply dropped from about 88% in the beginning of 1990 decade to about 73% in the period 2000-2003. In what concerns the cereals there is a great deficit of production in Portugal with a national auto supply of only 30%. However, in what concerns vegetables Portugal is an exporter with a national auto supply of 156% in the period 2000-2003.

In the rural areas people frequently grow a fraction of the food they consume in small farms. Furthermore there still is a tradition of wild food plants (WFP) gathering.

It should be noted that the collecting of WFP is a part of the Mediterranean agriculture traditional knowledge. In Portugal, mainly in the Alentejo region, several plants are gathered from the wild (e.g. *Scolymus hispanicus, Foeniculum vulgare, Beta vulgaris, Asparagus officinalis, Portulaca oleracea, Origanum vulgare, Mentha pulegium, Thymus vulgaris, Rosmarinum officinalis*) and are used as food supply or as aromatic plants.

8.3 Contribution to economic development

During the last decades changes were observed concerning the crops that have been grown. The annual crops (cereals, oil crops and fodder plants), have decreased abruptly since 1997 and the grazing land increased in the same proportion. It is thus observed the replacement of annual crops, essentially by permanent grasslands. Nowadays, Portugal mainland (96.6% of the national territory) crops correspond 59% of the agricultural area to grazing land, 11% to cereals, 9% to olive trees, 5% to grapevine, 4% to fruit trees and 2% to vegetables. In economical terms, wine and vegetables are the most important in the agro-food activities (wine representing 15%, fresh vegetables 16%, fruits 11% and olive oil 2%). The crop production in the Azores and Madeira Islands is much less diversified than in mainland. In Madeira, vegetables (including potato) are the most important production (represent 37.4%), tropical fruits (like banana) 20% and wine 7%. In Azores plant products represent only 14% of the agriculture production.

In the last two decades there has been a great increase in the agriculture production in Portugal, but at a constant prices value that increase represents only 11.9% in the period between the quinquennials 1980-1984 and 2002-2006. However, if it is considered only the plant products, a decrease of 3.9% in that value was observed for the same period. At present agriculture represents less than 3% of the Gross Value Added of the total economy, for which the plant products represent less than 60%. However, almost 10% of the active population works in agriculture.

Since 1991, it is being observed an increased deficit in the commercial balance of the agro-food products.

Despite the fact that national production has increased, this growth has not been sufficient to support the increasing needs, making very prominent the gap between production and consumption and, thus, between imports and exports values. This situation has been notorious in the olive oil, cereals and fruits sectors. Conversely, the wine sector has contributed to the exports.

According to the Policy Planning Office of the Ministry of Agriculture Portugal mainland has unusually good natural conditions for wine, olive oil, fruits and vegetables production, which are considered strategic, while for Azores and Madeira Islands fruits, vegetables, floriculture and wine are the strategic crops. It should be added that Portugal is very rich in PGRFA, particularly concerning grapevine, olive and fruit trees.

The natural and cultural richness of the Portuguese territories has allowed the development of products with differentiate quality and characteristics.

Some politics targeted to the promotion and valorisation of local and traditional crop products have been implemented. These measures are contributing to preserve the biodiversity and the natural ecosystem. According to the regulations CEE n°2081/92 and 2082/92 the promotion of these products is a way of settling the rural population in the areas where these products are obtained and contributed to improve the farmer's income. The traditional products are subjected to control and certification, granting the quality and easing the establishment of market "niches". These products in the period 1997-2003, had a great increase, in production, but the increasing of the income was much lower.

Portugal within the EU occupies the 4th place in products with origin denomination and geographic protection with 96 products. An interesting case, concerning fresh consuming fruits, is that of the pear, "Pêra Rocha do Oeste", a PDO, corresponds to 73% of the production volume.

8.4 Contribution to poverty alleviation

In rural areas small farming, family-based, still has a great share in the number of farms and of active people working in agriculture, animal production, hunting and forestry. There is a very high number of farms of small dimension: ¾ of the farms have less than 5 ha of farming area and 22.2% utilize less than 0.5 of working units/per year (in 2005). In 2001 almost 1/3 of the active people in agriculture were self employed person or unpaid family worker. Thus, in spite of the fact that agriculture activity has a small importance in the national economy, agriculture still is important for the economy of many families with low income.

In other terms, Portugal supports the collaboration with Countries with economies in transition, particularly with African Countries having Portuguese as the Official Language (PALOPs). Indeed, in 2001, the Centre for Agrarian Cooperation of the Portugal/Africa Foundation, the Ministry of Agriculture and Rural Development of the Republic of Mozambique, the Eduardo Mondlane University (Mozambique) and the Portuguese Foundation for Community Development have constituted a programme with the purpose of developing a strategic plan for the sustainable development of the agricultural region (mainly rice) in the province of GAZA (Mozambique). IBET in 2000-2001 strengthened the partnership Portugal/IRRI for rice research and established a project with the aim of developing higher quality rice for Mozambique.

The Lusophone Initiative on Plant Genetic Resources was a collaboration project (1999-2001) between Portugal (with INIA coordination) and the PALOPs, which gave training and improved the capacity building on plant genetic resources in those countries and gave basic equipment for seed drying and seed packing and storage.

The cooperation Portugal/Angola, in what concerns on-farm maize breeding activities, was initiated in 2005 and should be intensified, following the pioneering work with Portuguese regional maize

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