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

CYPRUS

STATE OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE IN CYPRUS

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Note by FAO

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LIST OF ABBREVIATIONS AND ACRONYMS

ARI	Cyprus Agricultural Research Institute
CAPO	Cyprus Agricultural Payment Organization
CBD	Convention on Biological Diversity
CGIAR	Consultative Group on International Agricultural Centers
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLC	Co-ordination of Information of Environment (CORINE) Land Cover
CR	Critically endangered species
CYPARI	Cyprus Agricultural Research Institutes' Genebank
DA	Department of Agriculture
DUS	Distinctness, Uniformity and Stability test
EC	European community
EN	Endangered species
EU	European Union
GCDT	Global Crop Diversity Trust
GDP	Gross Domestic Product
GIS	Geographical Information Systems
GMOs	Genetically Modified Organisms
GRFA	Genetic Resources for Food and Agriculture
CIMMYT	International Maize and Wheat Improvement Center
ICARDA	International Center for Agricultural Research in Dry Areas
IPGRI	International Plant Genetic Resources Institute
ITPGRFA	International Treaty for Plant Genetic Resources for Food and Agriculture
IUCN	International Union of Conservation of Nature
NGOs	Non Governmental Organizations
OECD	Organization for Economic Co-operation and Development
PGR	Plant Genetic Resources
PGRFA	Plant Genetic Resources for Food and Agriculture
RDP	Rural Development Plan
SMTA	Standard Material Transfer Agreement
UNCCD	Convention to Combat Desertification
UPOV	International Union for the Protection of New Varieties of Plants
VCU	Cultivation Value and Usage test
VU	Vulnerable species
ha	Hectares
Km	Kilometers
Km²	Square kilometers
m	Meters
mm	Millimeters
°C	Degrees Celsius

SUMMARY

Cyprus economy has been substantially developed over the last ten years. The tertiary sector has been significantly expanded, where the primary sector has been remained stable. The share of the agricultural sector to the national GDP has slightly decreased reaching the 2.3% in 2007. Around 30 000 inhabitants are employed to the agricultural sector representing the 8.2% of the labour force. Despite of its diminished contribution to GDP, the agricultural sector is still considered very import for the economy.

Agricultural products have possessed a high proportion of the total value of the exporting products representing almost the 17.5%. Agricultural sector has an enormous social role, since it contributes to the conservation and sustainable development of rural communities and rural areas.

The irregular outline of Cyprus, in conjunction with the climate, the geology, the high number of agricultural holdings and the high fragmentation of agricultural land resulted to the development of an enormous diversity of PGR. About 1 908 taxa have been recorded as native or naturalized. Around 376 taxa have been recorded as cultivated, 360 as rare or very rare and 144 taxa as endemic. The endemism is relatively high and is estimated to 7.5%. The accession of Cyprus to EU in 2004 had a great impact on the agricultural sector. The exposition of the agricultural sector to the common market allowed the importation of numerous agricultural products. The low competitiveness of domestic products has caused in some cases their displacement from the local market and the decrease of agricultural income. The new environment has imposed the adaptation of the agricultural sector to the new challenges where key elements are the augmentation of the competitiveness of agricultural products, the introduction of new technologies, the modernization of the production systems, the implementation of environmental friendly strategies, the development of efficient producers' organizations, the sustainable development of rural areas and the production of food with high quality and safety standards.

The national strategy concerning the agricultural sector and the rural development are mainly implemented through the Rural Development Plans.

The main strategic priorities of the RDP 2007-2013 are:

- The restructuring and the improvement of the competitiveness of agricultural holding;
- The maintenance and improvement of the environment;
- The diversification of rural economy and the improvement of the quality of life in rural areas.

The agricultural land has slightly increased resulting in a total of around 149 000 hectares. The diversity between cultivated species is well recorded through regular surveys conducted by the Statistical Services and data kept by CAPO. There is enormous diversity among cultivated species ranging from deciduous trees and vines to the mountainous areas, cereal and olives to the rain fed areas, vegetables and fodder crops to irrigated areas and tropical and subtropical trees to the irrigated coastal areas.

The major crops are cereals, fodder plants, vegetables, olives, vines and citrus. The area cultivated with potatoes, vines and citrus significantly decreased, whereas the area cultivated with olives and fodder plants increased. The major forces influencing the distribution of cultivated crops are the competitiveness of the products, consumers' preferences, the prices and the water availability. With the exception of wine vines, there is no national mechanism recording diversity within cultivated crops in regular base. Farmers have been using introduced modern varieties and hybrids, varieties bred by domestic breeding programmes and landraces.

Studies regarding the diversity and distribution of crop wild relatives, underutilized crops and wild plants have been conducted in the framework of national and regional programmes. Surveys regarding diversity in Cyprus have been also conducted without national participation.

Potential threats of genetic erosion have been identified as the modernization of agricultural systems, the continuous droughts, fires, overgrazing, urbanization and habitat fragmentation. In the future, the state of diversity of genetic material between and within species should be recorded in regular base and the outcome of this work should be used as guidance for assessing genetic erosion and undertaking *in situ* and *ex situ* conservation initiatives.

There has been an overall progress for *in situ* conservation over the last ten years as it is indicated by the numerous projects undertaken to survey and inventory PGR, the strengthening of *in situ* conservation strategies and the expansion of "protected areas". On-farm conservation strategy in mainly implemented through the RDP.

The RDP provides various measures for *in situ* conservation, although most of them are very general and target biodiversity in a very broad sense. More specific measures should be added to target specific threats of erosion. Crop wild relatives and wild edible plants are also *in situ* conserved inside national state forests and protected areas. The protected area under the "Natura 2000" covers the 12.21% of the total area of the island; 11 103 and 4 788 hectares of forest land have been declared as National State Forests and Protected Fauna and Flora areas respectively.

Ex situ collections are held by the Departments of the Ministry of Agriculture Natural Resources and Environment and are under the public domain. These *ex situ* collections are comprised of one genebank (CYPARI genebank) established by ARI, numerous field collections established by ARI and the Department of Agriculture and forest field collections and botanical gardens established by the Department of Forests. Despite of the progress made, more efforts should be made towards filling identified gaps of underrepresented species, enhancing capacity building and introducing technologies for conservation of asexual propagated material. The introduction of new technologies, the wider use of GIS and GPS technologies and the creation of databases would contribute to the creation of robust *in situ* and *ex situ* programmes.

Research programmes associated with assessment, development and utilization of PGRFA have been strengthened over the last ten years. This trend would continue to raise taking into account the involvement of universities and the national strategy to increase funding for research. The distribution of native germplasm conserved to CYPARI genebank was rather limited. However, numerous projects have used native genetic material for selection, evaluation and utilization. The seed and propagating material production schemes and the market have been substantially affected by the accession to the EU. Emphasis has been given to the production and marketing of seed and propagating material of high quality.

There was a tremendous development of national legislation caused by the accession to the EU. The national legislation is harmonized with EC legislation. Emphasis shall be given to the effective implementation of the legislation. There is no national programme which integrates all aspects related to PGRFA. However, numerous national programmes and schemes are highly associated with PGRFA, promoting their conservation, sustainable use and development. The training of farmers and the education of the public about the importance of PGR and their sustainable management are considered as key components for the successive implementation of the national strategy.

Cyprus has been participating to numerous regional networks programmes and projects. It has also established bilateral, regional and international collaboration on many areas related to PGRFA. Most of these activities have been very beneficial and have contributed enormously to the conservation, development and sustainable use of PGRFA through access to funds, scientific expertise, enhancement of capacity building, better communication and dissemination of knowledge, diversification of tasks etc. The collaboration with International Research Centers has been very beneficial through exchange of genetic material. Regional and international collaboration should be strengthened by giving more attention to the effectiveness of the networks and projects established.

Cyprus has ratified the Convention to Combat Desertification (UNCCD) and the International Treaty of Plant Genetic Resources for Food and Agriculture (ITPGRFA). The implementation of the Standard Material Transfer Agreement for the species listed to the Annex I of the ITPGRFA has facilitated the movement of genetic material. However, national legislation regarding access to PGRFA, sharing the benefits arising from their use and farmers' right has not been developed.

INTRODUCTION

Cyprus lies in the north eastern corner of the Mediterranean Sea. The island has an irregular outline, with numerous bays and headlands, which in conjunction with climate and geology affect the distribution of vegetation and more broadly most of the socioeconomic and environmental parameters of the island. It is estimated that the flora of Cyprus is comprised of 1 909 taxa from which 144 are considered as endemic. Substantial diversity has been also recorded within cultivated crops and wild plants.

The national GDP has been considerably increased and it was estimated € 16 596 million in 2007 compared to € 7 150 million in 1995. The income per capita also increased reaching € 18 709 thousands in 2007 compared to € 10 735 in 1995. The population was estimated to be 778 700 inhabitants in 2006 with an increase of around 122 400 compared to 1995. It is expected that the population will continue to rise with slower rate.

The rural population is estimated 233 200 inhabitants compared to 209 400 in 1995. However, the percentage of the rural population slightly decreased from 31.9% in 1995 to 30.4% in 2005. It should also be noted that Cyprus has been receiving around 2.4 million tourists annually contributing to the consumption of agricultural commodities.

The accession of Cyprus to EU in 2004 had a great impact on the agricultural sector. Before 2004, the agricultural sector privileged a very protective regime e.g. high tax to imported agricultural commodities, subsides of agricultural inputs and production. Agricultural systems were characterized by high production cost, low investments to new technologies, low quality standards, etc. The exposition of the agricultural sector to the common market has allowed the importation of numerous agricultural products. The low competitiveness of domestic products has caused in some cases their displacement from the local market and the decrease of agricultural income.

The new environment has imposed the adaptation of the agricultural sector to the new challenges where key elements is the augmentation of the competitiveness of agricultural products, the introduction of new technologies, the modernization of the production systems, the implementation of environmental friendly strategies, the development of efficient producers' organizations, the sustainable development of rural areas and the production of food with high quality and safety standards.

Further to its contribution to the conservation and sustainable development of rural communities and rural areas, agriculture is still considered one of the most important sectors of the economy. The gross output and the value added of the agricultural production were € 635 770 and € 340 180 thousand in 2007 compared to € 591 170 and € 340 870 thousand in 1995 respectively. The share of the agricultural sector to the total GDP has slightly reduced reaching the 2.3% in 2007 compared to 5.3% in 1995.

The continuous decline of the contribution of the agricultural sector can be attributed to the high rates of development of other sectors of the economy. The employment in the agricultural sector has remained stable and it amounts to around 30 000 people. The share of employment in agriculture to the total labour force has diminished reaching 8.2% in 2007 compared to 10.7% in 1995.

According to the agricultural census of 2003, the total number of holdings enumerated was 45 199 of which 588 were landless livestock holdings. The average area per holding was 3.5 hectares, while each holding is consisted on average of 5 land parcels. The mean area per parcel is 0.7 hectares.

A number of 44 752 holdings, i.e. 99% of the total belongs to natural persons, 381 were operated by companies and 45 by government. 51% of the holders and their family members had agriculture as their primary or sole occupation while the rest 49 % were employed mainly in non agricultural jobs. The average age of the holders was 54 years, with 5.3% being less than 25 years old, 46.1% aged between 35 and 54 and 48.5% being over 55 years old. 92.9% of the total agricultural land enumerated belonged to private individuals, 5.6% to companies and 1.2% to the government. 44% of the agricultural area operated was owned by the holders, 51.7% was rented, 1.1% was jointly owned and the remaining 3.3% had other exploitation status. It is expected that the number of holdings will decrease resulting to the increases of the average area per holding.

The major governmental and semi-governmental institutions and official entities involved with PGARFA are: the Ministry of Agriculture, Natural Resources and Environment, the Cyprus Agricultural Payment Organization, the Agricultural Insurance Organization, the Council of Wine Products, the Grain Commission, the Cyprus Potatoes Marketing Board and the Olive Products Board. The Ministry Departments involved with PGRFA are the Department of Agriculture, the Department of Forests, the Environment Service and the Agricultural Research Institute. Two Universities are

active in research concerning PGRFA, one private and one public. NGOs, agricultural and farmers' organization are also active. National committee concerning PGRFA has not been established; nevertheless, there is cooperation between stakeholders.

The main institutional change was the establishment of the Cyprus Agricultural Payment Organization (CAPO) in 2003. The main responsibility of CAPO is the payment and the management of funds, to which Cyprus is entitled regarding the agricultural sector, after its accession to the European Union, as well as the management of all other aid granted from national funds to support farming and rural areas. In practice, CAPO implements the Common Agricultural Policy, through the payments it makes.

The CAPO has paid around € 435 million since its establishment. In 2007, total payments have reached € 160 millions, 37.8% from European funds and 62.2% from national funds.

The government introduced a bundle of restructuring measurements, so that the agricultural sector would be prepared for entering the common market. A two year Rural Development Plan (2004 -2006) was implemented with the main purpose to improve the competitiveness of the domestic agricultural products. In 2007, a new RDP came into force ending up in 2013. The RDP 2007-2013 is the main instrument for the implementation of the national strategy regarding agriculture including the conservation and sustainable use of Plant Genetic Resources. The main strategic priorities of the RDP are the restructuring and the improvement of the competitiveness of agricultural holdings, the maintenance and improvement of the environment and the diversification of rural economy and the improvement of the quality of life in rural areas.

The RDP has been subsidizing a number of activities allocated to specific measures. A number of measures target the conservation of biodiversity and the sustainable use of PGRFA.

The cultivated area has slightly increased resulting in a total of around 149 000 hectares. The area covered with forest is estimated to be 387 610 hectares. There is enormous diversity among cultivated species ranging from deciduous trees and vines to the mountainous areas, cereal and olives to the rainfed areas, vegetables and fodder crops to irrigated areas and tropical and subtropical tress to the irrigated coastal areas.

The major crops are cereals, fodder plants, vegetables, olives, vines and citrus. There was a substantial decrease of citrus, vine and potato areas over the last ten years mainly due to low prices and the continuous drought. In contrary, there was a substantial increase of fodder crop area due to high demand from livestock and the wide use of waste water. A substantial increase of the area cultivated with olive trees has been also observed.

The main livestock products are meat, milk and eggs. It is estimated that 100 069 tonnes of meat, 193 420 tonnes of milk and 9 457 tonnes of eggs were produced in 2005. The animal population was estimated as follows: cattle 57.8 thousand, sheep and lamps 268.9 thousand, goats and kids 329.3 thousand, pigs 429.7 thousand, poultry 2 822 thousand.

The total irrigated area was 35 900 hectares in 2005 compared to 40 000 in 1995. The irrigated area ranges between crops from 2.6% for cereals to 100% for vegetables, fruit trees and citrus. The usage of treated waste water has been widely expanded and it is expected that this trend will continue.

In 2008, Cyprus suffered one of the worst droughts of its history resulting in the total loss of rain fed crops, in the severe effect of biodiversity and in the depletion of national water reserves. It is likely that the continuous decline of precipitation in correlation with the increase of average temperature will seriously affect the diversity PGRFA.

The Agricultural Insurance Organization, established in 1978, has been compensating farmers for loss of income due to adverse environmental conditions such as drought, hail, frost, wind etc. The funds are available due to insurances paid by the farmers and due to national funds.

Agricultural products have possessed a high proportion of the total value of the exporting products representing almost the 17.5%. In 2007, the exported raw agricultural products amounted to € 120.9 million and the industrial products of agricultural origin amounted to € 69.7 million. The major exported raw agricultural products are potatoes, citrus, and vegetables. The major exported industrial products of agricultural origin are fruit and vegetable juices, wines and halloumi cheese. The main exported agricultural products have remained the same over the last ten years, with the exception of grapes, the total exporting quantities of which have declined substantially.

Cyprus is highly depended on the importation of cereals for food and feed. The local production is very low, it is highly susceptible to adverse environmental conditions and it represents only 10-20% of the total annual needs. In 2007, around 220 008 tonnes of barley, 186 638 tonnes of maize, 90 308 tonnes of wheat and 2 425 tonnes of flour wheat were imported. The same year, the local production was 37 750 tonnes of barley and 5 400 tonnes of wheat. Cyprus is self sufficient or almost self sufficient for most vegetables and fruits; nevertheless agricultural commodities are imported to cover any shortage of the market.

CHAPTER 1

THE STATE OF DIVERSITY

Cyprus lies in the north eastern corner of the Mediterranean Sea situated between 34.5° to 35.8°, Northern Parallel, and 32.2° to 34.6°, Eastern Meridian. The country has an area of approximately 9 251 Km^2 and is the third largest island of the Mediterranean Sea.

The island is divided into four geomorphologic zones, the Troodos (or Southern) range, the Pentadactylos (or Northern) range, the Mesaoria (or Central) plain and the coastal belt. The Troodos Mountains, underlain by the Troodos massif, occupy the south central part of the island and cover an area of about 3 200 Km^2.

The mountains rise to a maximum height of 1 951 m on Mount Olympus which occupies the central part of the range. The Pentadactylos Range runs parallel to the north coast at an average distance of 8 km inland and rises to elevations of over 1 000 m. The Mesaoria plain is formed by a succession of Upper Cretaceous to Pleistocene sedimentary rocks. Its northern half is underlain by highly folded Kythrean Flysch and has a characteristic hummocky topography, while the southern part consists of a sequence of generally under-formed gently inclined rocks of the Circum Troodos Sedimentary Succession.

The coasts are almost everywhere low and shelving. Sea cliffs are extremely rare. In many places the shores are rocky or stony but sandy bays are found all around the island. Many areas of the costal belt are fertile and are tilled almost to the edge of the sea.

The climate is intensive Mediterranean with cool, wet and rather changeable winters, from November to March, and hot and dry summers from May to mid September, separated by short spring and autumn seasons and rapid change in weather coordination.

In July and August the mean daily temperature ranges between 29°C on the central plain to 22°C on the Troodos Mountains, while the average maximum temperature for these months range between 36°C to 27°C, respectively.

In January, the mean daily temperature is 10°C on the central plain and 3°C on the higher parts of the Troodos Mountains, while the average minimum temperature is 5°C and 0°C, respectively. Frosts are rarely severe but are frequent in winter and spring and in some years handicap the economically important production of early vegetable crops and main citrus crops.

The average annual precipitation increases up to the south western windward slopes from 450 mm to nearly 1 100 mm at the top of the central massif. On the leeward slopes, figures decrease steadily northwards and eastwards reaching 300 and 350 mm in the central plain and the flat south-eastern parts of the island. The narrow ridge of Pentadactylos range produces a relatively small increase of rainfall to nearly 550 mm along its ridge at 1 000 m. Autumn and winter rainfall, on which agriculture and water supply generally depend, substantially fluctuates over years. The average rainfall is about 480 mm (average rainfall for the period 1951-1980). It should be noted that the average rainfall over the last ten years was lower than the average and was as low as 448 mm.

The irregular outline of the island, in conjunction with the climate, the geology, the high number of agricultural holdings and the high fragmentation of agricultural land resulted to the development of an enormous diversity of PGR. A recent project has studied the land cover over the island (CORINE Land Cover Project 2000 - Table 1).

TABLE 1
CORINE Land Cover 2000 of Cyrus

CLC level 1	CLC level 2	CLC level 3	Pieces	Area (ha)
1. Artificial surfaces	1.1 Urban fabric	1.1.1 Continuous urban fabric	9	563
		1.1.2 Discontinuous urban fabric	363	43 691
	1.2 Industrial commercial and transport unit	1.2.1 Industrial or commercial units	147	12 987
		1.2.2 Roads and rail networks and associated land	7	209
		1.2.3 Port areas	4	347
		1.2.4 Airports	8	2 502
	1.3 Mine, dump and construction site	1.3.1 Mineral extraction sites	38	2 865
		1.3.2 Dump sites	4	286
		1.3.3 Construction sites	25	1 825
	1.4 Artificial, non agricultural vegetated areas	1.4.1 Green urban areas	15	1 093
		1.4.2 Sport and leisure facilities	55	3 863
2. Agricultural areas	2.1 Arable land	2.1.1 Non irrigated arable land	254	244 474
		2.1.2 Permanently irrigated land	63	19 078
		2.1.3 Rice fields*		
	2.2 Permanent crops	2.2.1 Vineyards	28	13 998
		2.2.2 Fruit trees and berry plantations	99	14 749
		2.2.3 Olive groves	59	6 988
	2.3 Pastures	2.3.1 Pastures	4	871
	2.4 Heterogeneous agricultural areas	2.4.1 Annual crops associated with permanent crops	146	33 165
		2.4.2 Complex cultivation pattern with scattered houses	194	70 586
		2.4.3 Land principally occupied by agriculture, with significant areas of natural vegetation	159	39 143
		2.4.4 Agro forestry areas*		
3. Forest and semi-natural areas	3.1 Forest	3.1.1 Broad leaved forest	15	704
		3.1.2 Coniferous forest	105	154 616
		3.1.3 Mixed forest	4	357
	3.2 Shrub and/ or herbaceous vegetation associations	3.2.1 Natural grassland	74	32 264
		3.2.2 Moors and heath land*		
		3.2.3 Sclerophylous vegetation	361	159 825
		3.2.4 Traditional woodland/shrub	102	27 827
	3.3 Open spaces with little or no vegetation	3.3.1 Beaches, dunes and sand plains	25	5 265
		3.3.2 Bare rocks	27	2 941
		3.3.3 Sparsely vegetated areas	100	12 410
		3.3.4 Burnt areas	4	11 650
		3.3.5 Glaciers and perpetual snow*		
4. Wetlands	4.1 Inland wetlands	4.1.1 Inland marshes*		
		4.1.2 Peat bogs*		
	4.2 Coastal wetlands	4.2.1 Salt marches	3	1 956
		4.2.2 Salines*		
		4.2.3 Intertidal flats*		
5. Water	5.1 Inland waters	5.1.1 Water courses*		
		5.1.2 Water bodies	19	1 401
	5.2 Marine waters	5.2.1 Coastal lagoons*		
		5.2.2 Estuaries*		
		5.2.3 Sea and ocean		
Total			**2 520**	**925 989**

* Class not represented in CLC 2000 of Cyprus

It should be noted that the figures above referred to the whole island. The Turkish invasion in 1974 resulted in the occupation of the 38 % of the country's territory. The total government control area is estimated to be 575 000 hectares, of which only 149 000 ha are agricultural land and 318 715 ha are forest land.

1.1 The main values of PGR

The cultivated area is divided into four agro economic zones based on variations in elevation, soil, rainfall, cropping pattern and other futures associated with agricultural production. These are the coastal, dry land, vine and mountain zones. The coastal zone includes to a large extent irrigated crops, mainly citrus, vegetables and green houses. The dry land extends over the central pains and all the hilly areas. Farms in this zone are mainly rainfed and the predominant crops are cereals, fodder plants and olives. The vine zone is located to the south and west slopes of Troodos Mountain and it is mostly consisted of rainfed vines. The mountainous area is located to Troodos Mountain and includes irrigated deciduous fruit trees.

The coastal zone and central plain areas are considered as the "more favourable areas"where dense rural population exist and the trend is for modernization of agricultural systems On the other hand, the vine and mountain zones and hilly areas are considered as "less favourable areas" where the rural population diminish and traditional farming systems predominate. It should be emphasized that local varieties and landraces are still cultivated to these traditional systems and in some cases occupy high percentage of the total area cultivated with the species concerned e.g. in vines. The conservation of the agricultural systems in the vine and mountain zones is of outmost importance for the sustainability of rural communities and the environment. The RDP invokes to achieve this goal.

In 2007, the value of production of major crops amounted to € 292 959 thousand compared to € 315 164 in 1995. Vegetable production has the higher contribution followed by the fruit trees. The reduce contribution of cereal production can be attributed to the drought conditions and to the trend for using cereal crops for forage. The main industrial products of agricultural origin are the wines and the fruit and vegetable juices.

TABLE 2
Production and value of production of the major crops for 2007

Crops	1995		2007		(%) in production	(%) in value of production
	Production (tones)	Value of production (million €)	Production (tones)	Value of production (million €)		
Cereals	145 170	29 724	43 990	8 028	- 69.70	-72.99
Fodder crops		12 767		12 118		-5.08
Other		14 617		12 713		-13.02
Total field crops		**57 109**		**32 860**		**-42.46**
Potatoes	234 000	73 359	155 500	40 528	-33.55	-44.75
Other vegetables		51 360		74 614		45.28
Total vegetables		**136 299**		**129 843**		**-4.74**
Vines	118 000	26 067	35 274	8 448	-70.11	-67.59
Citrus	176 000	26 248	137 520	46 894	-21.86	78.66
Fresh fruits		34 774		30 032		-13.64
Nut trees	3 760	4 813	1 209	2 443	-67.83	-49.24
Olives and carobs	19 800	14 217	23 430	16 138	18.33	13.51
Total fruit trees		**106 122**		**111 711**		**5.27**
Flowers and nursery products		15 633		18 544		18.62
Total		**315 164**		**292 959**		**-7.05**

1.2 Diversity within and between crops

Cyprus is characterized by the impressive diversity of its flora. About 1 908 taxa have been recorded as native or naturalized. Around 376 taxa have been recorded as cultivated, 360 as rare or very rare and 144 taxa as endemic. The endemism is relatively high and is estimated to be 7.5%. New endemic species have been recorded over the last ten years contributing to the better understanding of genetic diversity. The studying and the recording of flora is an ongoing process.

Studies regarding the diversity and distribution of crop wild relatives and underutilized crops have been conducted in the framework of national and regional programmes. Surveys regarding diversity in Cyprus have been also conducted without national participation. Studies revealed the great diversity of crop wild relatives. It is well documented the substantial diversity of crop wild relatives of stable crops e.g. *Aegilops* sp, *Avena* sp, *Hordeum* sp, *Medicago* sp and *Trifolium* sp. It has estimated that about 1 310 species of the flora of Cyprus can be considered as crop wild relatives.

A recent study has showed that around 76 taxa of wild plants can be considered to have actual or potential use for food, medicine, fuel and others. An ethno botanical study has recorded 78 species of wild edible plants only in two areas. It should be mentioned that the contribution of wild edible plants for food is negligible. Most of these plants have traditionally used in diet and some of them have only local importance.

Despite of the small size of the island, there is a substantial diversification among cultivated crops ranging from tropical to temperate species (Table 3). The major cultivated crops are barley, wheat, oats, citrus, olives, wine vines, fodder plants and vegetables.

TABLE 3
Distribution of cultivated area among crops and trends over the last 10 years

- **Field crops**

		1995 (ha)	2008 (ha)	% change
Cereals	Durum wheat	3 650	6 919	89.56
	Barley	57 000	57 778	1.36
	Oats	220	934	324.55
Total cereals (ha)		**60 870**	**65 631**	**7.82**
Legumes	Broad beans	560	166	-70.36
	Cow peas	310	235	-24.19
	Chick peas	35	46	
	Lentils	4	6	
	Lathyrus sp	130	45	-65.38
Total legumes (ha)		**1 039**	**498**	**-52.07**
Industrial crops	Tobacco	73	70	-4.91
	Ground nuts	350	22	-93.71
Total Industrial crops (ha)		**423**	**92**	**-78.25**
Fodder plants (ha)		11 117	12 985	16.80
Graze land (ha)		5 320	5 725	7.61
Total field crops (ha)		**78 769**	**84 886**	**7.7**

- **Vegetables**

		1995 (ha)	2008 (ha)	% change
	Potatoes	9 900	3 881	-60.80
	Carrots	60		
	Tomatoes	550	145	
	Taro	115		
	Cucumbers	300	33	
	Beans	780	57	
	Cabbages	150	53	

		1995 (ha)	2008 (ha)	% change
	Onions	268	175	
	Artichokes	165	153	
	Cauliflower	95	24	
	Marrows	150	77	
	Eggplant	65	11	
	Beetroots	75		
	Celery	45		
	Okra	70		
	Pepper	60	20	
	Peas	80		
	Watermelons	750	298	
	Melons	225	102	
	Leafy vegetables		524	
	Green houses		306	
	Other	645	1 751	
Total vegetables (ha)		**14 548**	**7 610**	**-47.69**

- **Fruit trees**

		1995 (ha)	2008 (ha)	% change
Vines	Wine vines	17 400	9 508	-45.69
	Table vines	1 900	694	-54.67
	Raisin vines		87	
Total vines (ha)		**19 300**	**10 289**	**-46.69**
Citrus	Oranges	2 200	2 632	19.64
	Lemons	1 450	714	-50.76
	Grape fruits	1 600	485	-69.69
	Mandarins	1 800	740	-58.89
	Other	150	420	
Total citrus (ha)		**7 200**	**4 991**	**-30.68**
Olives and Carobs	Olives	5 750	13 659	137.55
	Carobs	2 500	2 620	4.80
Total olives and carobs (ha)		**8 250**	**16 279**	**97.32**
Nut trees	Almonds	3 050	4 902	60.72
	Walnuts	380	268	-29.67
	Hazelnuts	100	34	-66.00
	Pistachio	200	81	-59.50
Total nut trees (ha)		**3 730**	**5 285**	**41.69**
Deciduous and other trees	Apples	1 100	1 288	17.09
	Pears	180	122	-32.22
	Quinces	12	6	
	Peaches	760	769	
	Apricots	320	329	
	Cherries	310	338	
	Plums	175	498	184.57
	Pomegranates	170	123	-27.65

		1995 (ha)	2008 (ha)	% change
	Figs	330	140	-57.58
	Bananas	260	238	
	Loquats	60	38	-36.67
	Avocado	110	86	-21.82
	Kiwi	45	6	-86.67
	Strawberries	75	44	-41.33
	Prickly pear		20	
	Palms		54	
	Guavas		8	
	Lotus		4	
	Cherimoya		6	
	Others	100	165	
Total deciduous and other trees (ha)		**4 007**	**4 282**	**6.86**
Total fruit trees (ha)		**42 487**	**41 126**	**-3.20**
Floriculture (ha)		**47**	**53**	**12.77**
Aromatic plants (ha)			**89**	
Fallow (ha)		**7 100**	**14 980**	**110.99**
Total cultivated area (ha)		**14 2951**	**148 789**	**4.08**

With the exception of wine vines, there is no national programme surveying in regular base the diversity within species for major and minor crops. Indications for the state of diversity can be extracted through data kept by the phytosanitary authorities at the official points of entry and by the competent authorities for seed and propagating material certification.

The Wine Products Council has been keeping records regarding the diversity of wine vines. The 9 500 ha of wine vines are cultivated by 30 major and numerous minor wine varieties. The 76% is covered by local varieties and landraces and 24% is covered by introduced varieties.

Concerning the other cultivated crops, it can be said that there is substantial diversity within species because of the existence of diverse local germplasm and the introduction of genetic material. The introduction of genetic material has been increased over the last 10 years. That was extremely evitable in case of vegetables. It is also expected that the introduction of cereal and fodder varieties will increase.

Farmers have been preferring bread varieties and hybrids due to the uniformity of produced crops and products, the resistance to diseases, the prolong shelf life and other. Local varieties and landraces are still cultivated for commercial purposes due to consumer preferences and to the production of special commodities out of them. It shall also be mentioned that, in some cases, introduced material has failed to replace landraces due to lower adaptation.

In case of cereals, fodder plants and vegetables, bread varieties and hybrids predominate and in many cases totally replaced the native genetic material. However, local varieties and landraces are still cultivated to small scale e.g. eggplant, cabbage, chart, squash, durum wheat and others. There are also few exceptions where landraces are cultivated to rather large areas e.g. taro, pepper and oats.

In case of fruit trees, vines and legumes, local varieties, landraces and introduced modern varieties are been cultivated. In some cases, landraces dominate or represent high proportion e.g. olives, wine vines, faba beans, common vetch, cow, peas, figs, pomegranates and loquats. In some other cases, landraces are represented to lesser extent e.g. in apples, apricots.

It should be noted that numerous landraces are cultivated from farmers and amateurs for personal consumption. Although the number of these landraces is unknown, it shall be expected they are more than the landraces cultivated for commercialization. A recent study revealed that tomato and bean landraces do cultivated in very small scale only for personal consumption.

1.3 Factors influencing the state of plant genetic diversity

The area cultivated with mandarins, lemons, grapefruit, vines, industrial crops, potatoes and legumes has been substantially declined. The decline can be attributed to low marketing prices, low competitiveness of the products, drought, high cost of labour, reduction of the exporting quantities and other. The area cultivated with minor temperate, subtropical and tropical fruits also decline. In contrary, there was a substantial expansion of the area cultivated by olives that can be attributed to low input requirements and drought resistance. The area cultivated with oranges also expanded.

The area of vegetable species other than potatoes and cereals slightly increased. A strong trend is observed to use cereal crops for forage, especially oats and triticale and to lesser extend barley due to livestock demand.

The expansion of irrigated fodder crops is also attributed to livestock demand and to the availability of waste water for irrigation. The availability of waste water will continue to increase over the next year due to the completion of water recycling projects. The main irrigated fodder plants are maize, Italian ryegrass and sorghum. The area cultivated with legumes and pulses tents to remain stable over the last year due to the incentives given by the RDP for rotation systems and organic farming. It should also be stated the massive expansion of grasses for amenities such as *Festuca* sp, *Poa* sp, *Lollium* sp etc.

The danger for genetic erosion of the local genetic material is high, especially for landraces cultivated for not commercial purposes. Taking into account that the selection of varieties for cultivation is a market driven process, it can be said that there is a potential threat for replacement of the cultivated landraces by introduced varieties. The RDP envisages the modernization of agricultural systems implying higher risk of replacement of the old cultivars and landraces and suppression of PGRFA. On the other hand, RDP underpins the conservation of diversity of PGRFA and compensates farmers for using sustainable agricultural practices.

In some cases, certain legislative provisions might impair the conservation of genetic diversity causing genetic loss. For example, the provisions that only certified genetic material of officially registered varieties can be marketed exclude the marketing of landraces.

The threat of genetic erosion is even higher for crop wild relatives and wild edible plants because are exposed to drought, overgrazing, fire, habitat fragmentation and urbanization. The climate changes, as it is evident with the extended drought period and the increase of the average temperature, accelerate the depletion of genetic diversity. The high occurrence of forest fires over the last years and the difficulties for restoration of the natural eco systems due to low precipitation is another major concern of potential genetic erosion. Overgrazing occurs even inside important natural ecosystems causing severe loss of PGR. The massive expansion of the touristic and urban areas, the construction of a dense road network and the development of recreation activities resulted to deterioration of ecosystems and habitat fragmentation.

The construction of dams has been substantially influencing genetic diversity along torrent banks and around dams. The impairment of water flow due to dam construction resulted to genetic erosion of species along torrent banks. On the other hand, the establishment of permanent water reserves allowed the establishment of new species around dams contributing to genetic diversity.

A variety of crop species (including a vast array of genetically modified crops) are known as invasive alien species and propagation to the environment, may result to negative effects to local biodiversity. The Scientific Committee under the Law on the Protection and Management of Nature and Wildlife (Law No. 153(I)/2003) holds regular meetings, examining (amongst other species of flora and fauna) cases related to invasive alien crops, in order to prevent negative effects to the local environment.

1.4 Future needs and priorities

The diversity within species is to large extent been unexploited. In the future, the state of diversity of genetic material within species and especially of the native genetic material should be recorded in regular base and the outcome of these work to be used as guidance for assessing genetic erosion and undertaking *in situ* and *ex situ* conservation initiatives.

The impact of climate change and pollution to genetic erosion should be studied into detail. An ongoing study is investigating the effect of the climate change to the endemic plants that are adapted to the higher slopes of Troodos Mountain. The results of these studies should be integrated to the national strategies and management plans.

The RDP contains numerous measures aiming to halt genetic erosion. However, most of them are very general and target biodiversity in a very broad sense. More specific measurements should be added to target specific threats of erosion such as replacement of landraces. The strengthening of the linkages between policy makers, agricultural and environmental scientists and other stakeholders would invoke the development of integrated approaches and more effective strategies.

CHAPTER 2

THE STATE OF *IN SITU* MANAGEMENT

There was an overall progress for *in situ* conservation over the last ten years as it is indicated by the numerous projects undertaken to survey and inventory PGR, the strengthening of *in situ* conservation strategies and the expansion of "protected areas".

2.1 Inventories and surveys – assessments and priorities

Studies regarding the diversity and distribution of PGR have been conducted in the framework of national and regional programmes, projects and networks while others have been conducted without national participation. Examples of these activities are the publication in 2000 the Cyprus Flora Checklist Format containing the native or naturalized-cultivated-endemics -rarities and additions of Cyprus flora, the survey and inventory of the crop wild relative species, of the native seed plants, and of the wild plants with actual or potential use for food, medicine and fuel. Ethnobotanical studies have also been conducted surveying the wild edible plants in Paphos and Larnaca countryside. A study for recording and conserving rare endemic plants inside the buffer zone has been initiated.

Cyprus has participated in a survey for recording the top 50 plants of the Mediterranean islands threatened with extinction. Another study has focused on surveying the flora of coastal sand dunes and coastal salt marches and identifying strategies for their conservation.

A very important step forward was the publication of Cyprus Red Book in 2007. The book contains detailed information about very rare and rare plants and their distribution. In total, 328 taxa were evaluated against the IUCN criteria and 238 taxa were found to qualify for classification in one of the IUCN treat categories (CR, EN, VU).

Recording plant diversity has been a continuous process inside national state forests and other protected areas. Inside "Natura 2000" protected areas, the diversity of the species and habitats are recorded. Diversity of rare and endemic plants is regularly monitored inside national state forests. Some of the recorded species are considered as crop wild relatives.

Important information regarding the relative importance of major and minor species and their distribution can be extracted from the regular surveys carried out by the Statistical Services. Relative information can also be obtained from records kept CAPO. Both of these surveys do not contain data concerning diversity and genetic erosion within species. With the exception of wine vines, there is no national programme surveying in regular base the diversity within species of major and minor crops.

In the future, the state of diversity of genetic material within crops, crop wild relatives and wild plants should be surveyed and inventoried in regular base and the outcome to be used to enhance *in situ* and *ex situ* conservation strategies. The knowledge regarding underutilized crops and wild edible plants is usually held by the eldest people in rural areas. Ethnobotanical studies should be carried out to acquire and conserve this knowledge.

The main constrain for surveying and inventorying the diversity of cultivated crop and PGRFA in general is the insufficiency of staff. The insufficiency of staff can be mitigated by the effective regional networks and enhancement of capacity building. The existence of effective regional networks would be helpful in terms of making fund available, exchange information and centralization of certain activities. In case of capacity building, there is a need to boost the usage of new technologies such as GIS systems and creation of friendly use, easily accessible databases. The accretion of more research studies, especially from universities, should also be envisaged.

2.2 On-farm management and improvement of PGRFA

The importance of development of efficient on-farm management systems is illustrated by the fact that 12% of the total area of Cyprus is estimated to be "High Nature Value Farmland". "High Nature Value Farmlands" are considered as very important habitats for the conservation of wild flora.

The Rural Development Plan 2007-2013 is the main instrument for on-farm conservation of PGRFA. The RDP contains numerous measures that envisaged the conservation of diversity and sustainable use of genetic resources through subsidizing specific actions. The RDP also gives incentives for the sustainable development of the agricultural areas and forest land inside the protected areas.

Some measures anticipate the enhancement of biodiversity in general. Agro environmental measures are key elements of RDP e.g. rotation systems, reduction of the usage of herbicides, management of strips around cultivated areas. Agro environmental measures have been widely used tools to make agriculture more sustainable, but not all agro environmental measures are explicitly targeted on biodiversity and further analysis is required to determine their effectiveness.

The promotion of organic farming and the obligation of farmers to apply "Cross Compliance" are two other tools of the RDP for sustainable development. The area under organic farming has been expanding and was estimated 2 300 hectares in 2007. According to "Cross Compliance", farmers are obliged to implement good agricultural and environmental practices and comply with the provisions of 19 EC Regulations and National Laws. The impact of organic farming and cross compliance as a tool to promote *in situ* conservation is difficult to be assessed however it can be assumed that it reduces stress on ecosystems and provides a wider range niches for farmland species. Some other measures anticipate the *in situ* conservation of PGRFA straight forward. A specific measure targets the *in situ* conservation of wine vine landraces endangered with extinction and genetic erosion.

Additional payments to less favorable areas are provided through the RDP. These additional payments envisaged to reinforce rural income to areas that for several reasons shows less competitiveness capacity than other areas. By this strategy, the sustainability of agricultural systems and rural communities to less favorable areas is safeguarded.

The RDP also aims the education of farmers and dissemination of knowledge among them for several issues related to PGRFA including the importance of on-farm management of biodiversity. On-farm conservation is also promoted by measures aiming to add value to raw agricultural and forestry products through the establishment and support of small manufacture industries in rural areas. The promotion of agro-tourism and the related actions associated with it is also targeted. Related actions promoted include the conservation of traditional landscape of rural areas and the production and marketing traditional commodities derived from landraces and wild plants.

Cyprus has been also implementing the Single Area Payment Scheme since 2004. The scheme reinforces agricultural income by making payment according to the cultivated area and crop. The scheme contributes to the conservation of agricultural systems and therefore rural communities. The amount of payment made per crop is calculated taking into account agro economical studies and community legislation. The necessary funding for the implementation of the Single Area Payment Scheme is made available from National and European funds.

A new activity has been the initiation of Participatory Breeding activities for field crops, where farmers, as the primary stakeholders, have an increased saying in the decisions about the genetic material better suitable for them.

Cyprus has been enforcing new legislation framework in compliance with EC legislation since its accession to the EU. In some cases, the new legislation framework has an impact on *in situ* conservation of PGRFA. According to national seed law, only certified seed and propagating material from officially registered varieties can be produced and marketed. The legislation covers all major crops cultivated in Europe.

These provisions impair the marketing and dissemination of seed and propagating material of old varieties and landraces for the species covered by the legislation. A draft legislation that will enter into force by the end of 2009 invokes to remove these barriers by setting special derogations for the production and marketing of old varieties and landraces. For minor species not cover by the legislation, the production and the marketing of seed and propagating material are not subject to seed law provisions.

Measures have been taken to impair the importation of seeds and propagating material of low quality, invasive alien species including GMOs and pest and diseases. These precautionary measures are important to safeguard genetic diversity, on-farm conservation and improvement of PGRFA. The importation of seeds and propagating material is allowed only if the seeds comply with the national legislation for seed and propagating material, the phytosanitary legislation, the biosafety legislation and the legislation on the protection of wild fauna and flora. Seeds and propagating material shall also comply with the provisions of the Cartagena Protocol and the Convention of International Trade of Endangered Species of Wild Fauna and Flora (CITES).

In the future, more on-farm conservation activities should be initiated to target specific landraces, wild plants and crop wild relatives threatened by extinction and genetic erosion. The effective implementation of such strategies implies the construction of an effective mechanism to survey and inventory PGRFA in a regular base. The sharing of expertise and the development of *in situ* techniques can be achieved through regional networks. It should also be promoted the strengthening of linkages between all stakeholders related to *in situ* conservation and the development of integrated approaches.

2.3 Restoring agricultural systems after disasters

Cyprus has been suffering from fires destroying every year substantial area natural ecosystems and agricultural land. The rate of fires has been increased over the last year due to the climate change. It can be said that fires is the main threat of natural disasters.

The RDP contains measures for protection of forests from fires and for reforestation. Similar measures have been included to the National Forest Plans. The Department of Forestry has also established nurseries where forest genetic material, rare and endemic plants have been multiplied and used to restore ecosystems following disasters.

In case of agricultural system, there is a national action plan in case of infestation of vines with the *Phyloxera*. At the time being, Cyprus is free from *Phyloxera*, thus vines are not grafted to resistance root stock. However, resistance rootstocks have been introduced and evaluated and prebasic plantations with virus free propagating material have been established. Another mechanism established concern the compensation of farmers to restore agricultural systems destroyed by fire. This mechanism is general and do not ensure that genetic diversity would be represented in same percentage after restoration. In the future, such mechanism should be developed.

2.4 *In situ co*nservation of wild crop relatives and wild plants for food production

Crop wild relatives and wild edible plants are widely spread to natural ecosystems. The majority of these natural ecosystems are included in protected areas. It must be mentioned that many ecosystems have been declared as protected areas according to more than one legislative framework.

The "Natura 2000" is a European Network of protected areas based on the provisions set out by the Birds and Habitats Directives (79/409/EEC and 92/43/EEC respectively). It primary aim is the conservation of European biodiversity. In 2008, the Natura 2000 network was further expanded, after inclusion of a total of 38 protected areas out of which 7 have been classified as Special Protection Areas and 36 as Sites of Community Importance. The total protected area has reached 87 587 ha, 74 916 being terrestrial. At the time being, the network covers 12.21% of the total area of the island. Natura 2000 sites are comprised of both governmental and private land and contain substantial area of agricultural land.

The management plans for 14 Natura 2000 areas of the network have been completed and are under preparation for other 17 areas. The RDP contains specific measures for the implementation of the management plans in agricultural land inside Natura 2000 areas.

Eligible areas for inclusion to the network are those containing habitats or species listed to the Annexes of the aforementioned Directives. Conservation of wild species of agricultural importance generally occurs as an unplanned result on Natura 2000 protected areas. This is in compliance with the general goal of the protected areas that is to say the conservation of nature and wild life. A rare exception is the community driven inclusion of indigenous hazelnuts trees to the Natura 2000 network in Pitsilia area.

Forests are managed by the Department of Forests. The Department has been implementing National Forests Plans for the sustainable management of forest ecosystems with specific attention to rare habitats and wild species. The management plans include restoration and reforestation activities, protection measures from wild fires and other related activities. Based on the Forest Law, seven areas have been declared as "Protected Flora and Fauna Area" totaling an area of 4 788 hectares. "Protected Flora and Fauna Area" is considered a main State Forest where proper and permanent measures for the protection of flora and fauna have been made. Additionally, nine forest areas have been declared as "National Forest Parks" totaling an area of 11 103 hectares. Two "Protected flora and fauna areas" and three "National Forest Parks" have been declared after 1996.

"Areas of Outstanding Natural Beauty" and "Protected Landscapes" are managed by the Department of Town Planning and Housing. These areas are both government and private owned and are considered as areas with substantial biodiversity. Housing development is strictly restricted inside "Protected landscapes" where inside the "Areas of Outstanding Natural Beauty" is allowed only in predefined areas and under certain conditions.

Priority has been given to the finalization of management plans of Natura 2000 areas and their implementation.

The inclusion of new areas to the network is also investigated since important unprotected habitats are been deteriorated.

More efforts should be made for the inventorying wild crops of global importance and greater emphasis should be given for their *in situ* conservation in protected areas. An effective *in situ* conservation strategy passes through farmers training and public education on the importance of PGRFA. Both activities should be of high priority. It should also strengthen research aiming to develop the appropriate methods for enhancing public awareness.

CHAPTER 3

THE STATE OF *EX SITU* CONSERVATION

Ex situ collections are held by the departments of the Ministry of Agriculture Natural Resources and Environment and are under the public domain. These *ex situ* collections are comprised of one genebank (CYPARI genebank) established by ARI, numerous field collections established by ARI and the Department of Agriculture and forest field collections and botanical gardens established by the Department of Forests.

Tissue culture has been widely used over the last ten years in several research projects including the establishment of *in vitro* collections of virus free citrus propagating material. At the time being, tissue culture has not been used for the establishment of *in vitro* genebanks as such. Cryopreservation facilities have not been developed.

Numerous private owned collections of rare genetic material exist, including a small collection held by a private university containing rare endemic plants. These collections have not been established as *ex situ* collections and in most of the cases, data regarding these genetic materials are extremely rare or do not exist at all.

There is also genetic material collected in Cyprus and stored only in genebanks abroad. This genetic material has been collected either in cooperation with the departments of the Ministry of Agriculture, Natural Resources and Environment or by initiatives taken by universities, international institutes and organizations. It mostly concerns landraces and crop wild relatives and to lesser extent breeding lines developed by the ARI breeding programme.

3.1 CYPARI genebank

The CYPARI genebank was established in 1985. Seven hundred and three accessions of local varieties, landraces, crop wild relatives, endemic and rare plants are been conserved under its premises (Table 4). The germplasm is mainly native, collected by the ARI and/or in cooperation with the Department of Forests, international organizations and institutes e.g. IPGRI and ICARDA. Recently, collecting missions have been also taken by a private university. Most of the accessions are duplicated to genebanks abroad. Some accessions are kept by more than one genebanks. The existence of the same accessions to more than two genebanks indicates that more regional and international collaboration is needed to avoid conserving material that is not unique.

One hundred and fifteen accessions have been introduced to the CYPARI genebank over the last 10 years representing the 16.4% of the total. The rather limited number of accessions introduced can be attributed to the reduced number of collecting missions taken over the last ten years. Taking into account the enormous crop diversity of Cyprus, it is evident that a large amount of species are underrepresented. Actions would be taken to fill the gap especially for vegetable species, minor crops, underutilized crops and crop wild relatives. New collecting activities should be based on surveys and inventories of plant diversity and taking into account *in situ* conservation strategies. Collecting missions can be taken in the premises of national and regional collaboration.

TABLE 4
CYPARI genebank accessions

Taxon	Common name	No. of accessions	No. of accession collected after 1996	Genebank holding safety duplicate
Amygdalus communis	Almond tree	55	55	
Cicer arietinum	Chick pea	28		ICARDA
Cucumis melo	Melon	7	7	
Hordeum vulgare	Barley	26		ICARDA
Lathyrus ochrus	Ochrus vetch	12		ICARDA
Lathyrus sativus	Chickling vetch	19		ICARDA
Lens culinaris	Lentil	19		ICARDA
Lycopersicon esculentum	Tomato	9	9	
Phaseolus vulgaris	Beans	28	28	
Pisum sativum	Field pea	6		ICARDA
Triticum durum	Durum wheat	80		ICARDA
Vicia ervilia	Bitter vetch	15		ICARDA
Vicia faba	Faba bean	101		ICARDA
Vicia sativa	Common vetch	67		ICARDA
	Crop wild relatives	178	14	Partly
	Other endemic and rare plants	53	2	
Total		**703**	**115**	

The CYPARI genebank has medium storage facilities with controlled temperature about 0 -4°C and 50% RH. The seeds are hermetically sealed to laminated foil bags. Recently, the CYPARI genebank acquired long term storage facilities with controlled temperature about -20°C.

13.7% of the accessions have been regenerated over the last 10 years. At the time being, only self pollinated crops have been regenerated. It is estimated that 86.3% of the accessions would need to be regenerate in the near future. With the employment of new staff, CYPARI genebank has the capacity to conduct germination tests and to check stock inventories in frequent intervals. The germination requirements and seed biology of numerous endemic and rare plants have been studied and the knowledge for germination and regeneration is available. Regeneration would be done when germination capacity or seeds in stock is less than the international standards.

For most of the accessions, passport data are available and dully completed. Passport data of 468 accessions have been load to EURISCO database. For all accessions, data regarding regeneration activities are kept. At the time being, there is no specific programme available for the management of the genebank data. Currently excel sheet are used for documentation. One of the said priorities is the acquisition of software for genebank documentation and management.

About 18% of accessions have been characterized and evaluated before 1996. Activity in this area has been rather low over the last ten years. This can be explained by the focusing in other fields considered having higher priority, like assessing biodiversity. However, it must be pointed out the introduction of molecular tools for the assessment of genetic material. Molecular assessment for tomato accessions is in process. The appointment of regional centers of excellence that would be specialized in specific characterization and evaluation procedures on behalf of the national genebanks would be very fruitful. Cyprus has ratified the International Treaty for Plant Genetic Resources for Food and Agriculture (ITPGRFA). CYPARI genebank has set its genetic material under the multilateral system of ITPGRFA. The Standard Material Transfer Agreement (SMTA) as it was concluded at the first meeting of the Governing Body of the ITPGRFA in 2006 in Madrid is used for transferring genetic material of the species listed in Annex I of the Treaty. The possibility to extenuate the usage of the SMTA for all species is been investigated.

Requests for distribution of seeds from the CYPARI genebank have been negligible over the last ten years. This can be attributed to the lack of a user friendly and easily accessible database and to the fact that the local breeding programmes have being using to most extent introduced material for crossing and evaluation. The poor characterization and evaluation data of the accessions also impairs the distribution of genetic material.

The main constrain in the activities of the CYPARI genebank, especially over the last four years, has been the insufficiency of staff. Recently, new staff has been employed.

3.2 Botanical gardens

One botanical garden has been established by the Department of Forests (Athalassa) and two more are under construction (Troodos and Akamas). The mandate of theses botanical gardens is to host rare and endemic species. In this sense, the representation of all species listed to the red book of Cyprus is envisaged. Further to the *ex situ* conservation, the botanical gardens would have a crucial role to play for education purposes.

3.3 Field genebanks

There are numerous collections of fruit trees and vines nevertheless none of these collections has been established as a field genebank per se. These collections are comprised of either local genetic material or both local genetic material and introduced genetic material (Table 5). The mandate of these collections has been the evaluation of genotype performances or/and the production of propagating material. Most of these collections have been established before 1996.

TABLE 5
Field collections of fruit trees and vines

Taxon	No. of genotypes	Taxon	No. of genotypes
Actinidia chinensis	5	*Pistacia vera (DA)*	10
Amygdalus communis	16	*Pistacia vera (ARI)*	27
Carya illioensis	16	*Persea americana (ARI)*	19
Corylus americana	6	*Persea americana (DA)*	10
Citrus sp *(DA*)*	48	*Phoenix dactylifera (ARI)*	6
Citrus sp *(ARI*)*	35	*Phoenix dactylifera (DA)*	7
Diospyrus kaki (ARI)	6	*Prunus armeniaca*	20
Diospyrus kaki (DA)	6	*Prunus avium*	17
Eryobotrya japonica (ARI)	14	*P. domestica and salicina*	14
Eryobotrya japonica (DA)	8	*Prunus persica*	15
Ficus carica	32	*Prunus persica var nectarina*	7
Junglans regia	5	*Punica granatum (DA)*	4
Magnifera indica (ARI)	10	*Punica granatum (ARI)*	33
Magnifera indica (DA)	12	*Pyrus communis*	12
Malus sp	28	*Pyrus pyrifolia*	3
Olea europa (ARI)	32	*Vitis vinifera (ARI)*	48
Olea europa (DA)	22	*Vitis vinifera (DA)*	100

Institute holding the collection; DA: Department of Agriculture, ARI: Agricultural Research Institute

A step forward has been the introduction *in vitro* techniques for the conservation of citrus virus free genetic material and the creation of an *in vitro* collection containing the major citrus varieties under cultivation. Another major recent advance is the introduction of molecular tools in the assessment of the diversity. Molecular assessment and morphological description for vine and pomegranate genetic material is in process.

In the future, initiatives should be taken for the establishment of field genebanks especially for species with high diversity of native genetic material. Steps should also be taken for the introduction of cryopreservation techniques and the usage of tissue culture technology for conservation of asexual propagated material.

CHAPTER 4

THE STATE OF UTILIZATION

Research programmes involving PGR have been strengthening over the last ten years. This trend would continue to raise taking into account the involvement of universities and the national strategy to increase funding to research.

The distribution of native germplasm conserved to CYPARI genebank was rather limited. However, numerous projects have used native genetic material for selection, evaluation and utilization. The seed and propagating material production schemes and the market have been substantially affected by the accession to the EU. Emphasis has been given to the production and marketing of seed and propagating material of high quality.

4.1 Distribution of PGR

The number of accessions distributed over the last ten years from the CYPARI genebank was limited. Exact data are not available. The main reasons for the poor distribution are the lack of a user friendly and easily accessible database and the poor characterization and evaluation data of the accessions. Breeding programmes are limited to very few cereal species reducing the potential of using large number of species for breeding purposes. Breeders have being using introduced material for crosses. In few cases, landraces and crop wild relatives were used for breeding. Breeders usually store promising genetic material at their own premises for crosses and further evaluation.

The distribution of landraces for evaluation and selection has been widely occurred. Most of the accessions distributed to ARI and concerned legumes, pulses and forage crops for screening, selection and registration for commercialization.

In case of field collections, most of the genetic material has been used for evaluation and selection for commercialization and for the establishment of pre basic virus free plantations. In these field collections, the majority of the cultivated varieties and landraces of fruit trees and vines are represented. Basic material has been distributed to nurseries for propagation and production of certified material.

Distribution of crop wild relatives and wild rare plants was negligible. The collection and distribution of crop wild relatives and wild rare plants could be of international interest taking into account the great diversity of Cyprus and the uniqueness of this material. Such potential is underpinned by the high number of collecting missions undertaken before 1996, the interest for organizing new collecting missions and from recent publications underling the need for more *ex situ* collections of some species e.g. *Aegilops* sp.

4.2 Utilization and enhancing the use of PGR

There is only one active breeding programme running by the ARI and is considered as the national breeding programme. The main aim of the programme has been the breeding of barley, durum wheat and wheat varieties adapted to Cyprus conditions as well as the study of genetic and environmental factors affecting yield, quality and the resistance to pest and diseases.

The breeding programme has been using mainly introduced genetic material from CIMMYT, ICARDA and other national institutes. Wild crop relatives and landraces have been used to lesser extent in barley crosses to introduce stress resistance to heat and for other special purposes. Participatory Plant Breeding has been initiated for barley. The national breeding programme has been very successful as indicated by farmers' preference to varieties resulted from the programme than introduced varieties and landraces.

The farmers' preference is attributed to the high adaptation of bred varieties to the adverse climate conditions. These varieties are also of high quality and resistance to diseases (Net Bloch, Scald, Powdery mildew, black point, head blight etc). Ten barley varieties, six durum wheat varieties and two wheat varieties resulted from the breeding programme have been registered to the National Catalogue. Recently, a joint breeding programme aims the transferring of aroma from *Rosa damascena* to tea hybrid cultivars.

Screening of local landraces and introduced material, evaluation, selection and registration for commercialization has been a very active area of research.

Examples of such activities are the following:

- Forage crops and legumes e.g. *Medicago sativa, Vicia sativa, Lens culinaris, Vicia faba, Pisum sativum*. Selections from landraces of the species concerned predominate in agricultural systems.
- Turf for sport and amenity purposes. Selection and evaluation of different genotypes of *Cynondon dactylon* from native genetic material was emphasized. Selection and evaluation of native genetic material has also been done for aromatic plants (*Origanum* sp). Selected genotypes have been multiplying by nurseries and are been cultivated by farmers.
- Evaluation and clonal selection of promising genotypes from local landraces and genotypes of lemons, mandarins, vines, olives, loquat, pomegranate and pistachio. Selected genotypes are been cultivated.
- Collection, evaluation and DUS testing of traditional wine vine varieties.
- Evaluation of introduced citrus and vines varieties and rootstocks. The majority of the cultivated varieties and rootstocks have been recommended by the programme.
- Evaluation of introduced genetic material of avocado, banana, mango, persimmon, data palm, cherries, apricots and prunes.
- Evaluation of improved vegetable and ornamental varieties and hybrids for quantity and quality characteristics. Evaluation for indoor and outdoor cultivation.
- Evaluation of tomato, melon, and bean landraces for commercialization.
- Evaluation of endemic and native wild plants for floriculture. Technology for commercial cultivation of six rare endemic plants has been developed (*Arabis purburea, Centaurea akamantis, Onosma fruticasa, Origanum cordifolium, Ptilostemon chamaepeuce* var. *cyprium* and *Euphorbia veneris*).

Despite of the various research projects taken more research is needed to understand the relative advantages of native genetic material for the domestic agricultural systems and markets.

Research projects have been undertaken to study the germination requirements and seed biology of rare and endemic plants. The continuation of these projects are extremely import since the acquired knowledge is valuable for *in situ* and *ex situ* conservation activities.

An ongoing research study envisages investigating the phytoremediation of contaminated sites with heavy metals. For the experiment, plants of the genus *Allysum* sp have been selected.

A newly established examination center has been conducting DUS tests for registration to the National Catalogue and to the Common Catalogue. The common catalogue is comprised of varieties eligible for seed certification and marketing. At the time being, DUS test have been conducted for major cereal, vegetable, fodder, oil and fiber plants. DUS testing for registration purposes would be expanded to fruit trees and vines and a National Catalogue for these crops would be established soon. VCU test for registration is required only for annual rainfed crops.

Postharvest studies have been conducted for vegetable and fruit species e.g. potatoes, table vines and citrus.

An ongoing research has been targeting the production of virus free genetic material and the establishment of prebasic plantations. In the framework of this research, tissue culture techniques have been developed for various crops. Prebasic virus free plantations have been established for citrus and vines.

Substantial research has been done for cultivation practices, irrigation systems, irrigation requirements, integrated pest and disease management, rotation systems, soil management and greenhouses technologies. It should also be mentioned the development and usage of molecular techniques in various studies related to PGRFA.

The establishment of the faculty of Geotechnical Science and Environmental Management at the Cyprus University of Technology will boost the research concerning PGRFA. The Faculties' plan includes research in plant breeding, biotechnology, and biodiversity and environmental protection. Molecular, cell and tissue culture, plant biology and technology laboratories would be functional soon.

4.3 Seed and propagating material supply systems and the role of the markets

The accession to the European Union in 2004 totally changed the seed and propagating production systems and the role of the market. The main changes are the high quality requirements of seed and propagating the increasing role of the private sector.

The domestic market is easily accessible to improved high quality seed. The high involvement of private suppliers promotes the competitiveness among them to import varieties suitable to Cyprus conditions. The diversity of species and within species marketing material is a market driven process depending of the competiveness of the produced products and consumer preferences. To lesser extent national policy, as it is implemented through the RDP and the single area payment schemes, influence the diversity of the cultivated species and the usage of PGRFA.

Seed of most crops is imported from other countries by private suppliers. The seed must be certified according to the European legislation. In practice, certified seeds are imported from other member states and from third countries which EC granted equivalence in seed certification. The total requirements of certified seed for fodder, vegetable and legumes crops are been imported.

Seed production of major cereal, legume, vegetable, fodder and oil plants is allowed only if the variety concern is registered to the National Catalogue. Seed must be produced by officially authorized seed companies, must be officially certified and must comply with strict varietal and analytical purity requirements. Derogations for seed production and marketing of landraces and old varieties would be implemented soon. Unofficial seed production and marketing is prohibited and farmers can use alternatively seed that they kept form their own production.

The enforcement of the new legislation had a great impact on the domestic seed market. The high cost of certified seed has pushed farmers to farm saved seed.

Domestic certified seed production occurs only for cereal crops. Until recently, the Seed Production Center of the Ministry of Agriculture, Natural Resources and Environment was the only active seed company multiplying exclusively varieties bred by ARI breeding.

The Seed Production Center has been producing around 4 000 tonnes of barley seed, 1 000 tonnes of durum wheat and 300 tonnes of oats representing more than 50%, 90% and 50% of the annual needs respectively. This trend is expected to change the next years due to increasing private interest in seed production and the increased number of introduced varieties. The main constrain of domestic seed production is to meet the strict quality requirements. Domestic seed production has been also straggling by the continuous drought. The reinforcement of domestic seed production is off outmost importance because it is the only way to reinsure that highly adapted varieties are placed to the market.

Farm saved seed is widely used for various crops e.g. barley, oats, common vetch, faba bean, cow pea and some vegetables. Farm saved seed has been the only mean for conservation and dissemination of old varieties and landraces.

Seed can be marketed only by tenders officially authorized by the competent authority. The competent authority has been conducting regularly control of the market to ensure that certified seeds exposed for selling comply with the legislation provisions.

The marketing of potato seed has significantly changed the last five years. Since 2004, the Cyprus Potatoes Marketing Board has monopolized the marketing of potato seed. After the accession, private sector has been highly involved in the marketing of potato seed. There is a domestic potato certification scheme officially implemented by the competent authority. Certified seed is descent from imported basic material. The produced certified potato seed has been marketed domestically or exported, nevertheless potato seed production do not satisfy the domestic needs.

In case of fruit trees and vines, the prebasic and basic material is produced by public nurseries. Certified seeds and grafts provided by the public nurseries are used by the private nurseries to produce certified plants. The whole procedure is inspected and certified by the competent authority.

In very few cases, suppliers have showed reluctance to allowed marketing seed and propagating material because Cyprus is not a UPOV member.

CHAPTER 5

THE STATE OF NATIONAL PROGRAMMES, TRAINING NEEDS AND LEGISLATION

There was a tremendous development of national legislation framework caused by the accession to the EU. The national legislation developed is harmonized with EC legislation.

The Rural Development Plans are the core instruments for the implementation of the national strategy concerning agricultural and rural development. The new RDP covers a five year period starting in 2007 and ending in 2013. Training of all stakeholders for issues related to PGRFA is considered as a key issue for effective implementation of national plans and policies. For this purposes, several initiatives have been taken.

5.1 National programmes

There is no national programme which integrates all aspects related to PGRFA. However, numerous national programmes and schemes are associated with PGRFA promoting their conservation, sustainable use and development. The Rural Development Plan 2007-2013 is the core instrument for the implementation of the national strategy concerning agricultural and rural development. The main strategic priorities of the RDP are:

- The restructuring and the improvement of the competitiveness of agricultural holdings;
- The maintenance and improvement of the environment;
- The diversification of rural economy and the improvement of the quality of life in rural areas.

The programme is divided into 4 priority axes and 22 measures with different actions. The measures were prepared by the departments of the Ministry of Agriculture, Natural Resources and Environment and other services in compliance with community legislation taking into account the contribution of nongovernmental stakeholders. The Rural Development Programme was approved by the European Commission by a Commission Decision on November 2007. The public expenditure of the programme is € 325 million from which the 50 % is covered by the European Agricultural Fund for Rural Development and the other 50 % by national funds. The RDP 2007 - 2013 is the successor of RDP 2007-2013.

The Department of Forests has been implemented National Forestry Plans for the conservation and sustainable management of forests ecosystems. The new National Forestry Plan is been drawn up based on the following five action areas:

- Action to protect and enhance water supplies, wildlife and the national heritage in State forests.
- Afforestation and restoration of degraded land in the wider countryside.
- Safeguarding national parks and nature resources, in particular places which have outstanding scenery, cultural importance, exceptional ecological or scientific interest, and developing them for recreation and tourism where this does not conflict with conservation aims. These sites will be declared both inside and outside the state forests.
- Encouraging, guiding and controlling recreation and tourism development through local plans, zoning and development permits, in conformity with town and country planning regulations:
- Providing information and publicity about the forests, and their flora and fauna directed particularly at schools, colleges, tourists and the general public, using up-to-date information technology.

The National Strategy to combat Desertification was completed in 2008. The strategy indicates in detail with the aid of maps, the areas which are sensitive to desertification. Although, it is beyond the scope of the strategy, the appropriate PGRFA for specific areas with different soil types and varying water availability remain to be examined, depending on the degree of sensitivity to desertification. Various agricultural crops are increasingly found intolerant to local micro-climates and soil conditions, taking into account climatic change observed in recent decades. Furthermore, certain other species of agricultural crops are intensely water-dependent, producing less and should be replaced by other crops which are more water tolerant and result to less pressure on poor soils. Undoubtedly, more research is needed to determine the

appropriate PGRFA for specific areas/soil types/micro-climatic conditions on the island.

The preparation of a National Biological Diversity Strategy is a priority and is scheduled for the near future as it constitutes a commitment towards the efficient implementation of the Convention on Biological Diversity.

The Agricultural Research Institute undertakes research within the wider domain of plant and animal production. Its mission is to provide high quality scientific research with the objective of achieving a secure supply of safe, good quality food produced by methods financially, environmentally and socially sustainable. Since its establishment, ARI has been running a breeding programme aiming the development of varieties adapted to local conditions.

Research programmes have been evaluating genetic material for numerous crops and establishing virus free pre basic plantations. A national programme, initiated in 1992, has as main objective the systematic survey of all citrus for infection with tristeza virus and the removal of all infected trees.

The Department of Agriculture has been implementing a number of certification schemes quarantining the supply of farmers with seed and propagating material of high quality.

5.2 Education and training

Scientists have been participating to training courses, committees, working groups, meeting and conferences concerning PGRFA. The funds are made available through national and EU budgets and through budgets of regional programmes and networks. Seminars are also conducted for training and informing stakeholders regarding activities related to PGRFA.

One of the main set priorities is the training of farmers in issues related to the conservation and sustainable use of PGRFA. The RDP provides funds for educating farmers. A technical school has been established offering courses for students that they want to become farmers contributing to their better education about agriculture.

5.3 National legislation

There was a tremendous change of national legislation over the last five years due to the harmonization with community legislation. In addition, there is community legislation that it is directly applied to all member states (EC Regulations). The new legal framework is giving emphasis to the supply of farmers with inputs of high quality, the prevention of the dissemination of pest and diseases, the supply of market with safe products of good quality, the reconstruction of the agricultural market, the protection of the environment, the development of rural areas and other.

Examples of national legislation targeting the conservation and sustainable use of PGRFA are the following:

- The Law on the protection of Nature and Wildlife came into force in 2003 and it is harmonized with EC Directives 92/43/EEC and 79/409/EEC (Law No. 153 (I) /2003). The primary aim of the Law is to protect local biodiversity through protection and management of flora, fauna and habitats. As a result, a vast array of species and habitats which are of community importance are included in its appendices. There are no specific guidelines set out to protect and manage plant genetic resources for food and agriculture, as this Law was not designed for such a purpose. However, PGRFA is often an integral part of agricultural biodiversity and, in such cases, certain provisions trigger broad application of Law.

- The Forest Law is the main legal instrument for the protection and sustainable management all forests. However, the protective status of private owned forests is considerably lower than state owned forests. The Forest Law contains provisions for protection of isolated wild trees of considerable importance.

- The seed legislation set provisions for the production and marketing of seed of the major cereal, fodder, vegetable, oil and fiber crops and the listing procedures to the National and to the Common Catalogue. The legislation was drafted in accordance with the EC Directives for seeds. A newly drafted legislation would provide derogations by setting less strictness requirements for the marketing of landraces and old varieties.

- The legislation for the production and marketing of asexual plant propagating material is also harmonized with the EU aquis. The legislation is dealing with the registration of varieties, the monitoring and certification of fruit trees, vines, seed potatoes, ornamentals, forest plants and vegetables other than seeds.

- National Plant Variety Protection legislation has been implemented since 2003. The legislation has been drafted according to UPOV Convention, however Cyprus is still not a UPOV country. The legislation would be translated soon and it is planted to be submitted to UPOV. Community breeders' right can be applied according to EC Regulation 2100/94. A number of varieties marketed in domestic market are protected with Community Breeders' Right.

- The phytosanitary legislation regarding the protective measures against the introduction into the community of organisms harmful to plants or plant products and against their spread within the community is also into force. The legislation is harmonized with community legislation. Surveys and inspections of plants and planting material are been conducting to fields and at the official points of entry.

- There is national legislation in force for GMOs harmonized with EC Directive 2001/18/EC. The EC Regulations 1829/2003, 1830/2003 are also applied. According to this legal framework, only approved genetically modified plants or products can be deliberately released to the environment for cultivation or as food and feed. The approval of GMOs has been done in a Community bases system where the European Food Safety Association has a curial role. A monitoring system for the detection of adventitious presence in conventional seed lots is implemented at national level. The percentage allowed is set to 0 %. All products containing GMOs, either for food, feed or cultivation must bear label stating the presence of GMOs. There is also national legislation into force concerning development and research on GMOs. The legislation is harmonized with EC Directive 90/219/EEC on the contained use of genetically modified micro-organisms.

- Legislation has been developed for the recognition of producers groups / organizations for fruit and vegetables, for implementation of the Common Market Organizations for fruit and vegetables, for organic farming and for implementation of quality standards on agricultural products.

- The national Town Planning and Housing Law is containing provisions that restrict the inclusion of areas rich to PGRFA to the town planning zones.

Legislative procedures regarding PGRFA have been a continuous process through the constitutional bodies of the EU. Emphasis should be given to the effective implementation of the legislation. Regional collaboration would be very fruitful to achieve this goal.

5.4 Information systems

New technologies regarding information systems have been introduced the last ten years. Geographical Information Systems (GIS) and Global Point Systems (GPS) have been using to wide range of activities including agriculture. The CAPO has been using to large extent these technologies. The Department of Forestry has established a specific sector for land surveys including GIS systems. The sector provides significant information for vegetation studies and inventories.

Implementation of computerized documentation systems was rather limited. It should be expected that documentation and information systems would be included in future studies. The usage of GIS systems in recording diversity should be explanted. The establishment of national databases concerning biodiversity and its distribution is also a priority. The acquirement of appropriate software for genebank and herbarium management should be scheduled.

5.5 Public awareness

Public awareness is considered of outmost importance for the conservation and sustainable use of PGRFA. A recent analysis from the European Center of Native Conservation based on Eurobarometer survey has showed that 84% of the responses from Cyprus had never heard the term "biodiversity" and 71% had never heard about the Natura 2000 network. However, 42% of the respondents felt that they were either "well informed" or "very well informed" about diversity loss and 61% felt that they made personal efforts to protect biodiversity. The study reveals that there is a good basis for increased public participation for halting the loss of biodiversity however initiatives must be taken to reinforce this trend. The initiatives should include specific actions concern PGRFA.

A number of initiatives have been taken over the last years aiming to educate the public and the enhancement of its sensitivity. School programmes include activities aiming to educate students about biodiversity and the protection of the environment. The establishment of nature trails, botanical gardens and environmental information centers by the Department of Forest combines recreation and education purposes. The development of agro-tourism is another key strategy for enhancing public awareness. An ongoing research aims to provide environmental education to educators and to evaluate the impact of this approach.

The departments of the Ministry of Agriculture, Natural Resources and Environment have prepared numerous leaflets, radio and TV programmes targeting public awareness. Local communities have been also active in this field by organizing campaigns and performances about biodiversity. A business award scheme was piloted recently by the Environmental Service, taking into consideration amongst other themes, biodiversity.

CHAPTER 6

THE STATE OF REGIONAL AND INTERNATIONAL COLLABORATION

6.1 International networks and programmes

Cyprus has been participating to numerous networks programmes and projects. It has also established bilateral, regional and international collaboration on many areas related to PGRFA (Table 6). Most of these activities were very beneficial and contributed enormously to the conservation, development and sustainable use of PGRFA through access to funds, scientific expertise, enhancement of capacity building, better communication and dissemination of knowledge, diversification of tasks etc.

The collaboration with Bioversity International and the CGIAR centers has been continued. The collaboration with International Research Centers, (CIMMYT and ICARDA) has been very beneficial through exchange of genetic material. Most of the varieties developed by the domestic breeding programme contain germplasm received from CIMMYT and ICARDA. Around 825 accessions of genetic material originated from Cyprus are kept to International centers' genebanks, most of them by ICARDA. These genetic materials have been collected before 1996.

TABLE 6
Examples of bilateral, regional and international collaboration

Regional network	**Theme**
CWANANET	Central, West Asia and North Africa PGR Network - Neglected Mediterranean PGR of landscape, cultural and artistic value network
NUC	Neglected and Underutilized Species network
MEDUSA	Identification, conservation and use of wild plants of Mediterranean region network
ENSCONET	European Native Seed Conservation Network
ECONET	Ecological network for the promotion of convergent conservation strategies in coastal habitats of Community importance
Regional programmes	**Theme**
ECPGR	European Cooperative Programme for Plant Genetic Resources
International collaboration	**Theme**
CGRFA	Member of FAO Commission on GRFA
HORTIVAR	Horticultural Cultivars Performance Database
WIEWS	World Information and Early Warning System on PGRFA
OECD Certification Schemes	Participation to vegetables and legume certification schemes
GCDS	Collaboration with Global Crop Diversity Trust

Regional collaboration	Theme
EPGRIS	European Plant Genetic Resources Information Infrastructure Project
LIFE	EU financial instrument supporting environmental and nature conservation projects
RUBIA	Circum-Mediterranean ethnobotanical and ethnographic heritage in traditional technologies, tools, and uses of wild neglected cultivated plants for food, medicine, textiles, dyeing and handicrafts
FARVALDI	Collection, characterization, evaluation and *in situ*/*ex situ* conservation of PGRFA
GRAPE Gen 06	Collection, characterization and evaluation of vines genetic material
INNOVA	Establishing common models of integrated sustainable monitoring, planning and management of high environmental value areas to control natural resources degradation
BIOAGRO	Developing e-service system which will provide a single point of access for information on all aspects of organic agriculture
Bilateral collaboration	**Theme**
ENDIMANTHI	Moratorium of Understanding between Cyprus and Syria in the field of Agriculture including PGRFA. Joint project between Cyprus and Greece for evaluation of species from the Cyprus flora for use in commercial floriculture

The accession to European Union has boosted regional collaboration and the participation to networks and projects. The National Strategic Development Plan also encourages the promotion of International Networking and Cooperation. The insufficiency of staff is the main constrain for the full exploitation of the opportunities given by the participation to networks and projects. Despite of the substantial progress made over the last ten years, there are still a lot to be done and the establishment of regional and international collaborations is one way to move ahead. The effectiveness of networks, programmes and projects should be of major concern to ensure the optimum allocation of funds and human resources.

6.2 International agreements

Cyprus has signed and ratified the major international agreements related to PGRFA. Cyprus is been party of the Convention of Biological Diversity (CBD), the International Treaty of Plant Genetic Resources for Food and Agriculture (ITPGRFA), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on the Conservation of European Wild Life and Natural Habitats, the Ramsar Convention on Wetlands and the Convention to Combat Desertification (UNCCD). The Cartagena protocol is also ratified.

The ratification of International Conventions and Treaties has been very beneficial by motivating national actions or by removing barriers in genetic material movement. The ratification of the ITPGRFA and the adoption of the Standard Material Agreement have facilitated the movement of genetic material for educational, breeding and research purposes. The finalization of the national strategy to combat desertification has been motivated by the ratification of the UNCCD.

Some steps taken over the last years in order to achieve efficient implementation of the provisions set out by the Convention on Biological Diversity which constitutes a priority for the Cyprus government include:

- Setting up the "Natura 2000" network of protected areas with management plans to implement its provisions;
- Drafting biannual reports regarding the implementation of the Convention;
- Protecting and managing flora, fauna and habitats under the existence legal framework;
- Educating the public regarding biodiversity;
- Promoting international cooperation in biodiversity related issues (China, Egypt, Italy, Israel);
- Planning the preparation of a National Biological Diversity Strategy.

CITES, which Cyprus ratified in 1974, aims to ensure that no species including PGRFA, remain subject to unsustainable exploitation because of international trade. Strict customs controls and good cooperation between the Customs Authority, the Environment Service and the ARI prevents imports and exports of PGR (amongst a variety of other species), listed in the CITES Appendices. Such specimens should be confiscated and sent back to the country of origin at the importer's expense.

CHAPTER 7

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

The enormous contribution of farmers in the conservation and development of PGR is well known. The need to establish mechanism to share the benefits arising from their use and to grant farmers' right is well recognized by international agreements. Plant breeding is challenged by the expansion of world population, climate change and changes in agricultural systems. These challenges impose the facilitation of access to genetic material. The development of national and international legislation concerning plant variety protection and plant health has set additional obstacles and to same cases impair germplasm movement.

Cyprus has ratified the International Treaty for Plant Genetic Resources for Food and Agriculture and has set its genetic resources listed to Annex I of the Treaty under the multilateral system. National legislation regarding access to PGRFA, sharing the benefits arising from their use and farmers' right has not been developed. National and Community legislation concerning Plant Variety Protection are in compliance with UPOV Convention and access to protected germplasm is not restricted.

The development of the Standard Material Transfer Agreement and the decision of International Centers to set their genetic material under the multilateral system of the ITPGRFA have significantly contributed to the facilitation of access to PGRFA. The ratification and the implementation of the ITPGRFA from more countries, the usage of SMTA to species other than those listed to the ITPGRFA and the inclusion of as much as possible private owned germplasm collections to the multilateral system could enhance access to PGRFA.

Although existing seed legislation allows only the marketing of certified seed, it does not prevent farmers to use seed from their own production for sowing. In the same sense, Community legislation on plant variety protection does provide provisions for implementation of farmers' right. This is not the case for national legislation on plant variety protection since no provision on farmers' right has been provided. Several varieties marketed in domestic market are protected by Community rights. National variety rights have not been granted since today.

CHAPTER 8

THE CONTRIBUTION OF PGRFA MANAGEMENT TO FOOD SECURITY AND SUSTAINABLE DEVELOPMENT

The humanity has been facing the challenge to ensure food security. The climate changes and the continuous genetic erosion make this challenge even more difficult. The appropriate management of PGRFA in conjunction with their sustainable development is well recognized as key components of national, regional and international strategies aiming to ensure food security, economic development and poverty alleviation.

Cyprus is a developed country. The total of the population has easy access to a wide range of agricultural products of high quality and high safety standards. Cyprus is self sufficient to numerous agricultural crops and is a net exporter of citrus and vegetable commodities. On the other hand, it is a net importer of agricultural products including stable food and feed commodities e.g. wheat, barley, rice and maze. Taking into account the considerably high degree of modernization of agricultural systems and their expansion even to marginal areas, there is a little niche for increasing the domestic production of stable food and feed. The national strategy, as it was reformed after the accession to the EU, envisages maintaining agricultural production through a sustainable and environmental friendly approach giving emphasis to food safety and quality.

The halt of genetic erosion as it is provoked by the sustainable development of agricultural systems and rural areas by the national programmes is of outmost importance taking into account the substantial genetic diversity of PGRFA. The importance of native crop wild relatives and landraces can been stated by their usage in numerous breeding and evaluation programmes worldwide and the continuous interested for collecting missions. 6 696 of wheat accessions originated from Cyprus are considered of global importance as stated to the Global Crop Conservation Strategies developed by the GCDT. A newly marketed variety of *Trifolium spumosum* developed in Australia originates from Cyprus.

The contribution of Cyprus to food security, sustainable development and poverty alleviation would be through the efficient management and sustainable development of native PGRFA and the facilitation of access to this genetic material by the establishment of an effective international benefit and sharing mechanism.

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