ITALY:

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

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Note by FAO

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CHAPTER 1
Introduction to Italy and its Agricultural Sector

An important feature of the Italian national territory is the predominance of hilly and mountainous areas. Over a total area of about 30 million hectares, plains account for only 23%; this figure falls to 18% in the South and to 9% in the Centre. In recent years, demographic growth has been maintained, almost completely by foreign immigration whilst the natural growth rate of the Italian population continues to be very low, if not actually zero (tab. 1).

There are considerable differences in climatic conditions over the peninsula, from the continental climate of the North to the milder sub-continental conditions of the coastal areas and the typically Mediterranean climate of the South and Islands (Tab 2).

Table 1: Territory and population

Districts	Total area km2	Agricultural area %	Population 000 units	Density no./km2	Work force 000 units
North	119,880	43.4	25,433	212	11,059
Centre	58,369	46.4	10,973	188	4,492
South	123,054	58.0	20,748	169	7,236
ITALY	**301,303**	**49.9**	**57,154**	**190**	**22,787**

Table 2: Territory by altimetric zone (000 ha)

Zone	North	Centre	South	Italy
Mountains	5,530	1,578	3,503	10,611
Hills	2,272	3,724	6,548	12,544
Plains	4,185	535	2,255	6,975
TOTAL	**11,987**	**5,837**	**12,306**	**30,130**

The process of urbanization is progressively absorbing land in Italy. Unproductive areas, mainly residential and for infrastructure, are increasing and are estimated at about 2.8 million hectares or 9% of total national territory.

The agricultural area, on the other hand, is continuously decreasing from 1970 to 1991 utilised agriculture area (UAA) diminished by more than 2,400,000 hectares (-14%) according to Census figures (tab. 3).

Table 3: Land use in Italy (%)

Utilization	Italy
Arable land[1]	29.5
Permanent crops[2]	11.0
Vegetable gardens	0.3
Permanent meadows and pastures	16.2
Woodland	21.4
Inland waterways	2.4
Unproductive areas and other land[3]	19.2
TOTAL AREA (000 ha)	**30.131**

1 Including temporary forage crops and set aside
2 Tree and other permanent crops
3 Civic and industrial settlements, infrastructure, rocks and barren land: abandoned and uncultivated land, ornamental parks and gardens, farm land under buildings and road are included on the headings
Source: EEC - The agricultural situation in the Community, 1992

Employment: The percentage of agricultural labour to total population is continuously changing: in 1970 for every agricultural work unit there were 14 inhabitants, which had become 19 in 1980 and 29 in 1993.

Production: The value of the Italian agricultural reduction, according to the main sectors is shown in tab. 4.

Table 4: Value of Italian agricultural by main sectors (billion lire)

Total	Billion lire 59,255	% 100.0
Cereal, forage and dried pulses[1]	6,567	11.1
Horticultural[2]	9,350	15.8
Industrial crops[3]	1,887	3.2
Flowers and ornamental plants	3,667	6.2
Grapes	5,379	9.1
Olives	2,765	4.7
Fruit including citrus	6,028	10.1
Meat	15,314	25.8
Milk	6,766	11.4
Eggs and other	1,532	2.6

1 Forage crops were 156 billion lire, dried pulses, 313 billion lire

2 including potatoes

3 sugar beet, tobacco, oilseeds, textile fibres and other industrial products.

1.1 FOREIGN TRADE

Overall agro-food production is lower than consumption and therefore the sectorial balance of trade is constantly in deficit (tab. 5).

Table 5: Foreign trade by main category of agro-food products (billion lire)

Product	Imports	Exports	Balance
Crops	8.119	4.804	-3.315
Cereals	2.276	235	-2.041
Wheat	1.795	111	-1.684
Maize	213	65	-148
Vegetable. fresh	736	1.019	283
Fruit	1.396	2.657	1.261
Citrus	101	126	25
Coffee. tropical beverages	887	18	-869
Oilseeds	714	6	-708
Uncured tobacco	182	267	85
Cotton	697	10	-687
Other crops	1.231	592	-639
Forest products	1.171	107	-1.064
Food industry	5.212	7.839	+2.627
Flour and pasta	53	1.592	1.539
Rice	21	532	511
Sugar	196	216	20
Confectionery	540	829	289
Processed tomatoes	62	1.035	973
Other process vegetables	636	1.088	452
Olive oil	1.066	603	-463
Other oils and fats	475	201	-274
Wine and wermouth	199	2.319	2.120
Other beverages	781	621	-160
Other processed agricultural products	12.046	2.967	-9.079
Other	6.786	339	-6.447
TOTAL	**34.314**	**18.996**	**15.318**

1 Fresh and preserved

1.2 FARMS AND FARM AREA

The 1990 Census revealed that there were 3,023,344 agricultural forestry and livestock farms in Italy (tab. 6) with a total land area of 22.7% million hectares (of which 66.3% was utilised agricultural area).

Table 6: Number of farms and total area by class of UAA (1990 Census)

	no. farms	%	total area(ha)	%
Without agric. land	5,691	0.2	-	-
Less than 1 ha	991,562	32.8	481,722	2.1
1-2	590,942	19.5	814,640	3.7
2-3	335-995	11.1	798,958	3.5
3-5	373,850	12.4	1,411,821	6.2
5-10	354,401	11.7	2,436,234	10.8
10-20	201,321	6.7	2,747,371	12.1
20-30	65,242	2.2	1,561,974	6.9
30-50	49,743	1.6	1,870,238	8.2
50-100	32,722	1.1	2,217,720	9.7
over 100	21,875	0.7	8,361,878	36.8
TOTAL	**3,023,344**	**100.0**	**22,702,556**	**100.0**

CHAPTER 2
Indigenous Plant Genetic Resources

Despite genetic drift processes, the indigenous PGR, in Italy are, generally speaking, very important with great variability from a group to another.

The considered groups of plants, in this report, are the following cereals, woody crops, crops for processing vegetable, flower aromatic and medicinal, forage plants, forest trees. Due to their peculiarity of forest genetic resources the situation is illustrated in Annex 1.

2.1 CEREALS

In Italy wheats include different species of *Triticum*.

Triticum durum Desf. Domesticated in South-West Asia. More cultivated in Southern than in the Northern part of Italy since the Romans.

Triticum turgidum L. is a taxonomic variant of *T. durum*.

Triticum aestivum L. Domesticated in. South-West Asia. More cultivated in the Northern than in the Southern part of Italy since the 4th - 3rd century B.C.

Triticum dicoccon Schrank. Domesticated in South-West Asia. Known in Italy from 4000-3000 B.C. but more frequently cultivated in the 4th - 3rd century B.C.

Triticum spelta L. Originated in the South-Western corner of the Caspian belt. Cultivated in Italy since classical times.

Triticum monococcum L. Domesticated in South-West Asia. Introduced from Middle East and cultivated in Italy since the 4th - 3rd millennium B.C.

Wild wheats

In Italy, the germplasm of cultivated wheats, with few exceptions, has been adequately collected and stored,, while until late 1980s little exploration and collection was done for wild wheats. IBPGR sought to encourage national programs to collect the germplasm of wild wheats throughout the peninsula. Then intensive collecting work was started by the CNR Germplasm Institute of Bari in 1989. Until now more than 300 samples of 21 species belonging to five different genera have been collected from different regions of South Italy. Samples were collected from very diversified micro-environments. In particular collected samples belong to more than 6 species of *Aegilops*, more than 6 species of *Agropyron*, more than 4 species of *Hordeum*, one species of *Dasypyrum* and *Secale*.

Few samples have been classified as hybrids within and between genera. Each species has shown high polymorphism for different morphological and biochemical traits. A study on *Aegilops geniculata* for 10 traits has shown significant differences for all traits between regions of origin and accessions within regions. The most variable characters were weight of seeds and spikes, while the lowest variability was observed for heading time.

Cultivated oats (*Avena sativa* L.)

There are only 15 Italian registered varieties; the introduction of foreign varieties together with a decrease of cultivation has caused a very high genetic erosion. In remote areas of Southern Italy some old varieties are still cultivated. In Sicily and Calabria Regions old varieties, mainly *Avena byzantina* and *A. sativa* mixed with *A. strigosa* have been collected.

Wild oats (*Avena* L.)

None of the three wild species of oat, *Avena barbata* Potper, *A. fatua* L. and *A. sterilis* L., found in Italy is in danger of extinction, since they grow widespread in several regions and often as weeds of the cultivated species: *A. sativa*. It seems that *A. sativa* derived from the above wild species and especially from *A. fatua* and *A. sterilis*. This means that, in Italy, between cultivated and wild species there may still be a gene flow and a sort of co-evolution.

Cultivated Rye (*Secale cereale* L., segale)

There are only 3 Italian varieties registered. Old varieties of rye have been found in remote areas of Southern Italy. In particular, in Sicily there are still rare cases of *Secale montanum*, one of the progenitors of *Secale cereale*. The great reduction of cultivation and the introduction of foreign varieties suggest the loss of a great diversity.

Wild Rye (*Secale*- L.)

Secale strictum (Presl) Strobl (=S. *montanum* Guss.) is the only wild species found in Southern Italy, where introgression with S. cereals does occur and increases the genetic variation of landraces. Since it is not very common the species should be included among, the list of protected species.

Wild millet (*Panicum* L.)

Four wild species of millet, *Panicum repens* L., *P. conoressum* Biv., *P. capillare* L. and *P. dichotomiflorum* Miohx., occur in Italy. All of them are rare and grow only in none or few areas. Although none of them is considered to be relative of the cultivated species there is a needs of investigation on species relationships.

2.2 WOODY CROPS

The wild species and relatives of woody crops are relatively few (tab. 7); most of the fruit species, in fact, have been introduced from abroad during the Roman empire.

Table 7: Wild species of wood fruits crops.

Botanical name	Common name	Farmers' varieties
Vitis sylvestris	vine	
Oleaeuropeaoleaster	wild olive	
Prunus avium	sweet cherry	
Prunus cerasus	sour cherry	
Prunus spinosa	black thorn	
Malus sylvestris	wild apple	
Pyrus pyraster	wild pear	
Arbutus unedo L.	strawberry tree	
var. *typica*		
var. *angustifolia*		
Myrtus communes L.	common myrtle	
Pistacia lentiscus L.	mastic tree	
Pistacia vera L.	pistachio nut	Napoletana, Nuciddara Minnulara, Tignusa, Ghiandalora
Pistaciaterebinthus L.		
Juniperus oxicedrus oxycedrus	prickly junifer	
" " *macrocarpa*		
Juniperus oxicedrus transtagana		
Crataegus azarolus L.	azarole	Bianca, Rossa, Gialla
Sorbus domestics L.	service tree	Sorbo autunnale, Sorba mela ottobrina, Sorba pera maggiore settembrina
Cornus mas L.	cornel - tree	
var. *macrocarpa* Dipp.		
var. *albocarpa* Schn.		
var. *aurea* Schelle		
var. *aureo elegantissima* Schelle		
var. *argenteomarginata* Hort.		
var. *nana* Simon Louis		

Botanical name	Common name	Farmers' varieties
Corylus avellana L.	hazelnut	Tonda Gentile delle Langhe,Tonda Romana, Macchiona,Tonda di Giffoni, Martorella
Corylus sylvestris D.C.	wild hazelnut	
Castanea sativa Miller	chestnut	
Ficus carica saliva Fiori	fig	Aldo, Datto, Dottato, Dell'Abate, Brianzola, S.Piero, Cuore, Verdeccio
Ficus carica caprificus Risso	fig	
Punicagranatum	pomeamate	
Ceratoniasiliqua	carrob tree	Latininima, Racemosa, Saccarata
Sambucus nigra	elderberry	
Ribes idaeus L.	European red raspberry	
var. *vulgatus*		
Rubus fruticosus L.	blackberry	
Vaccinium myrtillus	lowbush blueberry	
Vaccinium Macrocarpus L.	cranberry	
Berberis vulgaris L.		

In Italy the olive is present with about 600 varieties and/or synonyms, nearly the totality of the cultivated varieties are traditional varieties, with particular characters, only a few cultivars are widely grown; the rest, of minor economic importance, are generally present in limited areas. The imminent introduction of the D.O.C. brand on olive oil will lead to a reduction of the existing genetic variability, in relation to the different production disciplinaries that foresee qualitative parameters met only by a few of the most common cultivars.

Vitis vinifera cultivars and crosses of American species (V. *riparia, V. rupestris, V. berlandieri*, ecc.) are still grown on some farms.

The Government has funded a programme for the exploitation of valuable traditional vine cultivars, in some regions these cultivars represent a substantial share of the marketable gross production.

Furthermore landraces and old cultivars are known of *Prunus insititia* and *Prunus cerasifera*. May be important as sources of hardiness and/or fruit quality. They are no more cultivated because surpassed by modern cultivars. Most have been lost. Some are still propagated by nurseries for home gardening.

2.3 CROPS FOR PROCESSING

Amongst the natural vegetation, *Beta vulgaris ssp. maritima* is largely diffuse in coastal areas. Compared with sugar beet, sea beet generally has smaller (length and width), longer, thicker leaves with lower percent of dry matter. The petioles are also smaller (length and width) than sugar beet. A significant variation in leaf characteristics exists between sites (locations) and among plants within sites. Older populations are dynamic, exhibiting crossing within group of plants. A distance of 25-50 km provides sufficient isolation to induce a shift in gene frequencies and favours the formation of distinct ecotypes.

This wild beet, primarily found along the coasts of Italy, evidenced resistance to cercospora leaf-spot and environmental stress; this germplasm was therefore incorporated into breeding populations by designated schemes of crossing and improved cultivars of sugar beet were developed in Italy. Old races of beans, "borlotto" and "cannellino" types, occur in Italy. This material provides a good source of seed of merceological qualities (shape, size, digestibility, flavour, cooking) and adaptability to Italian growing conditions. Beside to other legumes, the bean belongs to old cookery traditions of Mediterranean countries and its diffusion is promoted. In fact, the priorities in agriculturally and technologically well-developed countries have changed in recent years because of the problem caused by overproduction of some crops (i.e. cereal); this has drawn attention to the possibilities for increased cultivation of alternative crops, particularly locally-adapted pulses. For tomatoes and peas, old races are also available; they possess genetic resistance to many diseases and represent the base for new programmes of genetic improvement developed in Italy by which new cultivar have been released.

For hemp, old and successful germplasm was developed in Italy. Particularly, in the forties two prestigious varieties (Carmagnola e Fibranova) were bred; they combine a high fiber yield with a low content of delta-9-tetrahydrocannabinol (THC), the main psychoactive ingredient of hemp.

2.4 VEGETABLE

Characteristics and availability

Despite genetic drift processes, set off in recent decades by the gradual replacement of local forms with new certified cultivars even in home gardens and suburban farms (due to new distribution networks for propagation material, such as purchase in supermarkets and specialized nurseries of plantlets grown in pots), Italy can still be considered an important territory for gathering genetic material of vegetable plants. This material can be grouped as follow:

a. botanical varieties or species that are ancestors or related to vegetable crops presently cultivated, mainly species belonging to *Allium, Beta, Brassica, Cichorium, Lactuca, Cynara, Foeniculum, Sinapis, Erucar*; in this group we can include some "intermediate" forms, between cultivated species and related spontaneous ones (e.g. forms of *Cynara* and *Brassica*);

b. wild species picked and utilized as vegetables; they are very high in number; according to recent surveys there are about 400 and the relative product is occasionally marketed as for item; so in southern Italy the market often provides heads of *Cynara cardunculus*, tufts and tender shoots of wild fennel, of beet, of chicory, of mustard, of rochet, bulbs of muscari;

c. wild species used for flavouring or dressing such as origano, thyme, salvia, rosemary, capers, mint, sometimes exploited in food industry;

d. local cultivars, not always listed in the official register, utilised in particular systems; the survival or genetic identity of these cultivars is increasingly threatened by the introduction of recently bred varieties; local Italian cultivars registered in the past as cultivars of common interest, run the same risk; only some of these (e.g. San Marzano tomato, Agostana onion), following application of decision 89/7/EEC and 89/138/EEC are controlled for their genetic identity also by non-European companies and often registered in other EC countries (e.g. Holland and Great Britain);

e. cultivars belonging to the numerous minor species not considered by the EC Official Register, some of which have almost disappeared or survive on extremely limited areas (e.g. *Borago*);

The commercial interest in the products obtained from the above-mentioned resources on the part of professional vegetable growers - cases d) and e) - or just users/pickers, though marginal, has nonetheless reduced the risk of genetic erosion processes. Moreover, interest in local varieties and wild plants has increased as the market shows increasing importance to products considered of

good nutritive, organoletic and dietetic value. However the risk is considerable not only for cultivated form, but also for wild and semi-wild ones, as their survival is more and more limited by different use of the territory where wild flora survives.

2.5 ORNAMENTAL, AROMATIC, MEDICINAL

This topic will be dealt in relation to the following groups: cut flowers and foliage; potted flowering and ornamental plants; landscape outdoor plants (herbaceous, shrubs, and trees).

a. Cut flower and foliage plants: the genetic resources, constituted by old cultivars and more or less related wild species are held, at least for more important crops, by private companies involved in breeding and multiplying new cultivars creation and multiplication; some collections for study, even if incomplete, are held by some research institutes (e.g. Istituto Sperimentale per la Floricoltura of Sanremo). Most old cultivars escape collection, study and utilisation in any case, as they are used for hobby by non-professional collectors.

b. The related wild species that could be adopted for increasing genetic variability are numerous; a list would be extremely long; the largest collections may be found in botanical gardens, in private gardens and occasionally in parks and reserves. The latter, now present all over the country and hence in the different climatic environments, within their boundaries often comprise areas where certain species are protected "*in situ*". Important examples, as concerns material widely available among flora in various Italian regions, are the genera *Gladiolus, Dianthus, Anemone, Rosa, Antirrhinum, Limoniufiz, Calendula* and numerous other ones. The activity of collection and cataloguing, if not altogether absent, is episodic and partial.

c. Flowering pot plants: resources belonging to this group consist of few species but of high interest. Also in this case collections are episodic but Italy can offer significant resources as regards *Cyclamen, Viola, Erica, Rhododendron* and some flowering shrubs (*Nerium oleander, Genista spp.*, etc.).

d. Ornamental potted plants: the genetic resources are rather scarce with the exception of the numerous succulent plants among wild flora of dry environments and of *Chamaerops humilis*; the latter is a dwarf palm growing in some Mediterranean regions; morphological differences are evident in nature, probably related to genetic ones.

e. Landscape plants: the genetic resources are considerable as regards herbaceous, and shrubs and trees; some of these plants are more and more utilised for covering degraded areas. Within this group of plants particular attention deserve some ground cover plants (*Arabidopsis spp., Lobularia spp., Chrysanthemum segetum, Hedysarum spp., Glaucium flavum*, etc.); lawn plants (*Festuca spp., Lolium spp.*) or grass plants (*Oryzopsis spp., Andropogon spp., Ammophila littoralis, Ampelodesmos mauritanicus*), and Mediterranean shrubs (e.g. *Thymus spp., Rosmarinus offlcinalis, Teucrium fructicans, Genista spp., Cistus spp., Ericaarborea, Tamarix spp., Rhamnus alaternus, Euphorbia dendroides*, etc.) For their wide genetic variability, also species naturalised in our country (e.g. ornamental citrus, roses, camellia) often present in collections in botanical gardens or parks of historical interest must be taken into consideration; these collections should be preserved from decay and conserved, apart from undergoing a detailed census.

Other spontaneous species of great interest are some aromatic:

species
Arnica montana
Meuthapiperita
Chamomillarecutita
Achillea herbarosa
Artemisia genipy
Artemisia mutellina
Gentianalutea
Salvia officinalis
Origanum vulgare
Mandragora officinarum
Ephedra distachya

2.6 FORAGE PLANTS

Genetic resources of forage species of relevant agronomic interest are still widespread in the wild. The Ladino type of *Trifolium repens* and the *Lolium multiflorum* var. *italicum*, which is of remarkable longevity compared to other *L. multiflorum* types, originated in the irrigated natural meadows of Northern Italy lowlands where also *Lolium perenne* and *Trifolium pratense* are present. Wide diversification is expected to occur for *Phleum pratense* and *Arrhenatherum elatius* especially in the Alpine zone. Other species of interest in the sub-alpine area are *Festuca pratensis, F. rubra* and *Dactylisglomerata* among

grasses, and *T. repens, T. pratense, Lotus corniculatus* and *Trifolium hybridum* among legumes.

The Mediterranean area contains wide diversification in annual species, which dominate, in summer dormant and winter active perennial species. Of special interest are *Lolium rigidum* among annual and *Festuca arundinacea*, *D. glomerata* and *Phalais spp*. among perennial grasses. The widest diversity probably occurs for medics and subterranean clovers among annual, and *Hedisarum coronarium* among perennial legumes. Wild populations of *Trifolium vesciculosum, T. nigrescens, T. michelianum* and *Ornithopus spp*., little exploited for breeding new varieties, are also present. As regards subterranean clovers, the genetic diversity found in Sardinia can be considered unique relative to other Mediterranean regions.

Wide diversification can still be found for *Onobrychis viciaefolia* along all the Apennine and Sub-Apennine region from Central to Southern Italy. In central Italy are also widespread populations of both perennial grasses (*D. glomerata, F. arundinacea* and *L. perenne*) and legumes (*T. Pratense, T. Repens, H. Coronarium* and *Lotus spp.*)

The species at greatest risk of genetic erosion are those typical of the irrigated natural meadows of Northern Italy since such meadows are progressively being replaced by more intensive cropping systems. Land abandonment and reduced agricultural pressure on pasture land can also imply noticeable risk of genetic erosion in a range of native species. The introduction of foreign material, both as improved varieties in areas of intensive agriculture, and as seed of uncertified commercial category of diverse origin for some species, has certainly contributed to genetic erosion of indigenous materials.

Landraces

Landraces have been of importance only for forage legumes, which traditionally had a major role in Italian farming systems. The species utilised have been *Medicago sativa* in the whole country, *T. repens* of Ladino type in the continental climate plains of Northern Italy, *T. pratense* in both lowland and mountain areas of Northern Italy, *0. viciaefolia* in inland regions of Central and Southern Italy, and *Hedysarum coronarium, Vicia sativa, V. villosa* and *V. faba ssp.* minor mainly in the Mediterranean climate areas. As for *M. sativa* and *T. pratense*, the landraces have been included in the National Register of Varieties with a specific legislation regulating their multiplication in the relevant areas of origin under the control of the Ministry of Agriculture.

Because of the evolution of agricultural systems (intensification) and of related socio-economic changes (land abandonment), a great genetic erosion has already taken place. As an example, of 41 farms of Lombardy self-reproducing, "Ladino" landraces surveyed 20 years ago only one is still continuing that activity. The last available "Ladino" landraces in Northern Italy were collected a few years ago and sent to the Germplasm Institute in Bari for long-term conservation. The utilization of landraces is nowadays substantially restricted to *M. sativa* and *H. coronarium*. The commercialisation of farm landraces is discouraged or even forbidden by the current legislation aimed at increasing the adoption of certified seed of improved varieties. In the near future this policy will also apply to regional ecotypes. For *M. sativa* the multiplication and commercialisation of the 14 ecotypes, which cover about 75% of the species trade seed, will be forbidden within 7 years because of the recognized failure of the current seed multiplication policy to safeguard their "varietal" identity. A similar situation will occur for the 4 registered regional ecotypes of *T. pretense*.

CHAPTER 3
National Conservation Activity

A large activity for PGR conservation even if not well coordinated, is carried on in Italy.

The only public institution specifically devoted to PGR conservation and evaluation is the Germplasm Institute of Bari belonging to National Research Council (CNR) and working on cereals and grain legumes.

CNR, 15 years ago, promoted an action to coordinate and stimulate an activity of characterisation and collection of the main tree fruit species (citrus, olive, drape apple, pear, almond, apricot, peach, cherry, plum). At the moment the working, group is coordinated by the Ministry of Agriculture together with the CNR.

In Italy there is no specific policy which deals with the in-situ conservation of echo-types, local varieties of woody fruit species.

Nevertheless in l992 with the emanation of the EU rule no. 2078, which disciplines extensive methods of agricultural production, organic farming, and conservation of hedgerows and scattered orchards, which allows an economical contribution per hectare for the cultivation and propagation of useful plants adapted to local conditions and threatened by genetic erosion, some regional Governments have included local woody crop varieties in their list of useful plants (e.g. Umbria region has included some local olive varieties).

More in detail the situation for the main groups of crop plants is the following:

in situ conservation is a relatively new field for Italian Botanic Gardens, traditionally devoted to ***ex situ*** conservation. In March, 1995, a proposal has been submitted to EC, entitled "Actions for conservation of plant species of European interest, endangered or vulnerable, and their reintroduction *in situ*". Based on the "Botanic Gardens Conservation Strategy", a document published in 1989 by the UK-based Botanic Gardens Conservation International, the proposal outlines actions for reintroduction in their natural habitats of 75 rare or endangered wild species of the Italian territory. Furthermore, the Gardens co-operate to the management of protected areas and national parks - whose

phytogenetic resources need a careful and coordinated evaluation - as part of the institutional activities of the Italian Botanical Society.

3.1 CEREALS

In 1970, in Italy, the National Research Council (CNR) founded, in Bari, the Germplasm Institute with the main aims of collecting and preserving plant genetic resources of interest for Italian and Mediterranean agriculture.

Thanks to numerous exploration missions, carried out in different regions of Italy, Mediterranean countries, Ethiopia and South Africa, still relatively rich in genetic variability, the Germplasm Institute has collected and stores 11,802 accessions of seed samples.

They represent several cereal and grain legume crops and wild relatives typical of the visited regions. If besides these samples, directly collected by the staff of the Institute in collaboration with other institutions and international organizations, one considers also those obtained through exchange activities with other genebanks and similar institutes of the world the number of accessions stored at the Germplasm Institute grows up to 55,806. These genetic stocks represent more than 40 genera and more than 584 species.

The information collected during exploration and characterization, as well as the one deriving from evaluation, is filed in special data bases of the Institute. The documentation service is a source of information on the stored material.

It allows to check the amount of genetic erosion occurring in different areas, to decide about the opportunity of organizing further missions for collecting germplasm, to know the amount of material available for distribution, its germinability, and the need for rejuvenation. It is a source of information necessary for taking further decisions.

In Italy, there are at least 16 institutions that maintain seed germplasm collections (see annex 4 and 5). It is possible to count 55 genera, 137 species of crops and wild relatives, and 70,049 accessions. If one excludes the world collection of *Triticum*, stored at the Germplasm Institute, the rest of the collections, in most cases., are small or relatively small. In particular 14,243 accessions, stored by 15 institutions others than the Germplasm Institute, are maintained. for breeding purpose and not always available for distribution.

The effective total number of accessions stored as seed collections in Italy can be worked out by adding 14,243 shared by 15 institutions, to 55,806, stored at the Germplasm Institute. The result would be 70,049 accessions. Naturally here is not considered the number of samples of germplasm used and maintained by the several seed companies.

3.2 WOODY CROPS

In situ conservation

Most of the minor fruit species of Mediterranean origin (*Arbutus unedo, Cornus mas, Juniperus oxycedrus, Myrtus communis, Pistacia lentiscus, Pistacia terebinthus, Crataeous azarolus, Sorbus domestics, Punica aranatum,* etc.) introduced from other areas but adapted to the Mediterranean conditions and part of the wild PGR since millennia, are mainly maintained *in situ* in the National Parks (see annex 2) covering, the different areas of the country.

Conservation, *in situ* is also common for many old varieties of the main fruit crops (apple, pear, peach, cherry, apricot, plum,..) by private farms. In this case the risk of genetic erosion is much higher than in the previous are due to the farm crop organization changing.

Recently non governative organizations, are more and more interested in *in situ* conservation and an effort is done in this direction.

Ex situ conservation activities

Woody crops germplasm is nearly exclusively maintained in live field collections, varieties are grafted on common rootstocks and every accession is replicated at least three times, only a few accessions are stored in-vitro. The field collections are distributed all over the national territory and depend from the Ministry of Agriculture, the Ministry of Scientific Research, the National Research Council Regional Governments and NGO.

The institutions holding woody fruit germplasm field collections, the species, the total number of accession, the number of the Italian accession and the number of Italian accessions considered at risk of genetic erosion are listed in annex 6 and 7.

Every accession present at the collections is characterised using descriptors list (IPGPI, UPOV, etc.); the number of characters analysed vary according to the species.

When the observation have been concluded, for every accession are available data relative to the biometric characteristic (characterisation) and to the bioagronomic behaviour (evaluation).

Within the EU regulation 1467/94 several institutions, which are actively engaged n fruit tree germplasm, have joined in two project proposals on the "Conservation, characterisation, collection and utilisation of genetic resources in agriculture" of the species belonging to the *genus Prunus* while the second is focused on the species of the *genus Malus*. Both proposals will lead to the introduction of a common European database networked together.

Evaluation and characterisation

The description has been carried out referring to the IPGRI or UPOV descriptors which, on the base of previous experiences, have sometimes been modified.

Farmers are involved in commercial cultivar evaluation and sometimes are available in verifying the agronomic behaviour of some of the material present in the collections.

A complete evaluation, including data on susceptibility to the main diseases and pests, on the physiology on the analysis of isozymes pattern and genetic fingerprinting has been carried out only for a limited number of accessions.

Most of the data gathered on characterisation and evaluation on woody crops germplasm is published on variety monographs, books and articles on specialised magazines.

Evaluation data improve germplasm collection and conservation strategies to the extent to which the information that derives from it contains specific knowledge on agronomic characters (productivity-product) and on disease resistance.

Storage facilities

A limited number of accession of fruit species (apple, pear, peach, kiwi, apricot, almond, cherry, plum, vine grape, olive, citrus) is stored *in vitro* by

several research Institutes (ISF of Roma, Universities of Milano, Bologna, Perugia, Viterbo, Ancona, Palermo, Potenza, CNR of Perugia) and several private "*in vitro*" propagation laboratories.

3.3 CROPS FOR PROCESSING USES

In situ conservation

No specific funds exist for plant genetic resources including on-farm conservation of landraces/traditional varieties and wild relative in protected areas. Usually, the maintenance is provided by the breeders who use this germplasm for breeding, aims and it is carried out with grants reserved for research programmes.

Ex situ conservation

There is a plant genetic resources collection located in Bari. This genebank covers only a few species of those belonging to the industrial crops. An *in vitro* collection of potato is held -in Bologna, at Istituto Sperimentale per le Colture Industriali. It includes 250 accessions represented by old cultivars, local populations and farmers varieties. The main users of these resources are plant breeders working in national institutions.

Other national collections also are equipped for some species (sugar beet, potato and hemp) and not adequate for some others (tomato and peas); for this latter, resources are imported from outside, particularly from ICARDA (legume germplasm), CIP (potato germplasm).

Storage facilities

The collections are stored under in vivo and *in vitro* conditions. The use of tissue culture storage for genetic conservation includes different stages:

1. excision of tissue from the parent plant;

2. introduction of the excised tissue into culture;

3. storage by an appropriate method;

4. recovery of a healthy culture from the storage phase; and

5. regeneration of a whole plant.

The application of this approach is assured by technical expertise available in many laboratories. Apical meristem, bud tissue, calli, and cell suspension of some plants (e.g. potato) can be safely stored at a temperature of -196°C. This procedure is economical for long-duration preservation of germplasm.
The *in vivo* conservation is achieved by seeds which are stored in appropriate conditions (low temperature and moisture).

Documentation

The collections maintained at Istituto Sperimentale per le Colture Industriali are well documented. A complete computerized data base which includes also the agronomic evaluation of each material is available.

Evaluation and characterization

The description of collections is provided by the Centres and Institutes which hold the germplasm.

3.4 VEGETABLE CROPS

Initiatives for conservation of Italian vegetable germplasm, though underway, do not apply to a common logic in terms of species involved, operative methodology and territorial boundaries. Despite this, in recent years interest in this direction has been growing, on the part of numerous public institutions. Hereafter some of the initiatives under way will be reported; the list and information is obviously incomplete.
Regarding *in situ* conservation preparatory studies are being, undertaken by the Region of Tuscany in collaboration with the Universities of Florence and Lucca. The University of Basilicata (Potenza) is developing a similar initiative on aromatic and dressing plants, whereas in Sicily the University of Palermo is defining a project for conservation of wild and cultivated *brassicaceae.*

Regarding *Ex situ* conservation activity, at least for some species, is more developed. The Istituto del Germoplasma di Bari has been active in studying leguminous plants grown also as vegetable crops. Various Institutes dedicate activity more specifically to vegetable crops, consisting in gathering and assessing local germplasm, often for reasons other than conservation.

At an institutional level a recent organized initiative, to the best of our knowledge, is represented by the founding of the "Centro Interuniversitario di Ricerca sulla Utilizzazione e sulla Conservazione del Germoplasma Mediterraneo Vegetale" promoted by the University of Basilicata in Potenza, and supported by other academic Institutes in southern Italy. Other initiatives have been undertaken by Italian seed companies and, for some species (e.g. *Beta spp.*) by international bodies and institutes (IPGRI, FAO, EU).

The material is not usually regenerated according to timed and pre-established schedules and is rarely exchanged between institutes.

Collections presently conserved represent only a part of genetic diversity of each considered species. Seed gathering and conservation is normally a result of the commitment of individual researchers or of person in charge of an Institute. The aim is often the broadening of the genetic variability exploitable in new varieties creation projects.

The material exchange with foreign Institutions is rather an improvised event; as far as we know no reference is made to FAO codes or specific cooperation protocols.

Apart from the Istituto del Germoplasma, that possesses a base collection, other Institutes keep active collection of seeds, at a temperature of 5°C, normally not duplicated. Conservation methods often adopted comply with IPGRI guidelines and containers of varying type are used. The importance of collections is often not documented; data concerning features assessed according to IPGRI descriptors is only available for a limited number of accessions.

Evaluation activities, when performed, has above all considered aspects regarding agronomy, general biology and resistance to specific phytopathies; assessment of biochemical and physiological features is rare.

3.5 ORNAMENTAL, AROMATIC AND MEDICINAL PLANTS

The conservation activities of genetic resources belonging to flower and ornamental species is negligible and does not correspond to the importance they have in our country. The most important collections for certain species, are those kept by private with the aim of creating, new varieties. Not kept for this purposes are some ancient varietal collections, in botanical gardens, historic houses, public and private gardens or in research Institutes. Anyway the collections now available are so modest in relation to the exploitable genetic variability of flower and ornamental crops as to consider the activity of gathering, cataloguing and conserving germplasm of these crops a job as yet to be performed.

As concerns *in situ* conservation, protected areas and historic green areas, in that order, could be of great importance, at least in some cases (e.g. landscape plants or old cultivars). The same interest could be attributed to *ex situ* collections belonging to research Institutes, if suitably enhanced, and in particular to the Istituto Sperimentate per la Floricoltura of Sanremo. Private contribution to this activity is difficult to assess.

The utilisation of indigenous genetic resources has been sporadic and certainly not coordinated. It must be remembered that there are few Institutions involved in the floriculture (a few University Institutes, the Istituto Sperimentale per la Floricoltura of Mi.R.A.A.F., the Scuola of Minoprio). This did not allow an adequate exploitation of the germplasm available. The public sector, due to a shortage in financial and human resources, is so the worst equipped to deal with the biological innovation requirements of floriculture. Various initiatives are in progress to overcome these difficulties. Apart from some programmes activated by public Institutions as above, there is a coordinated proposal to gather and catalogue flower and ornamental germplasm on the part of some Universities. Activities aimed at exploiting outdoor Mediterranean species have recently been supported in EEC projects and are underway at some Universities with private participation. Other initiatives have been started in North Italy to gather and assess ornamental creeper species. Moreover, some botanical gardens to a certain extent contribute to researching and cataloguing of old cultivars of ornamental species (e.g. Camellia).

Botanic Gardens are involved in *Ex situ* conservation through:

a. setup and management of collections of wild origin and diffusion of the relative germplasm through seed exchange. All Botanic Gardens offer the exchange free of charge on a mutual basis, i.e., to other institutions offering

themselves a free exchange. The seed, spores or other propagules available for exchange are listed in the Index Seminum (sometimes also called *Delectus Seminum*), a catalogue published every year or every two years by each garden wishing to participate to the exchange scheme-nearly all of the 1,600 botanic gardens in the world, resulting in a world wide network of seed exchange. Many such catalogues include important information about the seed provenance (wild or cultivated, from controlled or open pollination, etc.). Major changes are expected in the future, as some gardens are shifting to electronic technologies (magnetic diskettes, telecommunication networks) to diffuse their seed catalogue and/or the related information, according to an internationally agreed file transfer format referred to as ITF (International Transfer Format for Botanic Garden Plant Records);

b. setup and management of long-term seed storage facilities. In recent months, a trend is appearing to setup such facilities: one has been planned in the Botanic Garden of Pisa and the necessary funds are now available: it will guard the germplasm of rare plants of the Tuscan territory and wild species of phytogenetic interest (aromatic, medicinal). It is highly desiderable that the efforts made by Botanic Gardens interact with the PGR management programs of relevant institutions (Ministry for Agriculture, University, National Research Council), possibly within a national network.

Documentation

Botanic Gardens collections are generally well documented and indexed, in most cases on card indexes and increasingly on computerized systems. Special attention is paid to provenance information for wild material.

The Working Group for Botanic Gardens and Historic Gardens is presently encouraging its members to revise and integrate the existing documentation on the basis of the recommendations provided by the ITF, in order to increase the capacity to exchange plant records data through electronic transfer.

In the light of the scientific management and the rather specialized capabilities of the garden staff, the accuracy of identification of collection specimens is generally excellent or satisfactory.

3.6 FORAGE PLANTS

No *in situ* conservation programme has been established for pasture/forage species. With the exception of a minor collection held at the Germplasm Institute in Bari, almost all existing collections were made by breeders to support specific selection programmes and were meant just for short-term conservation. Only recently the Plant breeding Institute of the University of Perugia set up facilities for long-term conservation. Their collection presently comprises over 3,000 accessions of natural populations and landraces of indigenous forage species mostly originating from Central Italy.

Because of the absence of a national institution specifically committed to long-term conservation of forage genetic resources and of related national policies, a great deal of germplasm accessions collected in the last decades went substantially lost. In. particular circumstances, as in the case of the collections of subterranean clovers (1,600 lines) and annual medics from Sardinia and Sicily carried out by the. Fodder Crops Research Institute of Lodi, the presence of collaborating foreign institutions involved in long-term conservation of given species allowed duplication and safeguard of collected materials.

Because of the presence of a number of relatively small breeders' collections, the relevant documentation lacks uniformity as regards description of both germplasm and sites of origin. Systems of fast retrieval of information are not common. The collections are generally evaluated at single locations and for agronomically important characters related to specific selection objectives, but are rarely characterized according to internationally accepted descriptors. Even for the collections which underwent long-term conservation (Perugia), regeneration is not presently contemplated because of the lack of financial support for activities which are not institutionally committed. No multiplication is foreseen for existing collection housed under short-medium term storage conditions such as the case of a collection of over 600 accessions of Mediterranean origin held at the National Research Council Centre for Mediterranean Pastures in Sassari.

With specific regard to forage species, the collection and conservation activity of the Germplasm Institute in Bari is neglected relative to that on other species to which this institutions is more specifically devoted and that takes up most of the available resources. In this situation, it becomes important:

1. to support national breeding institutions for maintaining adequately their own collections, which can serve as valuable working collections for germplasm users;

2. to establish stronger links with international and/or regional foreign institutions responsible for long-term conservation.

It seems appropriate for forage species in Italy to separate the responsibilities of long-term germplasm conservation and documentation of passport and evaluation data, specifically committed to gene banks, from those of local collection and evaluation, to be carried out by research institutions involved in breeding, activities according to well defined national and regional coals. Through satisfying breeders' requirements, germplasm evaluation should follow general guidelines for agronomic traits to make data from different evaluation sites comparable. In this prospects, the characterization work suggested by IPGRI guidelines seems excessive and should be reduced to a minimum number of key traits. The availability of detailed information on crucial passport data can compensate for the reduction of characterization data in order to avoid duplication of materials at the gene bank level.

CHAPTER 4
In Country Uses of Plant Genetic Resources

4.1 USE OF PGR COLLECTIONS

Samples of fruit tree (vegetative material, pollen, seed etc.) are used by national institutions, by public and private breeders, by foreign breeders operating in national programmes for research purposes. The balance between imported and exported material varies mainly according to the number of the authoctonous accessions of the species and on the socio-economic importance of the species, measures of agricultural policies (e.g. production diversification, quality improvement, sustainable agriculture), national and international research programmes, size of the collections. The imports concern mainly the introduction of both new genotypes obtained abroad and wild relative of cultivated fruit trees, as genetic reservoirs of resistance to biotic and abiotic stresses, from their country of origin. The exports regard newly bred varieties (the most widespread Italian fruit variety is the table grape "Italia" obtained at the ISF of Rome) and old Italian cultivars carrying particular characters i.e. resistance to pests and disease (e.g., the pear cv. *Spina Carpi* resistant to *Psylla pyri*), resistance to adverse pedoclimatic conditions (e.g. Sicilian olive cvs resistant to water stresses).

There has been a noticeable exploitation of forage indigenous genetic resources by foreign breeding institutions which often carried out extensive collection activities in the country. This was the case for perennial grasses utilized by British institutions and for annual self-reseeding legumes and associated symbionts by Australian institutions.

The genetic resources held at public Research Institutes are supplied to breeders engaged in programmes focused on improving crops.

Collections also have been used in national and regional projects. The utilization of national resources of sugar beet, potato, tomato, beans has been particularly fruitful since a few characters have been added for developing competitive varieties adapted to local needs.

The collections held in Botanic Gardens are mainly used as a display of live plants for students and general public, and as research material in the fields of genetics, biosystematics, taxonomy, cytotaxonomy, embryology, phytochemistry, plant physiology, etc.

Although basic research is greatly favoured, in some cases the living collections - particularly plants of agroindustrial interest - support applied research, according to the scientific policy of the associated Institute/Department.

4.2 CROP IMPROVEMENT PROGRAMME AND SEED DISTRIBUTION

The main uses of germplasm collections are the development of plant breeding, programmes focused at improving local varieties by introducing specific characteristic (pest resistance drought tolerance, agronomic traits) to adapt them to local needs. The ultimate objectives of these programmes are the improvement of plant ideotype (more suitable for mechanical harvesting) and of product quality.

In potato, *Solanum phureja* (germplasm with cold-chipping, ability) has been crossed with our adapted accession and germplasm to develop improved cultivars for their ability to accumulate less reducing sugars in cold storage and to produce chips with pale colour.

In legume crops and in peas, an abundant national germplasm was crossed with sources of disease and pest resistances (powdery mildew, mosaic and fusarium wilt) and numerous resistant cultivars and advanced breeding lines have been created.

In common bean (*Phaseolus vulgaris* L.), breeding has involved the improvement of resistance to bean common mosaic virus and tolerance to halo blight, the most severe diseases affecting, this crop in Italy.

In tomato, improved cultivars have been developed suitable to local needs.

The utilization has mainly concerned local cultivars within projects of regional interest, with a view to improving them by reducing their variability. These cultivars and other genetic material have rarely been employed in genetic improvement programmes of broader ranging, resulting in creating, a variety *ex novo*. Local types have constituted initial material to develop improvement programmes on resistance to specific phytopathies only for certain species.

Many seed companies undertake selection of these types; the lacking, of a continuous genetic control sometimes undermines the genetic identity of some cultivars; a study for a re-appraisal of the features of each local cultivar seems sometimes necessary.

As concerns wild species, at best, material gathered has been subjected to a preliminary characterization and selection. The largest, more complete and better studied collections are those established abroad, as a result of some missions promoted by international organizations (FAO, IPGRI, EU) that regarded specific species (e.g. *Beta spp., Brassica spp*. etc.).

In-country use of forage genetic resources has almost exclusively relied on indigenous germplasm which, as already mentioned has been in most cases purposely collected by the utilizers rather than being supplied by gene banks. In this context, the main functions of national improvement programmes have been:

1. to improve local varieties for yield potential in given agronomic and pedo-climatic environments;
2. to develop new varieties from wild materials, particularly in species where national commercial varieties do not exist and foreign varieties are not adapted to the growing environments.

Plant breeding activities are almost entirely conducted by Governmental institutions and they can be considered almost sufficient per se to meet national needs and goals, although indigenous germplasm of various important species (e.g. *T. repens, 0. viciaefolia* and *H. coronarium*) have been little exploited for breeding. For several species plant breeding, activity is, however, often jeopardized by inadequacy of seed multiplication and distribution systems, so that little seed of nationally improved varieties become available to farmers in spite of their superior adaptiveness.

National seed companies prefer to buy foreign varieties at cheaper cost and sell them in Italy rather than proceed on seed multiplication of national varieties.

PGR collection of fruit trees are used both for breeding programmes (public and private) and for nursery activity.

This second aspect of the PGR material is becoming more and more important due to the improvement of the fruit industry based on old cultivars carrying peculiar traits like characteristic flavour, pest tolerance, environmental adaptability and of the home garden fruit growing looking, at the “old” varieties carrier of “old time flavour”.

Generally speaking the plant breeding activities are conducted primarily by Government funded programmes, and are usually concluded with development and release of varieties available to all farmers. These breeding products could be most valuable if seed production and distribution could be better.

4.3 BENEFITS DERIVED FROM THE USE OF PLANT GENETIC RESOURCES

The germplasm is the basic material on which most of the breeding programs depend. Several primitive varieties and wild species endowed with the superior genes are being eroded and it is feared that such valuable material is lost and these types may become extinct in due course. Therefore, there is an urgent need for the conservation of genetic, material.

Indigenous germplasm needs greater care since it is a very unique and exclusive genetic material available in the world.

4.4 IMPROVING PGR UTILIZATION

The improving of PGR utilization should be base on:

- a multidisciplinary study approach (genetic, agronomic, biochemical, biomolecular, physiological, phenological, ..) to better know the traits of the great number of accessions present in the country;
- informatisation of all the data for on easy and fast exchange of the available information;
- a better coordination, both within the country and among countries, with the aim of harmonizing the protocols of the activity related to the PGR and of improving the cooperation.

CHAPTER 5
National Goals, Polices, Programmes and Legislation

Plant genetic resources activities are not organized into a national programme and are carried on by various institutions not well coordinated among themselves.

Even though considering binding, maintaining field collections it is intention of the single institutions to ensure the conservation of the genetic diversity. It would be desiderable, considering the high number of institutions involved, the costs of management and the difficulties in co-ordination, the creation of national collections of single species or a limited group of species entrusted to a single institution, while the duplicate collections (including only the authoctonous material considered at risk of erosion) could be managed by different institutions situated in different geographical areas.

At the moment there is a renewed interest of the Government in the rationalisation of all conservation activities in order to guarantee a safer and more economic conservation of such valuable material.

5.1 SEED MARKETING LEGISLATION

Seed production, certification and marketing are covered by national laws in Italy[1] harmonized with the European Union legislation concerning such a matter[2].

The European Union rules cover the following species: cereals, fodder and sugar beet, fodder species, fibre and oil seed species, vegetables seed and tubers of seed potatoes. Such European Union directives are based on the "consideranda" that the results of crops production mainly depends from high performant seed.

In particular the European Union aims to guarantee farmers that the seed they buy meet common genetic, technological and phytosanitary standards.

To this aim, agricultural species are treated in a different manner as horticultural species.

The marketing of seed of agricultural species is limited to officially certified seed; the varieties concerned are registered on an official list after ascertainment of their homogeneity, stability and uniformity.

Side of the compulsory certification of seed and listing of varieties, the European Union provide for rules concerning packaging, official sealing, and labels.

Member States are also prescribed to check seed marketed.

As far as vegetable seed is concerned the European Union rules provide for a different option to the official certification of seed for the so called "standard seed"; the most part of seed traded enter this category.

[1] Law 25/11/1971 n. 1096
DPR 8/10/1973 n. 1065

[2] Directive 56/400/EEC on 14/6/1966
Directive 66/402/EEC on 14/6/1966
Directive 69/208/EEC on 30/6/1969
Directive 70/458/EEC on 29/9/1970
Law 20/4/1976 n. 195
and following amendments
Directive 66/401/EEC on 14/6/1966
Directive 56/403/EEC on 14/6/1966
Directive 59/457/EEC on 29/9/1970

At random checks for varietal and technological characteristic are prescribed on marketed seed. A directive is also devoted to the rules governing listing of varieties providing for:

- national and common list of varieties;
- provision to be met to enter the list;
- official check on varieties maintenance;
- duration for registration.

All the rules governing seed certification concern the public rights and people in charge of the check on seed are public officers.

In the European Union framework official tasks are provided for listing of varieties, check on maintenance, seed certification, seed post control, Fraud Service.

As far as seed certification is concerned, the official body carries out seed crops inspection, laboratory tests on seed samples, official release of tags to be put on packages and seed post control. As outlined by the rules summarized above, the farmers buy officially checked varieties. Local varieties, as far as they do exist for the species covered by the European Union directive, are not allowed to be marketed; also farm saved seed cannot be marketed.

As far as concern some species of local interest not covered by the European Union legislation they can freely be marketed.

5.2 PLANT BREEDERS' RIGHTS

Italy enforced the 1961 Act of Pads about Plants breeders' rights.
The convection gives the option to protect breeders right through patent system or by special protection.
Italy entered the patent system in order to work by the National Patent Office in the Ministry of Industry; all the technical trials are under the responsibility of the Ministry of Agricultural Resources.
All the matter is in the framework of private rights.
Paris Convection has been enforced by law 16 July 1974, n. 722.
Afterwards, new rules have been introduced by DPR 12 August n. 974 and last amended by law 14 October 1985 n. 620 enforcing 1987 Geneva Act (Diplomatic Conference). By Ministry Decree 22 October 1976, as last

amended by Ministry Decree 26 February 1986, rules are determined to apply for protection of new varieties and to check varietal characteristics.
Ministry Decree 16 March 1987 n. 92,21 April 1990 n. 281 and 31 July 1993 n. 545, list the species to be protected.

Finally Decree 18 April 1994 establishes proceedings to release plants breeders' right.

5.3 COMMUNITY BREEDERS' RIGHTS

By Common Regulation 2,100/94/CE, on 27 July 1994, the Council of the European Union adopted Community rules to grant plants breeders' rights.

Before that, plants breeders' rights were granted only in respect of the national territory. Through Community breeders' rights Regulation a single application can grant the protection all over the European Union.

However an option to limit the protection at national level is still possible.
Community Regulation takes into account UPOV Recommendations, as last amended by the 1991 Diplomatic Conference.

A Community Variety Office, having, legal personality, has been established by the Regulation. Rules concerning application, granting, effects of the rights are provided for.

It is important to outline that propagating material of the variety, released for circulation, used, exported or imported into the Community and stored for one of this purposes is prohibited without consent of the owner of the rights.

The Community breeders right do not affect the so called farmers exemption, meaning the possibility to use for sowing seed obtained by the farmer using a protected variety.

Nevertheless such an act oblige users, other that small farmers, to pay royalties to the owner.

Community Regulation provides for the right to not effect non-commercial purposes acts or experimental or breeding purposes acts.

The term of a Community breeders' right last, in principle, twenty-five years after granting for species other than vine and tree species. For such species the

right expires after thirty years; for all botanical species the Community right can be granted.
The applicant can apply to the Variety Office; the application is subject to formal and substantive examination; propagation material of the variety is also subject to technical examination to verify identify, homogeneity and stability of the variety.

As far as the infringements to the Community Regulation is concerned they are assimilated to infringements to national rights and persecuted by law.

The Community Regulation entered into force since 27 April 1995. The rights given by Paris Convention to the breeders to take benefit of royalties is the first incentive to widen their research activity.

Genetic resources are the main primary material for breeders; it is so of great interest for them to collect and listing such a material.

Breeders' Right do not affect Research Programme, considering the use of protected variety is possible, under royalties systems, to breed new varieties, also through essential derivation.

5.4 SUBSIDIES TO THE PRODUCTION AND MARKETING OF CERTIFIED SEED

In the framework of the Common market organization, the European Union provides for Regulation governing, subsidies to the production of certified seed of some species in order to grant benefit from such an activity.
As far as Italy is concerned, rice and fodder species, are involved.
The Community Regulations provide for:

- subsidies granted to farmers multiplying seed;
- subsidies granted for seed officially certified as "basic seed" and "certified seed";
- seed being produced on the national territory under contract registered by the Ministry of Agricultural Resources.

As far as durum wheat is concerned, use of certified seed is compulsory to apply for subsidies for the production of such a species in traditional areas of Central and South of Italy.

This new provision determined an increase of 30% of the tonnage of durum wheat certified seed produced in only one year.

Quarantine laws do not substantially affect import/export of germplasm. Indigenous plant genetic resources are not protected by any laws limiting, their exploitation outside the Country.

The Government does not generally provide incentives to farmers that cannot legally commercialize their own landraces. Conversely, there are EC incentives for production of certified seed of improved varieties.

CHAPTER 6
International Collaboration

Some important collaborations between Italian institutions and CGIAR or regional research centres occasionally took place mainly for collecting activities. Some international collecting missions were funded by IPGRI according to previously defined priorities.

Thanks to the coordinating action of the Working Group for Botanic Garden and Historic Garden, Italian Botanic Gardens are in close contact with BGCI. BGCI Botanic Gardens Conservation International - is an NGO, based in Kew, England, aiming, to promote and co-ordinate wild plants conservation programs carried out by Botanic Gardens of the world. About 400 Gardens from 91 countries are associated to this active organization. Among, its activities, BGCI has published in 1989 a document entitled "Botanic Gardens Conservation Strategy", which outlines how the Botanic Gardens of the world can play a part in the implementation of the World Conservation Strategy.

As a joint publication with IABG - International Association of Botanic Gardens, a scientific association based in the Botanic Garden of Cordoba, Spain - BGCI is preparing, a document to highlight the role of Botanic Gardens in the activation of Agenda 21, in the light of recommendations provided by, UNCED.

Within the European context, the Group is part of the European Botanic Gardens Consortium, established in May, 1994 with the cooperation of the national Botanic Gardens networks from 10 countries of the EU. The Consortium promotes a wide range of activities of Botanic Gardens, ranging from conservation to tourism within EU bodies, and coordinates the proposal of projects by members to EU funding agencies.

Furthermore, individual researchers of the associated Institutes/Departments are personally involved in research projects in close links with all the major international botanical institutions. The University of Naples and the Istituto Agronomico d'Oltremare of Firenze, in collaboration with the Austral

University of Vaidavia (Chile), have made three expeditions ('92, '93, '94) in South Chile to collect *Solanum tuberosum* germplasm.

Together with ICARDA, CIAT and CIP some Italian Institute have an ongoing, collaboration to evaluate wheat, barley and chick pea, *Vignaunguiculata*, beans and potatoes.

The Italian Government has also contributed to the funding, of conservation facilities and germplasm laboratories (IITA, CIAT, ICARDA, Swaminathan Research foundation at Madras (India).

The University of Naples and the Swaminathan Research Foundation at Madras (India) are collaborating on a taxonomic study of mangroves using, molecular markers.

In 1980 a European Cooperative Programme for conservation and exchange of crops genetic resources (ECP/GR) of IBPGR was started. Taking into account the priority established by IBPGR in 1981 the scientific committee of ECP/GR considered most of the fruit species cultivated in Europe at the highest priority for conservation.

Italy is also member of a EU working group on units (walnut, almond, pistachio, filbert) with the aim of setting up 4 germplasm collections of these species common to the EU countries.

The EU walnut collection is located in Italy at the Istituto Sperimentale per la Frutticoltura in Caserta.

A Mediterranean network on Citrus has been recently promoted by FAO and the chairmanship has been given to Italy.

Italy has ratified the convention on Biological Diversity requesting to develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt to this purpose existing strategies, plans and programmes.

CHAPTER 7
National Needs and Opportunities

The line of action for the conservation and sustainable use of PGR is framed in the more general National Plan on Biodiversity putting into effect the Convention on Biodiversity.

The strategic actions of the Plan, already defined by the government, provide for intervention on the following items:

1. Knowledge of the Italian biologic diversity:
   - systematisation of the available knowledge
   - completion of the knowledge.
2. Monitoring of the state of biodiversity characterising an indicator system.
3. Training and education introduction of the biodiversity subject (knowledge, importance, conservation..) as interdisciplinary school courses. Training of specialised technicians on the conservation and sustainable use of biodiversity in Italy and abroad. Awareness of the various social components on the importance of biodiversity with the aim to modify consumptions and behaviours.
4. *In situ* conservation (protected areas, non protected territory, environment recovery).
5. Promotion of sustainable activities. Development of compatible activities in protected and non protected areas.
6. Containing risk factors.
7. *Ex situ* conservation, establishing an integrated network of germplasm conservation centres.
8. Biotechnology and safety.
9. International cooperation and echodiplomacy. Cooperation with developing countries for the conservation and sustainable use of biodiversity.

The objectives concerning PGR can be successfully achieved considering the main need for Italy, a coordination activity of all the very numerous public initiatives, belonging, to different national, regional and local institution and also non governative organisations (NGOS) when supported by public money.

Other needs are: identifying, for each, mentioned group of crops, the responsible institutions taking care of the conservation of the national PGR, avoiding useful and expensive duplication as it occurs today.

Identifying the really useful PGR in order to avoid the conservation of thousands of accessions carrying the same genetic information.

A better knowledge of the enormous number of the accession actually conserved *in situ* and *ex situ*, through progeny tests and through the gene mapping technique, is necessary to achieve this goal.

The network of the Research Institutes of the Ministry of Agriculture, covering the whole national territory and owning important experimental farms and well equipped laboratories, seems to be the logical center for most of the national PGR integrated with Universities and CNR institutes.

CHAPTER 8
Proposal for a Global Plan of Action

The discussion and international collaboration on technical, legal and political aspects, linked to plant genetic resources, conservation and exploitation of PGR using biotechnology techniques should be fully developed.

It seems urgent the definition of an international system of regulations through a rapid revision process of the International Undertaking, in order to achieve harmonisation with the Convention on Biodiversity and to allow, on a multilateral basis, free access to germplasm collections and the implementation of farmers' rights.

This revision process must lead to a legal binding instrument to be adopted as protocol of the Biodiversity Convention.

Regional activities already in the framework of ECP/GR should be coordinated with EU funded projects, this approach will assure complementarity between ECP/GR ongoing, activities and EU supported PGR programs.

Regarding the technical aspects, it is necessary to guarantee long term conservation of PGR, encouraging the International effort in assuring, development and coordination of National Agricultural Research Systems both in developed and in developing countries, enhancing, both the training, and exchange of specialised researches and the technical and infrastructure support. In this process it seems essential to associate the activity of research institutes of developed countries to the activity of the international research centres of the CGIAR. IPGRI should ensure the scientific coordination of those activities on PGR currently undertaken within the FAO framework. The activities should be financed within the existing budget.

The role of NGO, already involved in *in situ* conservation of PGR (ecotypes, local varieties, etc.), can be essential and determinant to strengthen the conservation and to fully exploit regional and local genetic resources.

An efficient and updated information system must allow an easy and complete access to the available data on PGR. In fact data availability is a limiting, fact for an effective free and total access to PGR.
Such a system, that can be shaped as a PGR world database, could be operative in a reasonable lapse of time using, where available, existing databases. This information should also be made available through an on-line global communication system.

ANNEX 1
Forest Genetic Resources in Italy

In Italy the total surface covered by forest trees is of ca. 87,000 sq. km, which represents the 29% of the total surface of the peninsula. Unfortunately until 1985 only 7% of the total forestry surface under bonds, that is ca. 6,000 sq. km, was submitted to naturalistic bond, like parks, reserves, oasis, etc. (tab. 8).

Today, as far as the national parks are concerned, the situation is slightly improved. In fact, at present, there are 18 national parks for a total surface of 9,430 sq. km (annex 2). In these areas, several species find an adequate preservation. However experts suggest that, if the objective is protection and conservation of existing species, in these *f*areas human activities should be continued, exerting the same influence as in the past.

The limits of this kind of conservation are represented by the high costs, unavailability of large surfaces, and the impossibility to carry it out in all the parts of the world.

The latitudinal extension of Italy, from 37° to 47° N, and its multifaced topography strongly influence the ecological conditions of different regions, which are submitted to climates varying, from high mountaineous to subtropical. This ecological variability is further complicated by the orography: besides the Alps, all along, the Apennines mountains often depass 2,000 m elevation reaching sometimes 3,000 m.

The wide range of bedrocks supports a large variety of soils of different depth and fertility.

Under these conditions the present forest flora is quite rich. Broadleaved tree species (*Fagus, Quercus, Castama* etc.) largely dominate and build up more than 80% of the forest ecosystems, while several coniferous species are present from the Alps (*Picea, Abies, Larix*) to the Mediterranean shores (*Pinus, Cupressus,* etc.).

Human actions have destroyed throughout the centuries almost all the forests of the plains and heavily reduced or altered the forest cover on hills and

mountains, especially in Southern Italy, the main negative factors having been conversion into agricultural land, intensive grazing, and fire.

Beginning with the last decades of the past century, reafforestation and reconstitution of degraded forests have been carried out on extensive areas, with the main aim of soil erosion and flood control: in these actions, coniferous species, mainly pines, have been largely used and besides native tree species several exotics have been tried, some of them (*Pseudotsuga, Cedrus*) with good results.

Industrial wood production projects have been developed and implemented with broadleaved species, mainly with *Populus* hybrids and, on a limited scale, with several *Eucalyptus* species. The silviculture management of the Italian forest is largely based on natural regeneration, which in principle ensures the conservation of the original composition of the forest and of its gene pool. But the coppice regime, applied to quite an important part of the forest area, has often simplified the forest ecosystems in favour of the most plastic tree species.

The present natural distribution of the main forest species is quite well known: vegetation studies, inventories and mapping, have been carried out, although with different intensity and detail, on almost all the forests. A first comprehensive map of Italian forests was drafted in 1935, while in 1985 a permanent forest inventory was established throughout the country and will be regularly updated.

A systematic genetic inventory of the main forest tree species was carried out, starting in 1948, in order to select the best stands for seed collection, according to criteria later officially adopted by EU and OCDE.

Almost 200 seed stands of conifers and broadleaved of different surface, from a few to several hundred hectars have been selected, representing the different ecological regions: a detailed documentation of each stand has been established. These stands, which are submitted to special regulations, ensure the *in situ* conservation of the most important samples of natural stands of the main forest tree species. In a more general and extensive form, national, regional and local parks, of very different extension and under different regulations, ensure the conservation of natural ecosystems, some of them with very strict protection rule: as biosphere reserves (UNESCO/M-AB), biogenetic reserves, integral protected reserves. In the whole, more than 8% of the country area is submitted today to some kind of protection regulation. The first legislation for the protection of the natural resources dates back to 1939; more detailed regulations directly concerning the protection and conservation of forest ("Legge Galasso" n.431) were issued in 1985.

Special attention is given to the conservation of species, provenances or stands in danger of genetic erosion or extinction. This applies i.e. to the 29 trees of *Abies nebrodensis*, a fir endemic of Sicily, which are the only relicts of this species: very strict protection measures and several actions ensure today its conservation.

Ex situ conservation actions are being carried out on several forest tree species or their provenances, comprehensive collections of provenances, individual trees or clones have been established with different aims: seed orchards, clonal parks, plantations of different conifers or broadleaved are under the care and control of several Forest Research Institutes (tab. 9), Forest Faculties, forest service. *Pinus silvestris, P. halepensis, P. laricio*, Mediterranean firs, walnut, wild cherry, alders, chestnut, cypress, poplars are among the forest species especially concerned. A special mention deserve botanical gardens (some of them established since the XVI century) and several arboreta, the main of them in Vallombrosa with 1,500 tree and shrub species: these tree collections are a precious reserve of a wide range of gene pools.

Seed of the main tree species is regularly collected for afforestation purpose by two special seed centers run by the state forest service. Seed is extracted, prepared and kept in large, modern storage facilities. Samples of especially important tree species or provenances are kept for long time (depending upon the species even over ten years) for the conservation of gene pools of particular interest.

Researches and studies on the evaluation of genetic variation and value of a large series of trees species are being carried out since over sixty years, very often in international cooperation (i.e. IUFRO provenance trials on scots pine, larch, Douglas fir etc.).

Provenance trials, individual selection and evaluation, genetic improvement have received since long large attention for the main forest species, with special regard to resistance to different site conditions, resistance to drought or frost, resistance to diseases: the improvement of resistance of chestnut to ink or blight diseases, of cypress to bark canker, of elm to Dutch disease can be quoted. Special mention deserves the improvement of poplars: the leading, action of Italian Research Institutes in this field is worldwide recognized, Italian poplar hybrids being, since many decades largely planted throughout the world.

Advanced technologies are currently implemented in forest tree breeding, improvement and production of planting material: modern genetic markers,

advanced mating designs and methods, micropropagation are applied or are being tried on many species.

Seed collection is mainly carried out by two seed extractories run by the State forest service. Forest planting material is raised for the most part by public owned nurseries with the exception of poplar planting material where presently private nurseries largely dominate the market.
In order to ensure the genetic identity of planting material and to avoid genetic pollution of natural forest stands special national and regional regulations (Law 22.5.1973 n. 269) concern the control of seed and plant production and prescribes that public financial support can be ensured only to afforestation or re-afforestation established with planting material of certified genetic identity (see annex 3). The certification schemes directly refer to the regulations established by EU and OCDE: Italian experts have been especially active for the development and up-dating of such international regulations. An Italian forest genetist is a member of the FAO Panel of experts on forest gene resources since its establishment in 1968.

Italian institutions are very active in international cooperation on forest genetic problems through personal contacts or institutional participation to a wide series of actions, both official and unofficial, with special reference to initiatives of IUFRO, EU, FAO. Special mention deserve activities carried out under the coordination of Italian forest genetists, in the framework of the FAO Committee for Mediterranean forest problems, "Silva mediterranea" which led to a cooperative selection of seed stands and to improvement or breeding of Mediterranean conifers, oaks, eucalyptus, etc.: common provenance trials on several (*P. halepensis, Cedrus,* Mediterranean firs) are currently carried out. Supply of forest reproductive material to foreign research institutions is frequently ensured.

Although activities and cooperation in the field of genetic resources are quite intensive in Italy, the need is felt of a more effective coordination, which is not fully ensured by the present regulations. The planned establishment of a "national plan on bio-diversity" could give a strong contribution toward this aim.

On an international basis, the very effective action of the FAO Panel of experts on forest gene resources should be further reinforced: the highlights and recommendations of the Panel, which acts as the main consultant of ICPGR, are a solid reference basis which deserve full attention.

Table 8: Italian forest surface under naturalistic bonds as a percentage of the total Italian surface

	sq, km	%
Total Forest Surface	**86,750**	**29**
cultivated productive	84,000	97
bound productive	1,200	1
permanently unproductive	1,555	2
Surface under bonds[1]	**81,170**	**94**
under plunning	9,370	12
under several bonds	55,380	68
under tonn-planting bonds	10,650	13
under naturalistic bonds	5,770	7
Surface free of bonds	**5,580**	**6**

Table 9: List of some Italian institutions active in forest tree genetics

Institution	Location
Istituto Sperimentate per la Selvicoltura *	Arezzo
Istituto di Sperimentazione per la Pioppicoltura	Casale Monferrato (AL)
Istituto per il Miglioramento Genetico delle Piante Forestali	Firenze
Centro per la Patologia delle Specie Legnose Montane	Firenze
Centro di Sperimentazione Agricola e Forestale	Roma
Istituto per l'Agriselvicoltura	Porano (TR)
Ufficio amministrazione produzione semi forestali	Peri (VR)
Ufficio amministrazione produzione semi forestali	Pieve Santo Stefano (AR)

*Main referent

ANNEX 2

National park, biosphere reserves and their relative extension (18 national parks with a tatal surface of 9,430 sq. km; 3 biosphere reserves with a tatal surface of ca. 38 sq. km).

Name: NATIONAL PARKS	Extension (sq km)	Flora (incomplete list)
1. Stelvio	1,360	Larix decidua Mill., Picea excelsa Link., Pinus cembra L., Pinus mugo Turra.
2. Cilento	1,000	Fagus silvatica L., Quercus cerris L., Castanea sativa Mill., Quercus ilex L., Alnus glutinosa Gaerth.
3. Gennargentu and Golfo di Orosei	1,000	Quercus ilex L., Quercus pubescens Willd., corktrees.
4. Circeo	840	Quercus ilex L., Quercus pubescens Willd., Arbutus unedo L., Ostrya carpinifolia Scop., Quercus suber L., Quercus cerris L., Chamaerops humilis L.
5. Gran Sasso and Monti della laga	800	Fagus silvatica L., Quercus cerris L., Pinus nigra Arnold., Verbascus thapsum L., Pinus mugo Turra.
6. Gran Paradiso	700	Larix decidua Mill., Abies alba Mill., Picea excelsa Link.,Pinus sylvestris L., Alnus glutinosa Gaertn., Vaccinium myrtillus L.
7. Val Grande	500	Picea excelsa Link., Larixdecidua Mill., Verbascum thapsum L., Fagus silvatica L., Betula alba L., Castanea sativa Mill., Coryus avellana L., Ilex aquifolium L.
8. Pollino	500	Fagus silvatica L., Abies alba Mill., Pinus leucodermis Antoine, Quercus ilex L.

Name: NATIONAL PARKS	Extension (sq km)	Flora (incomplete list)
9. Aspromonte	500	*Pinus leticodennis* Antoine, *Abies alba* Mill., *Fagus* L., *Quercus cerris* L., *Castanea sativa* Mill., *Alnus glutinosa* Gaerth.
10. Abruzzo	440	*Fagus silvatica* L., *Acer pseudoplatanus* L., *Verbascum thapsum* L., Sorbus *aucuparia* L., *Pinus nigra* Arnold, *Pinus mugo* Turra, *Quercus cerris* L., *Ostrya carpinifolia* Scop., *Acer platanoides* L., *Crataegus crus-galli* L., *Prunus spinosa* L., *Carpinus betulus* L., *Fraxinus excelsior* L., *Populus alba* L., *Coryls avellana* L., *Quercus ilex* L., *Quercus pubescens* Willd., *Castanea sativa* Mill.
11. Monti Sibillini	350	*Fagus silvatica* L., *Quercus cerris* L., *Pinus mugo* Turra, *Juniperus communis* L.
12. Morella	350	*Abies alba* Mill., *Fagus silvatica* L., *Quercus cerris* L., *Castanea sativa* Mill.
13. Dolomiti Bellunesi	300	*Abies alba* Mill., *Fagus silvatica* L., *Alnus glutinosa* Gaertn. verde, *Corylus avellaiia L*, *Castanea sativa* Mill., *Carpinus betulus* L., *Fraxinus ornus* L.
14. Gargano	300	*Fagus silvatica* L., *Quercus cerris* L., *Quecus ilex* L., *Castanea sativa* Mill., *Pinus halepensis* Mill
15. Calabria	160	*Pinus leucodermis* Antoine, *Fagus silvatica* L., *Abies alba* Mill., *Alnus glutinosa* Gaerth.
16. Foreste Cosentinesi and Monte	150	*Abies alba* Mill., *Pinus sylvestris* L., *Acer* Falterona *pseudoplatanus* L. *Fagus silvatica* L., *Quercus cerris* L., *Castanea sativa* Mill., *Carpinus betulus L., Quercus pubescens* Willd., *Verbascum thapsum* L., *Ilex aquifoluim* L., *Tilia cordata* Mill.
17. Vesuvio	120	*Pinus pinaster* Ait., *Quercus ilex* L., *Spartium junceum* L.
18. Arcipelago Toscano	60	*Arbutus unedo* L., *Myrus communis* L., *erica Eucalyptus leucoxylon* F. Muell.

Name: BIOSPHERE RESERVES	Extension (sq km)	Flora (incomplete list)
19. Circeo	32	Evergreen sclerophyllous woodlands, Mediterranean sclerophyll
20. Collemeuccio-Montedimezzo	5	Mixed mountain system with complexzonation, Central European Highlands
21. Miramare	1	Evergreen sclerophyllous forest (including costal marine component)

ANNEX 3

The present national regulations apply to forest reproductive material of the following species (other species can be added within regional regulations)

Abies alba Mill.	abete
Abies cephalonica (Loud)	abete greco
Cupressus sempervirens L.	cipresso
Larix decidua Mill.	larice
Larix leptolepis (Sieb & Zucc) Gord.	larice giapponese
Picea abies Karst.	picea, abete rosso
Picea sitchensis trautv. -e-Mey	picea di Sitka
Pinus cembra L.	cembro
Pinus halepensis Mill.	pino d'Aleppo
Pinus mugo uncinata Ramond	pino uncinato
Pinus nigra Arn.	pino nero d'Austria - di Villetta Barrea - pino laricio
Pinus heldreichii Christ. var. *leucodermis* Ant.	pino loricato
Pinus pinaster Sol.	pino marittimo
Pinus pinea L.	pino domestics
Pinus sylvestris L.	pino silvestre
Pinus strobus L.	pino strobo
Pinus insignis Doug.	pino insigne
Pseudotsuga taxifolia Britt.	douglasia
Alnus cordifolia Ten.	ontano napoletano
Eucalyptus sp. pl.	eucalitti
Fagus silvatica L.	faggio
Populus sp. pl.	pioppi
Quercus borealis Michx	quercia rossa
Quercus pedunculata Ehrh.	farnia
Quercus cerris L.	cerro
Quercus sessiliflora Sal.	rovere
Quercus suber L.	sughera

ANNEX 4

List of plant species preserved as seed collections in Italy. Number of accessions per species and Istitute or Centre responsible for conservation.

Genus and *species*	N. of acces-sions	Inst. or Centre (code*)	Genus and *species*	N. of acces-sions	Inst. or Centre (code*)
Abelmoscus esculentus	33	002	*Beta spp.*	14	001
Aegilops bicoris	1	001	*Brachypodium spp.*	15	001
Aegilops biuncialis	4	001	*Brassica oleracea*	30	014
Aegilops elongate	5	001	*Brassica spp.*	-	022
Aegilops geniculata	6	001	*Brassica spp.*	-	023
Aegilops lorentii	4	001	*Brassica spp.*	129	001
Aegilops neglecta	10	001	*Bromus spp.*	7	001
Aegilops ovata	90	001	*Capsicum annuum*	205	002
Aegilops triaristata	11	001	*Capsicum annuum*	100	015
Aegilops triumcialis	51	001	*Capsicum annuum*	93	001
Aegilops ventricosa	13	001	*Capsicum annuum*	43	014
Aegilops spp.	35	001	*Capsicum baccatum*	4	002
Aegilops spp.	10	010	*Capsicum chinense*	4	002
Allium ampelorasum	3	001	*Capsicum frutescens*	2	002
Allium cepa	-	022	*Capsicum spp.*	-	024
Allium cepa	-	025	*Cicer arietinum*	231	001
Allium cepa	228	021	*Cicer arietinum*	200	014
Allium cepa	46	001	*Cicer arietinum*	200	015
Allium sativum	-	022	*Cicer arietinum*	40	007
Allium sativum	-	025	*Cichorium spp.*	35	001
Allium sativum	5	001	*Citrullus lanatus*	11	001
Allium spp.	9	001	*Cynara spp.*	-	026
Anthyllis vulneraria	12	006	*Cynara spp.*	-	028
Apium spp.	17	001	*Cynara spp.*	-	029
Astragalus spp.	18	006	*Coronilla varia*	18	006
Aspargus spp.	-	022	*Coronilla spp.*	14	006
Avena sativa	302	020	*Cucumis spp.*	69	001
Avena sativa	8	013	*Cucurbita SPP.*	62	001
Avena spp.	114	001	*Dactylis glomerata*	180	001
Basylicum spp.	10	001	*Dactylis glomerata*	8	006
Daucus spp.	15	001	*Medicago luculina*	43	001
Eruca Sativa	14	001	*Medicago luculina*	18	006

Genus and *species*	N. of acces-sions	Inst. or Centre (code*)	Genus and *species*	N. of acces-sions	Inst. or Centre (code*)
Eruca spp.	1	001	*Medicago murex*	58	001
Festuca arundinacea	1	006	*Medicago muricoleptis*	3	001
Festuca spp.	118	001	*Medicago orbicularis*	104	001
Foeniculum spp.	19	001	*Medicago polymorpha*	112	001
Hedysarum coronarium	38	001	*Medicago rigidula*	21	001
Hedysarum coronarium	7	006	*Medicago rugosa*	26	001
Hordeum vulgare	600	008	*Medicago scutellata*	24	001
Hordeum vulgare	300	015	*Medicago tornata*	16	001
Horedum spp.	1,000	001	*Medicago tornoreana*	1	001
Lactuca sativa	55	014	*Medicago truncatula*	78	001
Lactuca spp.	31	001	*Medicago turbiriata*	4	001
Lathyrus spp.	129	001	*Medicago spp.*	36	006
Lens culinaris	255	001	*Medicago spp.*	6	001
Lens culinaris	15	007	*Onobrychis viciifolia*	33	006
Lolium perenne	1	006	*Onobrychis spp.*	8	001
Lolium spp.	197	001	*Origanum spp.*	1	001
Lotus corniculatus	42	006	*Pennisetum glaucum*	32	001
Lotus spp.	8	001	*Petroselinum spp.*	17	001
Lotus spp.	4	006	*Phalaris spp.*	87	001
Lupinus albus	48	009	*Phaseolus coccineus*	63	001
Lupinus angustifolius	3	009	*Phaseolus lunatus*	5	002
Lupinus luteus	2	009	*Phaseolus vulgaris*	93	002
Lupinus mutabilis	2	009	*Phaseolus vulgaris*	39	014
Lupinus spp.	100	001	*Phaseolus spp.*	200	001
Lycopersicon esculentum	500	009	*Phaseolus spp.*	-	024
Lycopersicon esculentum	200	015	*Phaseolus spp.*	-	027
Lycopersicon esculentum	127	014	*Phleum alpinum*	11	001
Lycopersicon esculentum	105	001	*Phleum bertolonii*	1	001
Lycopersicon esculentum	10	007	*Phleum pratense*	1	001
Lycopersicon	-	022	*Phleum subulatum*	1	001
Lycopersicon spp.	-	025	*Phleum spp.*	10	001
Medicago arabica	29	001	*Pisum spp.*	200	009
Medicago ciliaris	33	001	*Pisum sativum*	4,090	001
Medicago intertexta	11	001	*Pisum sativum*	350	015
Medicago littoralis	4	001	*Raphanus spp.*	18	001
Scorpiurus spp.	9	006	*Trifolium spp.*	76	006
Secale cereale	100	015	*Trifolium spp.*	3	001
Sinapis spp.	5	001	*Trigonella spp.*	9	006

Genus and *species*	N. of acces-sions	Inst. or Centre (code*)	Genus and *species*	N. of acces-sions	Inst. or Centre (code*)
Solanum melongena	98	001	*Triticale*	200	015
Solanum melongena	37	014	*Triticum aestivum*	8,337	001
Solanum melongena	23	002	*Triticum aestivum*	2,225	018
Solanum tuberosum	32	019	*Triticum aestivum*	500	015
Solanum spp.	98	001	*Triticum aestivum*	20	013
Sorgum bicolor	50	001	*Triticum araraticum*	127	001
Spinacia spp.	8	001	*Triticum boeticum*	318	001
Trifolium alexandrinum	1	001	*Triticum dicoccoides*	167	001
Trifolium angustifolium	17	001	*Triticum durum*	5,659	001
Trifolium arvense	11	001	*Triticum durum*	600	018
Trifolium bocconei	2	001	*Triticum durum*	500	015
Trifolium campestre	15	001	*Triticum durum*	25	013
Trifolium cherleri	20	001	*Triticum durum*	10	007
Trifolium congestum	1	001	*Triticum urartu*	139	001
Trifolium frangiferum	5	001	*Triticum spp.*	18,000	001
Trifolium glomeratum	5	001	*Triticum spp.*	713	010
Trifolium incarnatum	8	001	*Vicia faba*	-	022
Trifolium lappaceum	8	001	*Vicia faba*	3,671	001
Trifolium nigrescens	8	001	*Vicia faba*	190	007
Trifolium ochroleucon	1	001	*Vicia faba*	100	009
Trifolium pratense	9	001	*Vicia faba*	44	014
Trifolium repens	51	006	*Vicia faba spp.*	-	028
Trifolium repens	11	001	*Vicia spp.*	5	006
Trifolium resupinatum	16	001	*Vigna spp.*	-	024
Trifolium scabrum	2	001	*Vigna spp.*	-	027
Trifolium stellatum	13	001	*Zea mays*	4,516	012
Trifolium subterraneum	70	001	*Zea mays*	600	001
Trifolium tomentosum	13	001	*Zea mays*	25	018

Preserved as field collections:

Cynara cardunculus	16	007
Cynara scolymus	117	001
Cynara scolymus	20	015

Source: FAO and CNR, Germplasm Institute 1993

*for code numbers see annexe 5

ANNEX 5

Code numbers relative to Italian Institutions preserving seed collections in Italy

Code	Institutes or Centre (Institution)	City
001	Istituto del Germoplasma (CNR)	Bari
002	Istituto di Miglioramento Genetico e Produzione delle Sementi	Tofino
003	Istituto di Allevamento Vegetale	Perugia
004	Isituto Sperimentale Colture Foraggere (Mi.R.A.A.F.)	Lodi (Mi)
005	Istituto di Agronomia Generale e Coltivazioni Erbacee (University)	Padova
006	Centro di Studio e Miglioramento Genetico	Perugia
007	Istituto di Agronomia e Coltivazioni Erbacee	Catania
008	Istituto Sperimentale di Cerealicoltura	Fiorenzuola d'Arda
009	Istituto Agronomia Generale	Portici (NA)
010	Istituto di Miglioramento Genetico "Nazareno Strampelli"	Lonigo
011	Istituto di Allevamento Vegetale per la Cerealicoltura	Bologna
012	Istituto Sperimentale per la Cerealicoltura	Bergamo
013	Istituto di Agronomia e Coltivazioni Erbacee	Pisa
014	Istituto di Ricerca sull'Orticoltura	Pontecagnano (Sa)
015	Dipartimento di Agrobiotecnologia (ENEA)	Casaccia (Roma)
016	Istituto di Colture Industriali	Torino
017	Istituto di Protezione Vegetale	Udine
018	Centro Ricerche Dekalb Italiana S.p.A.	Chiarano (TV)
019	Istituto Sperimentale per le Colture Industriali	Bologna
020	Istituto Sperimentale per la Cerealicoltura	Badia
021	Istituto Sperimentale per l'Orticoltura	Montanaso Lombardo (MI)
022	Istituto di Orticoltura e Floricoltura	Catania
023	Istituto di Orticoltura e Floricoltura	Palermo
024	Dipartimento per la Valorizzazione delle Produzioni Agricole	Torino
025	Dipartimento di Agrobiologia e Agrochimica	Viterbo
026	Istituto di Agronomia Generale	Bari
027	Istituto di Agronomia Generale	Firenze
028	Centro di Studio sulle Colture Precoci Ortive (CNR)	Catania
029	Istituto per le Colture Ortive Industriali (CNR)	Bari

ANNEX 6

Institutions involved in germplasm conservation, total number of accessions, number of the accessions of Italian origin and number of accessions of Italian origin considered at risk of erosion

Species	No. of accessions present in Italy	Accessions of Italian origin		Institution*
		No	No at risk of erosion	
Kiwi	33	23	-	1
Apricot	504	225	149	1-2-6-7-8-13-15
Chestnut	104	85	6	1-2
Sour Cherry	169	112	107	1-2-9-14
Sweet Cherry	635	439	298	1-2-3-6-9-14-15
Feijoa	26	10	8	1
Fig	125	119	33	1-15
Strawberry	88	25	8	1
Kaki	67	13	1	1-9-10-13-15
Almond	190	122	106	1-14
Apple	1,438	634	586	1-2-3-5-6-7-8-9-11-12-13-15-16-26
Nespolo giapponese	20	17	8	1
Hazelnut	84	44	39	1-2-9-16
Walnut	50	8	8	1-2-13
Pear	718	435	389	1-2-3-5-6-7-8-9-11-13-15
Peach	1,881	735	548	1-2-3-5-6-7-8-9-10-13-16
Plum	521	151	69	1-2-6-7-8-9-10-13-15-16
Carrubo	6	6	6	16
Pistachio	31	-	-	1
Olive	600	-	-	2-3-6-8-10-14-15-16-17-18-19

Species	No. of accessions present in Italy	Accessions of Italian origin		Institution*
		No	No at risk of erosion	
Vines	2,500	1,000	-	3-4-6-8-10-14-16-22-23-24-25
Citrus	391	-	-	15-16-17-20
Small fruit	245	-	-	1
Nashi pear	36	-	-	1
Quince	59	-	-	1-4-9
Prickly pear	6	6	6	16
Total	**10,475**	**4,203**	**2,381**	

*for code numbers see annexe 7

ANNEX 7

Code numbers relative to Italian Institutions preserving woody germplasm field collections in Italy

1)	Istituto Sperimentale Per La Frutticoltura Ministry Of Agriculture	Roma - Trento - Forlì - Caserta
2)	Dipartimento di Colture Arboree - University Of Torino	Torino
3)	Istituto Sperimentale di Frutticoltura Amministrazione della Provincia di Verona	Verona
4)	Istituto di Frutti-Viticoltura University Cattolica del Sacro Cuore Of Piacenza	Piacenza
5)	Istituto di Coltivazioni Arboree - University Of Padova	Padova
6)	Dipartimento di Colture Arboree - University di Bologna	Bologna
7)	Azienda Agraria Sperimentale "Marani" di Ravenna Regione Emilia - Romagna	Ravenna
8)	Dipartimento di Coltivazione e Difesa delle Specie Legnose University Of Pisa	Pisa
9)	Istituto Sulla Propagazione delle Specie Legnose Cnr Scandicci	Firenze
10)	Dipartimento di Ortoflorofrutticoltura University Of Firenze	Firenze
11)	Dipartimento di Produzione Vegetale - Sez. di Ortorfloroarbo - ricoltura - University della Tuscia	Viterbo
12)	Dipartimento di Biotecnologie Agrarie ed Ambientali University Of Ancona	Ancona
13)	Istituto di Coltivazioni Arboree - University Of Napoli "Federico II"	Napoli
14)	Istituto di Coltivazioni Arboree - University Of Bari	Bari
15)	Istituto Per La Fisiologia della Maturazione e della Conservazione del Frutto delle Specie Arboree Mediterranee - Cnr Sassari	Sassari
16)	Istituto di Coltivazioni Arboree - University Of Palermo	Palermo
17)	Istituto Coltivazioni Arboree - University Of Catania	Catania
18)	Istituto Coltivazi0ni Arboree - University Of Perugia	Perugia
19)	Istituto Sperimentale Per L'olivicoltura	Cosenza
20)	Istituto Sperimentale Per L'agrumicoltura - Acireale	Catania
21)	Istituto di Ricerche Sull'olivicoltura - Cnr Perugia	Perugia

Code numbers relative to Italian Institutions preserving woody germplasm field collections in Italy

22)	Istituto Sperimentale Per La Viticoltura - Conegliano	Treviso
23)	Istituto Coltivazioni Arboree - University Of Milano	Milano
24)	Istituto di Produzione Vegetale- University Of Udine	Udine
25)	Istituto Agrario S. Michele All`Adige	Trento
26)	Centro di Sperimentazione Agraria e Forestale Laimburg- Provincia Autonoma di Bolzano- Alto Adige	Bolzano

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- Istituto Sperimentale per le Colture Industriali - Bologna
- Istituto Sperimentale per le Colture Foraggere - Lodi (MI)
- Istituto di Orticoltura e Floricoltura - Universita' di Catania
- Ente Nazionale Sementi Elette - Milano
- Istituto Sperimentale per la Olivicoltura - Rende (CS)
- Istituto Sperimentale per la Viticoltura - Conegliano (TV)
- Societa' Botanica Italiana - Gruppo di lavoro per gli Orti Botanici e Giardini Stranieri - Pisa
- Istituto di Ricerche sulla Olivicoltura (CNR) - Perugia
- Dipartimento Colture Arboree - Universita' di Bologna
- Istituto Colture Arboree - Universita' di Palermo
- Istituto Sperimentale per I'Assestamento Forestale e per I'Alpicoltura - Villanzone (TN)
- Istituto Sperimentale per L'Agricoltura di Acireale (CT)
- Dipartimento di Scienze Agronomiche e Genetica Vegetale - Universita' "Federico II" di Napoli