

INTRODUCTION

With its richness in genetic diversity, Turkey has a unique position. Two important **gene centres** (Near East and Mediterranean) described by Vavilov (1951) are located in the country. Besides these two gene centres, Turkey also includes **diversity centres** for many wild, transitional and cultivated forms of annual and perennial, herbaceous and woody plants

The richness of plant genetic diversity in Turkey is essential for continuation of a crop improvement and agriculture in the temperate belt of the world. However, conservation of genetic diversity of cultivated plants, their wild relatives, transitional forms and forest trees with global importance was generally ignored or not considered when the actions on protection of nature and biological diversity are the issues. Efficient conservation of genetic diversity in wild relatives of cultivated plants, their primitive forms and important forest trees are also needed for effectiveness and continuation of plant breeding researches on agriculture and forestry in Turkey as well as in the world.

Being in the temperate climatic belt, Turkey is very rich in habitat diversity due to the diversity in its geomorphology, topography and climate. As a result, Turkey is very rich in plant species. Studies conducted to date have shown that **there are 8745 species of vascular plants in Turkey, and 2763 of them are endemic species**. Turkey also includes gene centres of some forest trees (Fir, Spruce, Cedar, Juniper, Sweet-gum etc.) and wild relatives of cultivated plants (Wheat, Barley, Lentil, Chickpea, Apple, Pear, Cherry, Walnut, Pistachio, Chestnut etc.), which are crop plants of worldwide importance

The richness of Turkish flora is an important source for the utilisation of plants with different purposes. Many plant species of flora are used as food, drug raw material, wood etc. Economically important plants can be grouped as 'field crops' (cereals, legumes, industrial plants, forage plants), 'horticultural plants' (vegetables, fruits, ornamentals), 'medicinal and aromatic plants' and 'forest trees' (Table 1). The wild and transitional forms of many cultivated plants in the country are also found as genetic sources.

The cereals include 23 wild relatives of Wheat, 8 wild relatives of Barley, 4 wild relatives of Rye, and 6 wild relatives of Oat. The important genetic resources of many legume (9 wild relatives of Chickpea), forage (30 species of Alfalfa, 57 species of Bitter Vetch and related ones, 59 species of Chickling Vetch and 95 species of clover) and industrial (8 wild relatives of Sugar-beet, Opium Poppy) and medicinal and aromatic plants (87 *Salvia* spp, 22 wild relatives of Anise and 9 wild species of Foxglove *Digitalis*) naturally occur in Turkey. There are also **many wild relatives of cultivated horticultural (10 wild relatives of Pears, 8 wild relatives of Cherry, 4 wild relatives of Plum and 12 wild relatives of Almond and wild relatives of many other horticultural species)** and vegetable species (7 wild relatives of Lettuce, 4 wild relatives of Carrot, 143 wild relatives of Onion).

Turkey is also rich in forest genetic resources. Important forest tree species exist, which are very valuable not only for Turkey, but also for other countries. For examples, there are 5 native Pine, 4 true Fir, 20 Oak, 8 Juniper, one Cedar (Taurus Cedar), one Beech (Oriental Beech) and one Spruce (Oriental Spruce) species.

Factors Reducing Plant Genetic Diversity

Natural land structures in Anatolia, being a bridge between Europe and Asia where many ancient civilisations lived, have been changed due to long-term human impacts on natural resources. It is generally accepted that present steppe vegetation, dominant in most of the country, is the result of long-term anthropogenic effects. The changes have become faster in the last century due to

- (1) Agricultural Activities** (e.g., ploughing pastures for cultivation, over grazing in pastures, stubble-burning, excessive use of fertilisers and chemicals, extension of high yielding cultivars);
- (2) Industrialisation, urbanisation and construction of highways and dams;**
- (3) Collecting plants from nature;**
- (4) Forestry activities and fires;**
- (5) Tourism.** Particularly since the 1950s, these activities have increased the pressure on biological diversity beyond the carrying capacity of the land. The most important consequences of these activities are the reduction and fragmentation of natural habitats.

Legislative status

Although the items in the Turkish Constitution are not directly related to the conservation of plant genetic diversity, **Article 63 of the Constitution states that the government should protect its historical, cultural and natural values and resources, as well as support and promote conservation efforts made by people.** In addition to the articles present in the Constitution, the Law for Protection of Cultural and Natural Values, Environmental Law, National Parks Law, Bosphorus Law, Law for Specially Protect Environmental Regions, and Forestry Law provide the opportunity for the protection of nature and biological diversity and facilitate activities related to the conservation of plant genetic diversity

International agreements and cooperation

Turkey has aimed to participate actively and to control the trade in and conservation of natural and biological resources by signing international agreements with many institutions at different dates. A few of the most important ones are; Convention on Conservation of European Wildlife and Habitats, Bern (1979), Convention on Protection of Internationally Important Wetlands Providing Habitats for Birds, Ramsar (1975), Agreement on Trading of Wildlife and Plant Species, Washington (1973), Biological Diversity Agreement, Rio (1992). **The country gives solid efforts for the implementation of these international agreements.**

Turkey is a member of many international organisations related to biodiversity issues, such as the World Bank, United Nations-Education, Science and Cultural Organisation (UNESCO), International Union for the Conservation of Nature and Natural Resources (IUCN), World Wide Fund for Nature-US (WWF), Council of Europe-Centre Naturopa, United Nations-Food and Agriculture Organisation (FAO), International Commission on Plant Genetic Resources-FAO, International Plant Genetic Resources Institute-Italy (IPGRI), International Centre for Agricultural Research in Dry Areas-Syria (ICARDA), International Centre for Maize and Wheat Improvement-Mexico (CIMMYT), The International Union of Forest Research Organisation (IUFRO), United Nations Development Programme (UNDP), European Co-operative Programme for Crop Genetic Resources Networks (ECP/GR), European Forest Genetic Resources Programme (EUFORGEN).

Related institutes and organizations

The Turkish Ministry of Agriculture and Rural Affairs, and Ministry of Forestry are the leading institutions for the implementation of the laws and regulations related to the conservation of natural resources. The Ministry of Environment and Forests provides coordination of such activities. The General Directorates of Forestry (GDF), General Directorate of National Parks and Nature Protection, Game and Wildlife (GDNW), General Directorate of Afforestation and Erosion Control (GDAEC) and research institutes under Ministry of Forestry are responsible for the conservation programmes conducted in forest areas. Research Directorate of Forest Trees and Seed Improvement is responsible for conducting *ex situ* and *in situ* conservation of genetic diversity of forest trees.

Aegean Agricultural Research Institute (AARI) is the leading unit responsible for conservation (generally *ex situ*) of genetic diversity of cultivated plants under the Ministry of Agriculture and Rural Affairs. This institute provides co-ordination and cooperate especially with Central Research Institute for Crop Plants and other regional and local research institutes in the activities related to the conservation of plant genetic diversity.

The other institutions of the Ministry of Agriculture and Rural Affairs, Special Environment Protection Department of Ministry of Environment, Universities, the General Directorate of Culture and Natural Resources Protection under Ministry of Culture, and municipalities are also involved directly or indirectly in studies on the conservation of natural living resources. However, most of these activities are not directly related to the conservation of plant genetic diversity.

The number of non-governmental organisations (NGOs) and their activities has increased lately. But their contribution is not in a desired level, due to their inadequate budgets. However,

the Turkish Society for Protection of Nature (SPN), Foundation for Turkish Nature Conservation (FTNC), Turkish Erosion Prevention Foundation (TEPF), the Foundation of Conservation Afforestation and Natural Resources, Turkish Environmental Foundation efficiently involve with the public awareness on conservation and restoration of environment.

Present Conservation Areas and Programmes

The studies related to conservation of plant genetic diversity in forest areas are conducted by the governmental organisations, through programmes with various purposes and of different status, such as the National Parks, Nature Conversation Areas, Nature Parks, Natural Monuments, Seed Stands, Gene Conservation Forests, all within the Ministry of Forestry.

To date 452 Natural SIT (archaeological, natural and cultural) conservation areas, which are strictly protected, have been established by the Ministry of Culture. Also 23 of 64 wetlands in the country were set aside as a Natural SIT area.

General Directorate of National Parks, Game and Wildlife Conservation of MOF have been working in establishment of protected areas since 1958. To date, 31 national parks (612,112 hectares), 11 nature parks (46,872 hectares), 32 nature conservation areas (total area of 82,023 ha.), 54 nature monuments (total area of 73.8 ha.), 7 biogenetic reserves have been established and managed by MOEF. These programmes have to be reviewed in terms of their size, distribution, administration and management policy by taking the biodiversity and *in situ* gene conservation principles in order to have an effective *in situ* gene conservation programme in whole country. **Of these conservation programmes, Nature Conservation Areas are the most suitable ones for the *in situ* gene conservation programmes.**

There are also other protected lands established by different institutions that should be considered as *in situ* conservation programmes. These are MOEF-Protection forests (1.5 % of total forest lands, 360,130 ha. of total area) and Wildlife Conservation Areas, MARA-Agricultural Enterprises, and MOEF-Specially Protected Environmental Regions. These programmes are not directly involved *in situ* gene conservation. However they could also be utilised for the purpose of *in situ* conservation of plant genetic diversity, due to their legislative status.

Supplementary programmes for *in situ* conservation

It may not be adequate to have only *in situ* conservation programmes for the maintenance of the genetic diversity in many target plant species in certain areas. In such case, *in situ* conservation programmes have to be supported with *ex situ* conservation programmes to provide gene resources for plant breeders as well as for genetic stocks whenever it is needed. **At the present, there are two types of *ex situ* conservation programmes in Turkey:**

- 1) **Seed orchards and clone banks, mainly for forest tree species;**
- 2) **Gene banks, mainly used for annual plants and partly for forest trees.**

Research and Education

Recent taxonomic studies that have led to the discovery of many new species have indicated that plant species, genera and families should be revised, since there is a great need to clarify the taxonomic status of many species to have effective conservation programme. There are a few studies dealing with genetic variation within species. Most of the studies are limited to single location or a few observations. **To determine the real pattern of genetic variation within the species, new research programmes are needed.**

With funding from the project titled "*In situ* Conservation of Plant Genetic Diversity" initiated 1993, the institutes in MARA, and MOF have been equipped with new lab facilities as well as technical personnel in these institutes have been trained on *in situ* conservation of plant genetic resources. These institutes now have the research background to conduct the *in situ* conservation studies in the future. **The trained group of personnel from three ministries (MARA, MOF and MoE), with contributions from universities, have formed the technical personnel core responsible for producing management and research policies for *in situ* gene conservation programmes in**

Turkey. However, extensive educational programmes are still needed to train and educate more young researchers in the field for enlarging the existing core technical personnel.

Public education about environmental problems and nature values in Turkey has begun in recent decades. **Despite this, “environmental consciousness” amongst both educated and non-educated sections of the society of the country is inadequate.** In recent years, broadcasting of educational programmes related to environmental problems in the media has considerably improved the “environmental consciousness” of the public in Turkey. The environment and nature-related works of the governmental, private and voluntary organisations also promise to further improve the “environmental consciousness” of the public.

Database and exchange

Scientific data production and evaluation are needed to establish “Gene Management Zones” which will lead the *in situ* conservation programmes for plant genetic diversity in Turkey. For this purpose, **a database of *in situ* conservation of plant genetic resources should soon be provided** to responsible governmental and private or voluntary institutes who will need this kind of information.

At the moment, FTSIRD is the institution which establishes and monitors all gene conservation areas in tree species with cooperation of other MOF organizations. At the same time, the General Directorate of National Parks and Wildlife Conservation contributes to the conservation of genetic diversity in conserved areas. Conservation programmes concerning wild relatives and land races of crop species are carried out by the MARA-AARI, Ýzmir, and CRIFC, Ankara.

The continuation and success of “National Plan for the *In Situ* Conservation of Plant Genetic Diversity” depends on the generation of adequate data and the distribution of available information on genetic resources to related institutions. To eliminate the duplication of research in the future, **a central database of existing material should be formed and managed for conservation of plant genetic resources.**

The most efficient way to use the information accumulated in a centre will be in favour of establishment and precise utilisation of **Geographic Information System (GIS).** **The establishment of GIS network among involved institutions will be very valuable.** With the application of GIS, vegetation-mapping systems can be developed and can be very useful for vegetation management. GIS can be used in determining whether the areas defined in *in situ* studies are reduced or enlarged. Specific species within their habitats can be followed and controlled, and also any increase or reduction in species density can be monitored by this system. Therefore, GIS will help to evaluate continuously an area and to select the strategies for the sustainable utilisation of land.

Public awareness

The approach for conservation of genetic resources in our country is a very new issue. Public support is needed for effectiveness and continuity of the gene conservation programme. **The public in Turkey is not aware of the importance of the plant genetic resources and their conservation.** To establish a good public awareness programme on the conservation of biological diversity and especially *in situ* gene conservation of plant genetic resources, **we need comprehensive plans dealing with the issues such as determination of objectives and strategies, target public, and means and ways to apply the programmes clearly and effectively.**

The objective of the National Plan

The general objective of the “*National Plan for In situ* Conservation of Plant Genetic Diversity in Turkey” is **to determine the priorities and strategies for effective management and conservation, sustainable utilisation and monitoring of genetic diversity in target species, and to implement these priorities and strategies in the forms of a national *in situ* gene conservation programme.** With this approach, it is not only the plant genetic diversity for target species that will be conserved, but also conservation of biological diversity and natural environment will be achieved.

An *in situ* conservation project supported initially by a special fund (Global Environment Facility, GEF) of the World Bank has been conducted in Turkey. This pilot project aimed to conserve the genetic diversity of wild relatives of cultivated plants and forest tree species with global importance. Studies were initiated in 1993 by the Ministries of Agriculture and Rural Affairs (MARA), Forestry (MoF), and Environment (MoE). The objectives of this project were to train research scientists in various aspects of *in situ* conservation and upgrade the laboratory facilities in research institutes of MARA and MOF, to establish *in situ* conservation programmes for conserving genetic diversity of target species selected in pilot sites (Kazdag and Bolkar mountains, and Ceylanpinar State Farm), as well as to develop *in situ* GMZ concept which can be used for other species throughout the country. To achieve the last goal and to incorporate GMZ's concepts and experiences from the project into existing conservation programmes, the MoE was asked to prepare a 'National Plan for *in situ* conservation of genetic diversity in Turkey, (Here on, it will just be referred to as The National Plan). A draft copy of the National Plan was prepared in January 1995 and the copies of it sent to involved institutions within the country to obtain the views of in-country experts. The draft National Plan was also presented to the International Symposium held on " *In Situ* Conservation of Plant Genetic Diversity" on November 4-8, 1996 in Antalya, Turkey to solicit the views of the international experts. After the comments and criticisms from national and international experts in the field were received, they were incorporated in the present version of the National Plan.

The main objectives and expectations of the National Action Plan for *in situ* conservation of plant genetic diversity in Turkey could be summarised as follow:

- 1) The Turkish National Plan for *in situ* conservation of plant genetic diversity is the first example of the field in the world. Therefore, this final version is expected to be a good example for the similar programmes in other countries.
- 2) The implementation of the National Plan for *in situ* conservation of selected (target) species of the wild relatives of herbaceous and woody plants and important forest trees will provide efficiency and continuity in conservation programmes in Turkey by establishing GMZs for target species throughout the country.
- 3) Since the GMZs are accepted as one of the most effective ways of *in situ* conservation allowing the evolutionary changes and continuity of genetic diversity in target species in the National Plan, the alternatives for the selection criteria, management responsibility and policy for GMZs, as well as the methods for utilisation of genetic material from GMZs will be also developed for the target species with special requirements.
- 4) The basic purposes of all environmental actions are to prevent environmental problems before they occur, and to sustain the quality and quantity of the biotic and abiotic components in ecosystems. With the implementation of the National Plan, the plant genetic resources which are seriously threatened by various environmental problems will be efficiently conserved and managed *in situ*.

THE STATUS OF PLANT GENETIC RESOURCES IN TURKEY

1. Species Richness

The diversity of Turkey's flora has been emphasized in many publications. Especially after the publication of *Flora of Turkey and East Aegean Islands* (Davis 1965-1985; Davis *et al.* 1988) in 10 volumes, studies on Turkish flora have been accelerated. The studies motivated by the above-mentioned publication have also shown the richness in species diversity in Turkey, especially in ferns, seed- and primitive plants. However, detailed and complete floristic studies on primitive plants native to Turkey have not been conducted yet. The book, *Biological Diversity of Turkey*, which was published by Turkish Environment Foundation in 1987 includes substantial information about the status of different plant groups. All publications about the Turkish flora and natural vegetation can be found in the *Bibliography* by Demiriz (1993), published by TÜBİTAK. *Turkish Plant Names* (Baytop 1994) published by the Council of Turkish Language Studies also exhibits floristic richness of the country.

Turkey has a large diversity of habitats due to the diversity in its geomorphology, topography and climate. As a result, Turkey is very rich in plant species. The numbers of fern and seed plant species

native to Turkey are 8,575 (Table 2). New records of new species are continually being added to this list; for example, 135 species were added by the end of 1993 (Özhatay, Kültür and Aksoy, 1994). Recent studies have revealed that the total number of species of ferns and seed plants are about 8,745.

Endemic and Endangered Species

According to 'The Flora of Turkey and East Aegean Islands, Volume 10', there are 2,763 endemic plant species in Turkey. It means that 31.59% of the natural flora is endemic (Table 2). Looking at the families in Table 3 and the genera in Table 4, it can be seen that both families and genera with large numbers of species are also the families and genera with the large numbers of endemic species. For instance, the family *Compositae*, with the largest species number, has also the highest number of endemic species. The genus *Astragalus* within the family *Leguminosae* is the genus which is high in number of total as well as of endemic species.

When the subspecies and varieties are considered, the total number of Turkish endemic taxa rises to 3,747 (Y.Gemici, pers. comm.). The geographic and phytogeographic distributions of the taxa are presented in Table 5. The Central, Southern and Eastern Turkey amongst the geographic regions, and the Iran-Turan and Mediterranean among the phytogeographic regions, contain the highest numbers of endemic taxa.

A comprehensive classification for the complete threat status to plant species in Turkey has not yet been conducted. However, the study carried out by Ekim et al. (1989) classified the endemic and rare plant species based on the old criteria of IUCN (Table 6). The class "not threatened" was not included in their list. As can be seen in Table 6, 8 species are "extinct", 46 "endangered", 183 "vulnerable", 1,701 "rare", 5 "out of danger" and 798 fall in neither "rare" nor "threatened" categories. In this study, 49 and 282 endemic species are classified as "unknown" and "insufficiently known", respectively.

Güner and Zielenski (1996) classified the woody plants of Turkey according to the new threat categories of IUCN (Table 7). The table presents all woody plants except those (such as *Astragalus*) whose taxonomic classification is not yet completely clear. Results of this study showed that 84 of the 569 species studied are endemic, whilst 3 taxa are extinct, 1 taxon is critically endangered and 5 taxa are vulnerable. Numbers of the taxa in "lower risk" category were 10 and 95 in the "conservation dependent" and "near threatened" subcategories respectively. Twenty-two taxa were not evaluated due to lack of data. The threat classification of all plant species in Turkey needs to be updated according to the new categories and data.

Geographic Regions for Conservation of Genetic Diversity

Anatolia appears to have continental characteristics on the whole, when the distribution of economically important plant species and their wild relatives are considered. From this point of view, Southeastern Anatolia, the Mediterranean region (especially the Central Taurus Mountains), the Salt Lake vicinity, and the Anatolian Diagonal (from Ahyrdað to the Kackar Mountains) attract special attention. In terms of plant genetic diversity, the country has many species that need to be conserved. However, the list of species with higher priority for conservation (the **target species**) and their distribution areas are given in Table 7, and in the maps in Figure B in Appendix 2, respectively. Target species have been identified with the criteria developed in Appendix 1, with the suggestions made by the MARA, MOF and MoE, based on the global and local importance of the species, endemism, economic importance and whether or not they are wild relatives of crop species. With the consideration of the natural distribution, the special conservation programmes for these target species in representative populations should be prepared.

Southeastern Turkey: This area is very important for Wheat (*Triticum*, Figure B-1), Lentil (*Lens*, Figure B-2), Chickpea (*Cicer*, Figure B-3), and Pea (*Pisum*, Figure B-4) species. The tree species Pistachio (*Pistacia*), Euphrates Poplar (*Populus euphratica*), Oak (*Quercus brantii*), Red Pine (*Pinus brutia*) and Pseudo-walnut (*Pterocarya fraxinifolia*) in this region are to be conserved. The specific places where the wild flora can be protected in this region should be defined. The conservation programmes should be prepared by taking into consideration the flora and fauna affected by micro-climatic changes and irrigated farming due to the Southeastern Anatolian Project (GAP).

Mediterranean Region: This is the most important region for the forest trees (Figures B.7-10) and wild plant species. The endemism rate is also very high. The Chickpea (*Cicer*, Figure B-3), medicinal and aromatic plants (*Sideritis* spp - Ironwood Worth, *Origanum* spp - Sweet Marjoram, Figure B-18), Laurel (*Laurus nobilis*), Caper (*Capparis spinosa*) and Orchids (*Orchidaceae*) have priority in this region. The region is also very important for forest trees (Taurus Cedar - *Cedrus libani*, Taurus Fir - *Abies cilicica* (Figure B-7), Beech - *Fagus*, Junipers - *Juniperus*) and Olive (*Olea*). In addition to the existing national parks and nature conservation areas, the Amanos Mountains, which are crucial areas in this region for their floristic characteristics, should be included in conservation programmes. Tourism and construction, grazing, conversion of pastures into farmland and unregulated removal of wild plants are the main factors threatening the flora of region.

Aegean and Marmara Regions: As is the case with the Mediterranean Region, there are many wild relatives of cultivated plants (*Triticum* - Wheat, *Cicer* - Chickpea, *Vicia faba* - Broad Bean) and forest trees (Figures B.5-8) as well as many endemic species in both of these regions. The Aegean region is very rich in orchids (*Orchis*), Sweet Marjoram (*Origanum*), Ironwood Worth (*Sideritis*), and Walnut (*Juglans regia*), Red Pine (*Pinus pinea*), Black Pine (*Pinus nigra*), Stone Pine (*Pinus pinea*), Kazdağy Fir (*Abies nordmanniana* ssp. *equi-trojani*), Olive (*Olea europea*); Almond (*Amygdalus communis*), Sweet-gum (*Liquidambar orientalis*), while the Marmara region is rich in Red Pine (*Pinus pinea*), Black Pine (*Pinus nigra*) Chestnut (*Castanea sativa*), Alder (*Alnus*) and Hornbeam (*Carpinus*) species. Adequacy of the present conservation programmes in the regions should be reviewed. These two regions are heavily influenced by industrialisation, establishment of new structures, creation of new agricultural areas, tourism, and soil salinity.

Eastern Anatolia Region: This region has very high rate of endemic species. It is rich especially in forage plant species. This region is important area for the collection of the some cultivated plants such as *Triticum* - Wheat (Figure B-1), *Beta* - Sugar-beet (Figure B -15), *Lens* - Lentil (Figure B-2), *Medicago* - Alfalfa, *Trifolium* - Clover, *Vicia* - Vetch, *Onobrychis* - Sainfoin, *Lathyrus* - Chickling Vetch (Figure B-6), *Lactuca* - Lettuce (Figure B-13), and *Allium* - Onion (Figure B-14). This region has many fruit species (*Prunus*, *Cerasus* and *Amygdalus* – stone-fruit species (Figure B-11), *Pyrus* - Pear (Figure B-12), forest trees as *Quercus* - Oaks (Figure B-9), Scots Pine (*Pinus sylvestris*), *Betula* - Birch, *Ulmus* - Elm. *Thymus* -Thyme (Figure B-19), *Glycyrrhiza* - Liquorice, *Gypsophila* – Chalk-plant) and many other plants with bulbs, tubers and rhizomes are also very common in the region. Factors affecting the flora of the region are grazing, opening new farm fields, and excessive use of pastures. It is a region where the existing conservation programmes are not adequate.

Black Sea Region: This region is important for forest tree species as *Pinus* - Pine (Figure B-10), *Abies* - Fir (Figure B-7), *Picea* - Spruce, *Tilia* - Linden, fruits with soft and hard stones (*Prunus*, *Cerasus*, *Pyrus*), medicinal and aromatic plants (*Galanthus* - Snowdrop, *Colchicum* - Autumn or Meadow Crocus, *Origanum* - Marjoram) and other pasture species. This region suffers the effects of disturbing factors such as illegal collection of wild material, landslides due to opening of new field areas, floods and erosion.

Central Anatolia Region: There are many wild plant species, especially around the Salt Lake. The transitional zone between the northern and southern Anatolian regions is very rich in endemic species. The forest trees still remaining are *Ulmus* - Elm, *Pinus nigra* - Black Pine, and *Pinus sylvestris* - Scots Pine. The fruit trees such as *Amygdalus* - Almond and *Pyrus* - Pear and wild pear, need to be conserved. The *Medicago* - Alfalfa and *Agropyron* - Wheatgrass species, among the legumes and grasses respectively, show wide diversity. *Astragalus* - Milkvetch species, which are found commonly in destroyed pastures, are abundant in this region. Also, *Rosa* - Rose, *Salvia* - Sage, *Cistus* - Rock rose, or labdanum, and many other shrubs and herbaceous species are present in the region.

The destruction of pastures due to over-grazing, erosion and, partly, soil salinity are the predominant problems of the region. This region, harbouring genetic resources of plant species resistant to drought and salinity, may have special importance, as global warming and the northward movement of temperate zone are on the global agenda of discussion.

CONSERVATION OF PLANT GENETIC DIVERSITY IN TURKEY

1. Legislative Status

1.1 Constitution

Although the items in the Turkish Constitution are not directly related to the conservation of plant genetic diversity, Article 63 of the Constitution, approved by the nation on 18.10.1982, states that the government should protect its historical, cultural and natural values and resources as well as support and promote conservation efforts made by people. This article also provides the possibility to conserve plant species in their natural habitats. There are items on environment protection in Article 56, items on public benefits priorities in use of private properties in Article 35, items on the optimum utilisation of land in Article 44, items on preventing the misuse of pasture and forages in Article 45, and items on the conservation and development of forest resources in Article 169. These items in the Constitution indirectly support the conservation of plant genetic diversity.

1.2 Other Laws

In addition to the articles present in the Constitution, The Law for Protection of Cultural and Natural Values (Code No: 2863, 1983), Environmental Law (Code No: 2872, 1983), National Parks Laws (Code No: 2873, 1993), Bosphorus Law (Code No: 2960, 1983), Law for Specially Protect Environmental Regions (Code No: 88/13019, 1988), and Forestry Law (Codes: 6896, 1956; 2896, 1983; 3302, 1986) provide the opportunity for the protection of nature and biological diversity, and facilitate activities related to the conservation of plant genetic diversity.

However, the Laws and related Regulations should be reviewed as looking for new management policies for effective and scientific conservation programme, since the *in situ* conservation of target species will be implemented in areas in the contents of the above-mentioned laws. New arrangements, especially in the Forestry Law, should provide the possibility of forest ecosystems restoration, including that of the destroyed genetic diversity of many target plant species. The second item of The National Afforestation and Erosion Combating Law passed in July 1995 (Code No: 4122) is a step towards the restoration of forest ecosystems. During the preparation of projects related to erosion and afforestation, the areas to be afforested should be considered, whether or not they are genetically diversity in herbaceous species, since afforestation will cause a change in natural habitats.

1.3 Regulations

The Regulations legislated by Ministry of Agriculture and Rural Affairs mainly aim at conservation of plant genetic diversity. The most important regulations are the followings:

- 1) The Regulation on the Collection, Storage and Use of Plant Genetic Resources (1992, The Turkish Official Gazette 21,316, pp 4-8),
- 2) The Regulation on the collection, production and export of wild flower bulbs (1995, The Turkish Official Gazette, No. 22,371, pp 5-11),
- 3) The Regulations on the collection of plant materials in Turkey.
- 4) The rules and principles for researches on plants by foreigners regulated by the Ministry of Foreign Affairs (1988, The Turkish Official Gazette. No. 1,979, pp 3-4).

2. International Agreements and Co-operation

Turkey has aimed at actively participating in conservation and controlling the trade of natural and biological resources by signing international agreements at different dates with many institutions listed below. The country gives solid efforts for the implementation of these international agreements. The agreements in which Turkey participates are as follow:

- * Agreement on establishment of European and Mediterranean Plant Protection Organization, Paris, 1951
- * Agreement on conservation of the World cultural and natural inheritances, Paris, 1972.
- * Convention on conservation of European wildlife and habitats, Bern, 1979 (Turkey became a party in 1984).
- * Agreement on long-distance trans-boundary air pollution, Geneva, 1984.
- * Convention on protection of internationally important wetlands providing habitats for birds, Ramsar, 1975 (Turkey signed this in 1994).

- * Agreement on trading of wildlife and plant species, Washington, 1973 (Turkey signed it in 1996).
- * Biological diversity agreement, Rio 1992 (Turkey signed this through legislation article No. 4177).
- * Conference on general principles for conservation of biological diversity in European forests, Ministerial Conference on Protection of European Forests, Helsinki, June 1993.
- * Conference on conservation of forest gene resources. Ministerial Conference on Protection of European Forests, Strasbourg, December 1990.
- * Convention on combating desertification, Paris, 1994.
- * The Agreement on International Plant Genetic Resources (signed between Turkey and the International Plant Genetic Resources Institute (IPGRI) on Jan. 3, 1994).
- * Action plan for maintenance and conservation of plant genetic resources for agriculture and food (Turkey became a part of the plan in International Technique Conference for Plant Genetic Resources held on 06.17-23.1996).

Turkey's Memberships of International Organizations Related to Plant genetic Resources:

Turkey is a member of the following international organizations. However, it is difficult to say whether Turkey gets adequate shares from international funding sources, although the country is in close cooperation with the international institutions below:

- * World Bank (WB),
- * United Nations, Education, Science and Cultural Organization, (UNESCO),
- * International Union for the conservation of Nature and Natural Resources, Switzerland (IUCN),
- * World Wide Fund for Nature, United States (WWF),
- * Council of Europe-Centre Naturopa, France (represented by the Association of Turkish Nature Conservation),
- * United Nations-Food and Agriculture Organization (UN-FAO),
- * International Commission on Plant Genetic Resources, FAO
- * International Plant Genetic Resources Institute, Italy (IPGRI),
- * International Centre of Arid Land Development for Agriculture, Syria (ICARDA),
- * International Centre for Maize and Wheat Breeding, Mexico (CIMMYT),
- * The Union of International Forest Research Organization (IUFRO),
- * United Nations Development Programme (UNDP),
- * European Cooperative Programme for Crop Genetic Resources Networks (ECP/GR),
- * European Forest Genetic Resources Programme (EUFORGEN)

Priority Research Topics

There is a need to carry out many studies and in different areas to those which have been mentioned in the previous sections. A list of research topics on *in situ* conservation of plant genetic resources has also been provided in Appendix 1. Research topics with priorities that should be carried out in the early stages of the National Plan implementation can be outlined as follows:

- * The floristic composition of presently protected areas should be reviewed, the detailed distribution maps for the target species should be prepared and potential GMZ areas should be taken into temporary conservation status.
- * The management plans according to the principles of *in situ* gene conservation of plant genetic resources should be prepared for the areas reserved as *in situ* gene conservation sites including GMZs.
- * The population biology, autoecology, and genetics of the target species indicated in *The National Plan* should be studied in the populations in protected and non-protected lands.
- * To effectively determine the number and size of GMZs for the target plant species indicated in *The National Plan*, the population genetics studies helping to determine the effective population size (or minimum viable population size) should be carried out in populations of target plant species
- * The effects of anthropogenic factors (air pollution, fire, harvesting techniques, grazing etc.) on the genetic composition of target species populations should be determined.
- * For the areas set aside as GMZs as well as already extant *in situ* gene conservation areas, the management plans should be prepared by considering the principles of the *in situ* conservation programmes.
- * A list of land races for the cultivated plants in the country and the *in situ* conservation projects for these cultivars should be developed.

- * To get the attention of local people for effective *in situ* gene conservation programmes, projects that will create employment in the conservation of plant resources for the local people should be developed.
- * To prevent the degradation or destruction of the genetic structure of populations of plant species that are collected and traded improperly, projects should be developed for cultivation techniques (genetic improvement and agriculture) of such plants.
- * To reduce the pressure created by human impact and grazing on plant genetic resources, prototype cultivated pasture and animal-farming projects should be developed by MARA.
- * The research topics and areas, which can be carried out by the NGOs and private organisations due to their expertise, should be determined to have their contribution to the conservation activities.
- * The studies on the CBS communication network should be developed to relate the information to the biological diversity in GMZs.