LIBYA:

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

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CHAPTER 1
Introduction and the Agriculture Sector

1.1 INTRODUCTION

Libya, a North African country, lies along the southern coast of the Mediterranean, approximately between latitude 18° and 33° North and 9° and 25° East. Its total area is about 1,759,540 km^2, of which more than 90% are desert. Most of the agricultural activities are limited to a long narrow strip along the Mediterranean coast, low mountains and scattered oases in the desert. The human population is about 4.5 million inhabitants.

The prevailing climatic conditions are typical of the Mediterranean region characterized by variability and unpredictability. The rainfall is erratic in quantity, frequency and distribution. On the basis of climate and soil conditions, four agricultural regions are recognized.

- The coastal belt: a narrow strip with a width varying between 5 and 25 km along the sea. However, south of this, in the west this plain extends to a distance of more than 100 km in the form of an arc to form what is known as the Jeffara plain. The average rainfall there is 200-250 mm. Supplementary irrigation, using underground water, is a common practice in this area. Future expansion of irrigation using underground water is very restricted due to the lowering of the water table (1 to 5 m/year) and sea water intrusion. The soil in the western part is sandy or sandy loam, very low in nitrogen and organic matter contents with neutral to slightly alkaline reaction, while soils in the eastern part are heavier, mainly sandy loam to clay loam.
- Low mountains (Jabals): there are two distinct and geographically separate low mountain areas located immediately south of the coastal belt, one in the eastern part known as Jabal Al Akhdar, and the other in the western part known as Jabal Al Gharbi. These mountains are generally rocky and stony and intercepted frequently with many wadis (rivers). The average rainfall in Jabal Al Akhdar ranges between 250-600 mm, the soils are terra-rossa or heavy clay. In Jabal Al Gharbi the average rainfall is much less, ranging between 200 and 300 mm. The soils are much lighter and variable than those of Jabal Al Akhdar.
- Semi-Desert areas: which are located immediately south and parallel to the Jabal regions. The average rainfall varies from 50 to 150 mm, and it is

used mainly for grazing. However, some primitive agriculture is still practiced by the nomads in the wadi beds.

- The Desert: consisting of sand dunes and gravely barren, rolling hills on plains. Rainfall is almost non existing. Agriculture was confined to a few scattered oases. Recently, due to the discovery of vast quantities of underground water in some parts of the desert area, some government sponsored agriculture projects have been established, aimed to reclaiming the land and settling the nomadic people. This has resulted in bringing about 100 thousands of hectares under permanent irrigation.

1.2 AGRICULTURAL SECTOR

Agricultural production is dominated by crop production, which account for 5% of the Gross Domestic Product (GDP) and occupies about 13% of the total labor force. The total arable land is about 2,170,000 ha of which 355,000 ha are permanent crops. The permanent pasture and rangeland occupy about 13,300,000 ha and the forest and woodland about 320,000 ha.

The agriculture production is depending mainly on the private sector. The private farms owned by individuals are producing the biggest part of the agriculture products. Some government production projects were established under irrigation in the desert, mainly for cereal and forage production .

1.2.1 Crop production system

The main farming system in the rainfed areas can be distinguished as follows:

- Cereal/Fallow rotation: in the coastal plains, marginal lands and wadi beds in the rangeland areas receiving less than 250 mm average rainfall. Barley, the main cereal crop, is cultivated in good seasons. The area is turned to fallow in the dry seasons. In areas of better rainfall fallow may be applied to control weeds or diseases.
- Continuous Cropping: in the areas receiving more reliable rainfall, mainly in the areas of Jabal Al Akhdar .
- Olive Trees Farms: in the coastal belt, especially in the western part of the country, areas between olive trees can be used for cereal production (barley) and vegetable crops if irrigation is available.
- Orchard Trees Farms: in areas receiving more than 350 mm, which represent about 2% of the total rainfed areas. The irrigation areas used

mainly for fruit trees (mainly *Citrus*) and vegetable production in coastal belt of the western part. Supplementary irrigation is also applied for cereal and forage crops.

The main crops produced in the country are wheat, barley, maize and millet as cereal crops; potatoes as root and tubers; dry beans, broad bean, peas, chickpeas and groundnuts as pulses; tomatoes, cabbage, cauliflower, pumpkin, squash, cucumber, eggplant, onions, garlic, green peas, carrots, water melons, cantaloupes, musc-melons as vegetables; grapes, dates, olives, apples, pears, peaches, plums, oranges, lemons, apricots, almonds and tobacco as fruits and industrial crops. The local production of main crops and the percentage of self sufficiency are shown on Table 1.

Table 1 Agricultural production of main crops in Libya

Agriculture product	Production (1,000 tons)	Self sufficiency (%)
wheat	101	18
barley	177	206
pulses	18	42
vegetables	998	125
fruits	229	93
olive oil	27	47

1.2.2 Forest sector

The main forest type in Libya is the natural forest occurring in Jabal Al Akhdar. Some remaining of natural forests are also found in Jabal Nafusa in the west. The total area of the forest in Jabal Al Akhdar was about 500,000 ha of which 35% were converted to cropping areas. Thus the actual area of these natural forests is about 320,000 ha. This can be shown through the comparison of the areas of the most important species as reported in Table 2.

Table 2 Evolution of forest areas in Jabal Al Akhdar

Species	1959	1979	Percent decrease
Cupressus sempervirens	8,000	0,500	93.75
Pinus halepensis	7,000	5,000	28.60
Juniperus phoenicea	20,000	15,000	25.00
Quercus coccifera	12,000	1,000	91.70

Source: Faraj *et al.* (1993).

The man made forest areas in the western part of the coastal belt where about 150,000 ha were planted in 1981 with different species of *Eucalyptus, Acacia* and *Pinus*. However, only 50 to 70,000 ha were successfully established.

The country mean production of wood is about 20 m^3/ha/year which results in an overall production of 626,000 m^3 of which 85% are used as firewood (charcoal). The country imports all his needs in forestry products, especially wood.

1.2.3 Seed supply

Seed supply depends mainly on the farmer's produced seeds, beside the seeds imported by some national companies, large amount of cereal seeds are produced by the government projects in the south. The local crop varieties are used only in very small scale, especially in cereal production, in some remote places, the commercial improved varieties are used in a large scale. Private nurseries provide most of the required amounts of the orchard trees seedlings.

CHAPTER 2
Indigenous Plant Genetic Resources

The country has a flora of 1,750 vascular species distributed in 744 genera and 118 plant families (Qaisar and El Gadi, 1994). The analysis of the distribution of the species shows that 4 families are represented by more than 100 species each. These are the *Asteraceae* with 237 species, the *Poaceae* with 233 species, the *Fabaceae* with 208 species and the *Brassicaceae* with nearly 100 species. The other sizable families which are represented by a number of species between 50 and 100 are the *Abiaceae*, the *Chenopodiaceae*, the *Lariaceae* and the *Boraginaceae*. The rest of the families are represented by less than 50 species each and concerns the *Liliaceae* (40 species), the *Scrophylariaceae* (35 species), the *Euphorbiaceae* (32 species), the *Ramnculaceae* (28 species), the *Rubiaceae* (28 species), the *Geraniaceae* (24 species), the *Cistaceae* (23 species) and the *Solanaceae* (20 species).

The endemism is fairly low in Libya, since only about 4% of the taxa are endemic (75 taxa). There endemism occurs in 4 main centres: (i) the Jabal Al Akhdar which confines about 50% of the total endemic species, (ii) the Coastal Belt, (iii) the Central part of Sahara and (iv) the Southern part of Libya including Jabal Al Awaynat, Tibesti and Plateau of Ghat (Qaisar and El Gadi, 1994).

2.1 FOREST GENETIC RESOURCES

The forest genetic resources are located in the Jabal Al Akhdar area in the north eastern part of the country where forest types can be distinguished:

- Humid forest types: confined to areas receiving more than 600 mm and occupy an area of about 200 km^2. The important species of this natural forest are *Quercus calliprinos, Laurus nobilis, Arbutus pavarii, Olea europaea, Ceratonia siliqua, Quercus coccifera, Cupressus sempervirens.*
- Sub-humid forest types: confined to areas receiving between 400 to 600 mm of rainfall. The main species are *Juniper phoenicae, Pinus halepensis, Olea europaea, Arbutus pavarii.*
- Semi-arid forest types: confined to areas receiving 300 to 400 mm of rainfall. The important species of this forest are *Sarcopoterrium*

spinosium, Pinus halepensis, Juniper phoenicae, Pistacia lentiscus, Rhus tripartitum Periploca laevigata.

- South Jabal Al Akhdar forest types: found in the zone located north of Benghazi plain and in the hills south of Jabal Al Akhdar. This area is receiving 200 to 300 mm of rainfall. The species encountered in this area are *Rhus tripartitum, Pistacia lentiscus, Periploca laevigata.*

Although, there are many measures and legislation preventing the damage of the natural forests, but they are not always applied. Therefore, most types of these forest have suffered extreme degradation mainly through the mismanagement by the people making fire wood, and converting the forest areas to a cropping land. The pace of destruction has been accelerated by the introduction of the mechanization. As a result of these factors, many indigenous species such as cypress (Cupressus sempervirens), pine (Pinus halepensis), oak (Quercus coccifera and Quercus ilex), pistachio (Pistacia atlantica) have became threatened by extinction.

2.2 WILD SPECIES AND WILD RELATIVES OF CROP PLANTS

Wheat and barley are the main field crops in Libya. Wild relatives of these crops such as *Aegilops ovata*, *A. kotschyi*, *A. ventricosa* and *Hordeum spontaneum* are still found in some areas. Wild species of forages and pasture crops which occur in the country are annual medics (*Medicago littoralis, M. truncatula, M. tornata, M. minima, M. polymorpha, M. laciniata*,...); vetches (*Vicia* sp.), Lupin (*Lupinus* sp.), other legumes (*Astragalus* sp., *Lathyrus* sp., *Lotus* sp.).

Medicinal plants are distributed all over the country. More than 100 species are massively used by Bedouins or local people, in folk medicine as hot or cold drinks, or chewed raw materials as fresh or dry. Also these are used externally to cure dermal diseases, either viral or bacterial infections, insects or animal bites or burns and sometimes for the treatments of the hair problems. The flora of these medicinal plants is very well documented (El Gadi and Bshaina, 1992; Kotb, 1985). The most important species are *Achillea santolina, Ajuga iva, Alhagi maurorum, Andrcymbium gramineum, Artemisia arborescens, Artemisia herba-alba, Calotropis procera, Capparis spinosa, Citrullus colocynthus, Cuscuta planiflora, Cymbopogon schoenanthus, Cynomorium coccineum, Datura stramonium, Ephedra alata, Globularia alypum, Hyoscyamus albus, Juniperus phoenicea, Marrubium vulgare, Myrtus communis, Peganum harmala, Ricinus communis, Rosmarinus officinalis,*

Ruta graveolens, Salvia officinalis, Teucrium polium, Thymus capitatus, Urginea maritima, Urtica urens, Withania somnifera, Ziziphus lotus.

Many local plants in Libya are used as ornamental. The most important ones are *Astragalus sp., Ceratonia siliqua, Cistus sp., Colchicum ritchii, Dianthus barbatus, Hibiscus subdariffa, Iris germanica, Ocimum basilicum, Pelargonium odoratissimum, Retama reteam, Rosa gallica, Rosmarinus officinalis, and Salvia officinalis.*

Actually there is an imminent danger of genetic erosion of all wild species because of the heavy grazing, human use and drought hazards which occurs more frequently in the country. There is an urgent need for international assistance to collect the endangered plants and to conserve the genetic resources.

2.3 LANDRACES AND OLD CULTIVARS

The landraces of some cereal and forage crops are still used for seed and forage production such as wheat, barley and alfalfa. These landraces with desirable characteristics and traits such as good quality, drought and disease resistance have been used in developing improved varieties. This is the case of landraces of bread wheat (Echaafi, Khrissi), durum wheat (Jlail-Dib and Hmira). The landraces Sahraoui and Fellahi of barley and Tamzdaoui of lentil are still used by farmers in different parts of the country. The farmers are preferring the landraces and old cultivars because of their backing quality or other desirable characters. For fruit trees and date palm, several old varieties are still in use by the farmers (Table 3).

Table 3 Landraces and old varieties of fruit trees available in Libya

Crop	Number of varieties
Date palm	393
Almond	7
Apple	4
Pear	2
Peach	3
Olive	5
Grape	6
Pomegranate	3
Apricot	3
Fig	8

The vast expansion of the agriculture in the marginal areas and natural forests in the last two decades has caused big damage to the natural resource of the indigenous plant genetic resources. The government is discouraging the use of such old varieties by promoting the new improved ones. Local people are not committed to conserve landraces unless a special conservation programme is implemented.

CHAPTER 3
National Conservation Activities

3.1 *IN SITU* CONSERVATION

The conservation activities in Libya started since 1956 with the creation of the Forestry Department in the Ministry of Agriculture. This administration was very active in implementing several projects related to the control of desertification, sand dunes fixation and the establishment of parks and reserves. Table 4 shows the area and location of the main reserves and parks. Although these parks and reserves were for wildlife conservation, they also serve the purpose of wild and weedy species.

Table 4 Natural reserves and parks in Libya

Reserves / Parks	Area (ha)	Location
Bir Ayad Reserve	12,000	150 km South West of Tripoli
Hiesha Jadida Reserve	100,000	300 km East of Tripoli
Abu Ghilan Park	4,500	60 km South of Tripoli
Surman Park	1,450	51 km West of Tripoli
Gharabouli Park	8,500	60 km East of Tripoli
Wadi El-Kouf Park	8,000	1,200 km East of Tripoli
Total	**134,450**	

Source: Khatabi, K. (1993)

3.2 *EX SITU* COLLECTIONS

Although, there is no national genebank in Libya, germplasm collecting activities have been conducted since 1960 (Table 5) in collaboration with international centres and institutes (ICARDA, IBPGR) and institutions from developed countries (Istituto del Germplasma, Bari, Italy and CSIRO, South Australia). The expedition missions were not conducted in a systematic manner, but they were planned according to the national needs. During these missions, collected samples were equally divided with the international institutions.

1. During the period of 1962-1965, the importance of the plant genetic resources became apparent when agriculture sector was studied and the problems were defined. During this period a total of 37 cultivars of bread wheat, durum wheat and barley were collected (Table 5) and characterized in the ARC research stations in different sites of the country.

2. In the frame work of the FAO/EMASAR project, the ARC has conducted in coordination with IBPGR two prospection missions in 1978 and 1979. The purpose was to collect indigenous forage and pasture species, particularly annual medics. A total of 2,160 and 244 accessions were collected during the first and second year.

3. In 1981 a collecting tour was organized in the Jabal Al Akhdar area by the ARC in collaboration with IBPGR and Istituto del Germplasma in Bari, Italy. During this mission, 78 samples of wild species and wild relatives of wheat and barley were collected.

4. A collecting expedition was also organized in 1981 by the ARC in the frame work of the Libyan Medic Evaluation project. During this mission 208 ecotypes of annual medics were collected.

5. A multi-crop prospection mission was undertaken in May 1982 by the ARC in collaboration with IBPGR and Istituto del Germplasma in Bari, Italy. 73 samples of wheat, barley, maize, vegetables, fodder and spice plants were collected.

6. A collecting mission was carried out in 1983 by the ARC in collaboration with the Istituto del Germplasma in Bari, Italy and the Zentralinstitut fur Genetik und Kulturpflanzenforschung, Gatersleben, German Democratic Republic. 316 accessions of cereal crops, food legumes, vegetables and other crops were collected.

7. The ARC in collaboration with ICARDA has conducted in 1990, an expedition to collect the wild relatives of wheat and barley. 38 samples were gathered in 19 sites.

8. In 1992, a collecting mission was undertaken in the western regions of the country by the Range and forests section of the ARC. Twenty ecotypes of five range species were collected.

Table 5 Germplasm collecting in Libya

Year of collection / Institution	Species collected and number	Site of conservation
1962-65. Libyan Ministry of Agriculture	Bread wheat (13), Durum wheat (9), Barley (15)	-
1978 & 1979. ARC/IBPGR/ FAO-EMASAR	Medicago (1925), Astragalus (122), Hippocrepis (87), Hedysarum (44), Lotus (61), Others (165)	IG Bari CSIRO
1981. ARC/IBPGR/IG Bari	Wheat (32), Barley (27), Oats (4), Wild grasses (15)	IG Bari
1981. ARC/LMEP	Medicago (208)	CSIRO
1982. ARC/IBPGR/IG Bari	Triticum (37), Aegilops (5), Hordeum (15), Sorghum and other cereals (8), Vegetables (9), Zea mays (2), Fodder & spices (2)	IG Bari
1983. ARC/IG Bari/ ZGK Gatersleben	Wheat (61), Barley (48), Sorghum (19), Maize (12), Pearl millet (10), other cereals (12), Faba bean (12), Other pulses (32), Vegetables, spices & Other species (111)	IG Bari
1990. ARC/ICARDA	Aegilops (24), Hordeum (10), Triticum (4),	ICARDA
1992. ARC	Rhus, Periploca, Helianthemum, Lolium, Artemisia	ARC

3.3 STORAGE FACILITIES AND REGENERATION

The country is lacking storage facilities and all the germplasm available in the ARC is maintained through cyclic multiplication and regeneration. This activities is a bottleneck for the ARC since it requires large amount of labor and funds, besides the risks of contamination. However, duplicates of the previously collected materials are preserved at international genebanks such as ICARDA, Syria; Istituto del Germoplasma, Bari, and CSIRO, South Australia. Actually, more than 5,000 accessions are maintained by the ARC (Table 6). The seeds are stored in glass bottles and paper bags at room temperature without any humidity control. Important efforts are made by the ARC scientists to maintain the viability of these accessions, especially the promising ones. Therefore, there is a big need to establish a genebank to preserve the present plant genetic resources, to provide good source of the

seeds for the different research activities, and to encourage and facilitate more collection efforts of the local plant genetic resources.

For vegetatively propagated plant mainly fruit trees, several cultivars and varieties are planted in field genebank in different ARC research stations (Table 7). There is no botanical garden in Libya as yet. However, the Department of Botany, Faculty of Agriculture, Al Fateh University has a good herbarium.

Table 6 Number of accessions maintained by the ARC

Crop	Number of accessions
Cereals	
Barley	2,500
Bread wheat	1,000
Durum wheat	800
Triticale	50
Food legumes	
Faba bean	200
Chick pea	200
Lentil	100
Forages	
Annual medics	220
Vicia	60
Lathyrus	20
Oats	5
Total	**5,155**

Table 7 Introduced varieties of fruit trees planted in field genebank

Species	Number of varieties/cultivars
Almonds	25
Pears	17
Grapes	65
Olives	36
Prunes	18
Peaches	18
Apples	13
Apricots	6
Pomegranate	4
Figs	8
Pistachios	10

3.4 CHARACTERIZATION AND EVALUATION

The evaluation programmes of cereal crops, food legumes and forages species are being conducted in collaboration with CGIAR Centres (ICARDA, CIMMYT and ICRISAT) and ACSAD. However, one of the most important projects for conserving local plant genetic resources was the Libyan Medic Evaluation Project. This started with the cooperation of the West Australian Department of Agriculture during the period of 1980-84. A total of 1,400 accessions were evaluated and 40 promising ecotypes were selected for advanced trials. In general the IBPGR descriptors are followed during the evaluation work.

3.5 DOCUMENTATION

The documentation of the collections available are not computerized and the information is scattered between different programmes. Passport and evaluation data are kept manually on field cards. Characterization and evaluation data of Medicago accessions are well documented and information is kept manually at the ARC and in a computerized form in Australia.

CHAPTER 4
In-Country Use of Plant Genetic Resources

4.1 USE OF PLANT GENETIC RESOURCES COLLECTIONS

The breeding programme in Libya is not well staffed of trained scientists. Actually, the number of scientists working in different programmes dealing with plant genetic resources does not exceed 14 with only 2 breeders working in the cereal section. Because of lack of germplasm conservation unit, all the plant genetic resources activities (collections, evaluation, etc.) are undertaken by the different programmes themselves.

4.2 CROP IMPROVEMENT PROGRAMME AND DISTRIBUTION

The main function of national breeding programme are to evolve, high yielding better adaptive, resistant to pest and diseases, a crop variety for sustainable crop production. The objective of the research programmes is to meet the national food needs.

The selection programme started within the former Ministry of Agriculture since 1950, and with the establishment in 1971 of the ARC, all the activities related to the plant genetic resources are undertaken by this Center. Because of the high demand of new high yielding varieties, the selection programme which has been based on hybridization at its beginning, is now using semi-finished varieties (F2) developed from local germplasm by CGIAR centres, mainly ICARDA. During the last 20 years, the selection programme at the ARC has developed several varieties of durum and bread wheat, barley and food legumes, which are now grown by farmers (Table 8). However, the major constraints for crop improvement programme at the ARC is the lack of proper research laboratories and trained scientists. For fruit and vegetables, the breeding programme is based only on the evaluation and selection of introduced varieties while there is no forest tree breeding programmes in the country.

Table 8 Varieties released by the Agricultural Research Center

Crop	Variety developed
Bread wheat	Mokhtar, Sidi Masri, Jaminiya, Zellaf, Sebha, Kufra1.
Durum wheat	Barka, Zerda, Merjawi, Fezzan, El Gara, Mexicali, Buhut 103.
Barley	Libya 4, Erawne, Maknousa, Barjouj, El Gattara, El Kouf.
Chick pea	ILC 484, ILC 482
Lentil	Safsaf 1
Alfalfa	Zaouia, Tajureia
Annual medics	Wasat

The agronomists of different programmes are testing and evaluating large number of strains and lines in a small scale variety trials at research stations. The promising material is further tested in large scale on Government project farms. In the absence of seed registration certification authority, the seeds of the selected varieties are multiplication by these projects and made available to the agricultural cooperatives for sales to farmers.

These seeds are not assessed for distinctness and uniformity and therefore not certified. The present situation is not very good regarding the provision of quality seed to the farmer. In fact there is a big risk to find a mixture of seeds sold as a variety. Efforts should be made to establish a seed certification authority and rules.

The extension programme and the farmers are not involved in the development of the variety. Also, seed multiplication is done by the Government projects and private companies are absent. However, the importation of vegetable seed are done through a state company.

4.3 USE OF FOREST GENETIC RESOURCES

The seed of forest trees is collected annually and seedlings are raised in several nurseries under the supervision of forest technicians. The plants are either planted in Government project areas or distributed to farmers to use as windbreaks.

CHAPTER 5
National Goals Policies Programme and Legislation

5.1 NATIONAL PROGRAMME

The Plant Genetic Resources activities in Libya are undertaken by the Agricultural Research Center (ARC) which is under the Secretariat of General Popular Committee for Agriculture. However, the Technical Central Committee for the Protection of the Environment which is under the Secretariat of General Popular Committee for Habitat and Equipment, is dealing with some in situ conservation, mainly national parks and reserves.

The main objective and goal of the ARC for maintaining plant genetic resources are:

- Exploration and collection of Plant Genetic Resources from different agro-ecological region of the country.
- Characterization and evaluation plant genetic resources and its documentation.
- Documentation and publication of plant genetic resources information.
- Training of scientists in different fields related to plant genetic resources.
- Collaboration with national and international research institutes.

Collection, characterization, evaluation and conservation of plant genetic resources are carried out within the ARC by the Cereal and Food Legumes Research Section, the Range and Forestry Research Section and the Horticultural Research Section. The plant genetic resources activities are integrated with the national plan for the conservation of the environment. The main objective of the Government is to insure the conservation and use of this national heritage for food and agriculture.

It should be noted that all the plant genetic resources activities are Government funded and neither commercial firms nor farmers organization are undertaking such activities in the country. However, after the signature by the country of the Convention of Biological Diversity, few Non Governmental Organization (NGO) dealing with the conservation of the environment were established. The most active ones are the Public Association

for the Environment Protection, the National Association for Wildlife Conservation, the Public Association for Olive tree Conservation and the Public Association for Date palm Conservation.

In the absence of a national committee on plant genetic resources, all the activities are coordinated through the Director General of the ARC. The budget of the ARC is released on year to year basis; however, the funds have been always very limited.

The plant genetic resources collections are not protected by any legislation and the Director General of the ARC is the competent authority to decide its fate. There is a need to protect this valuable germplasm by legislation, to conserve it both *in situ* and *ex situ* before it disappears for ever. If this valuable germplasm is not legally protected and conserved, this can pose a serious threat to our national food security.

5.2 TRAINING

The number of qualified scientists working in different sections of the ARC is very limited. Most of them graduated from universities within the country or in developed countries. Some of them were also trained through CGIAR Centres (ICARDA, CIMMYT) or Regional Centres such as ACSAD. Training courses are equally important for both man and women as both are equally undertaking plant genetic research activities.

At present, there is no training on plant genetic resources available within the country. However, the Department of Botany, Faculty of Agriculture, Al Fateh University, Tripoli, is well staffed and can offer special training in taxonomy. International assistance for high degree and short term training of the ARC scientists and technicians is needed regarding all the plant genetic resources fields (collection, documentation, characterization, evaluation, conservation and plant breeding). Although the concern on global basis has been shown for conserving biodiversity, there is an urgent need to create a public awareness at national level about the conservation and the importance of the plant genetic resources for food an agriculture.

5.3 NATIONAL LEGISLATION

There is no laws for the protection of plant genetic resources in Libya, but the control of the importation and exportation of the plant materials is regulated through the quarantine and phytosanitary legislation. All plant material visibly free from any infection can be transferred to/from Libya. In fact, our country is a member of the Plant Protection Convention signed in Rome in 1951.

In order to implement the environment conservation programmes, the Government has established several laws since 1947. The most important ones are:

- The law 5 related to the protection of Range and Forest established in 1982 and amended in 1992.
- The law 7 concerning the protection of the environment established 1982.
- The law 15 related to the protection of agricultural lands established in 1992.
- The law 8 related to hunting and wildlife conservation established in 1952.

Libya has no bilateral exchange of germplasm policy. However, the country has some agreements with some countries such as Italy and Australia, regarding the conservation of local germplasm.

With all the actual changes in the international trades (GATT) and with the development of biotechnologies and genetic engineering, there is a need to international assistance for establishing a national legislation on plant genetic resources and Intellectual Property Rights.

The government does not provide any incentive to the farmers for cultivation/conservation of traditional varieties. At present, the country is lacking seed registration and certification legislation. Therefore, the seeds are sold to the farmer without any label. Regional assistance (CGIAR Centres) on variety release is needed.

5.4 OTHER POLICIES

The seed production program is undertaken on the Government projects and seeds are sold to the agricultural cooperatives which distribute them to farmers. All the agricultural inputs are subsidized by the Government and short and medium term credits are also made available to farmers for purchasing agricultural equipment.

The ARC scientists are involved in planning of major agricultural development projects. However, these project are not always monitored and evaluated for their impact on the conservation and utilization of the plant genetic resources.

CHAPTER 6
International Collaboration

6.1 UNITED NATIONS INITIATIVES

Libya is a member of the FAO commission on plant genetic resources and also signed the International Undertaking to promote the conservation, exchange and utilization of plant genetic resources for food and agriculture. However; in the past, our country did not get much support from the commission. Much more assistance is needed from FAO, particularly for establishing a genebank facilities, for providing laboratory equipment and for training national scientists in different aspects of plant genetic resources. Our country is in support for the creation of an international fund for plant genetic resources. This fund will expedite the conservation activities in the developing countries. Libya has signed the Convention on Biological Diversity (CBD) and has ratified the Convention on the Protection of the World Cultural and Natural Heritage (WHC). The country has also adopted the African Convention on the Conservation of Nature and Natural Resources.

6.2 INTERNATIONAL AGRICULTURAL RESEARCH CENTRES

Our country has established a good working relations and linkages with the CGIAR Centres, mainly ICARDA, CIMMYT and CIAT. Several varieties of wheat and barley selected at ICARDA and CIMMYT are used in the country. In fact, all the breeding programme is done by ICARDA and semi-finished varieties (F2) developed from local material are evaluated in the country. Collaborative research with ICARDA concerning the evaluation of forage legumes (vetches and Lathyrus) is also conducted. Although, the International Plant Genetic Resources Institute (former IBPGR) played a major role in collecting several species in the past, it is of necessity, that collaboration with this Institute should be reinforced. The IPGRI mission is to encourage, support and engage in activities to strengthen the conservation and use of plant genetic resources worldwide. Also, Libya should take advantage of the WANANET.

CHAPTER 7
National Needs and Opportunities

The activities on biodiversity have received some attention in Libya in the past. However, the country is lacking enough qualified scientists and facilities to carry out genetic resources activities. Therefore, tremendous efforts are needed in the future to overcome these problems.

7.1 AT THE INSTITUTIONAL LEVEL AND CAPACITY BUILDING

1. There is a need to elaborate a national plan for the conservation and utilization of plant genetic resources for a sustainable development.
2. Since the plant genetic resources are scattered between different sections of the ARC, it is urgent to establish a national plant genetic resources coordination committee which will include scientists from other institutions.
3. There is an urgent need for high degree and short term training of scientists and technicians in all the fields related to plant genetic resources (germplasm collecting, characterization, evaluation, conservation, regeneration, documentation and utilization).
4. International assistance is needed for developing legislation on plant genetic resources including intellectual property rights and farmer's right.
5. Creation of public awareness through development of effective integrated mechanisms for sensitizing policy makers, scientific, farming communities and target groups on the importance of the conservation of plant genetic resources.

7.2 AT THE TECHNICAL LEVEL

1. Establishment of genebank facilities for at least short to medium term conservation of plant germplasm. Assistance is also needed for collecting, characterization, evaluation and documentation of plant genetic resources in the country.

2. Development of inventories of areas with high plant diversity and survey of endangered and threatened species.
3. Establishment of national botanical gardens.
4. Reinforcement of the breeding programmes of cereal crops, forage species, vegetables and fruit trees.
5. Promotion of *in situ* conservation of forest and range species and wild crop relatives indigenous to the Jabal Al Akhdar as well as other regions. The mechanisms for *in situ* conservation of landraces and old varieties, especially date palms and fruit trees, should be developed .

7.3 INTERNATIONAL COLLABORATION

1. Reinforcement of the collaborative research between the Maghreb countries and with the CGIAR Centres.
2. Encouragement of plant genetic resources information and materials exchange at the regional (Maghreb and Mediterranean) and international level through the creation of specialized networks.
3. More assistance and support should be given by IPGRI to the country in all fields related to plant genetic resources.

CHAPTER 8
Proposals for a Global Plan of Action

1. Creation of international fund for the development of mechanisms for germplasm collection, conservation evaluation, distribution and utilization. Research on storage should be encouraged.
2. Establishment of genebank facilities for at least short to medium term conservation of plant germplasm.
3. Assistance is also needed for Long term and short training of national scientists.
4. Reinforcement of international legislation order to ensure that countries providing genetic resources have access to the benefits arising from their utilization.
5. Promotion of innovative and efficient technologies exchange.

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