EGYPT:

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 Egypt and its Agricultural Sector

Egypt covers a land area of about one million km^2 in the hyper-arid regions of North Africa and West Asia as ride the Sahara and the Arabian desert, with an annual rainfall in most parts of less than 50 mm. It consists of three main parts; Sinai (61,000 km^2), the Eastern desert extending between the River Valley and Red Sea Coast (223,000 km^2) and the Western desert extending between the Nile River Valley until the Libyan border (681,000 km^2), with a coastal belt that extends along the Mediterranean Sea from Rafah to El-Salloum (850 km^2) (Fig. 1).

Egypt is situated at the crossroads of three continents, and at the junction of three biotic realms; Europe, Asia and Africa. The ecosystems found in Egypt as well as their associated flora and fauna reflect the influence of these distinct biotic regions. The biotic regions in the North are related to those of the Mediterranean Basin. The Eastern part of the country reflects influences from the Levant and the Arabian Peninsula. The biotic regions found in the South are influenced by Sudanian and Tropical Africa, and to the West, areas are related to the Saharan biotic regions found elsewhere in North Africa.

Many of the biotic regions found in Egypt represent the extreme limits of their respective ranges, which makes the biological diversity found in these areas of special scientific importance.

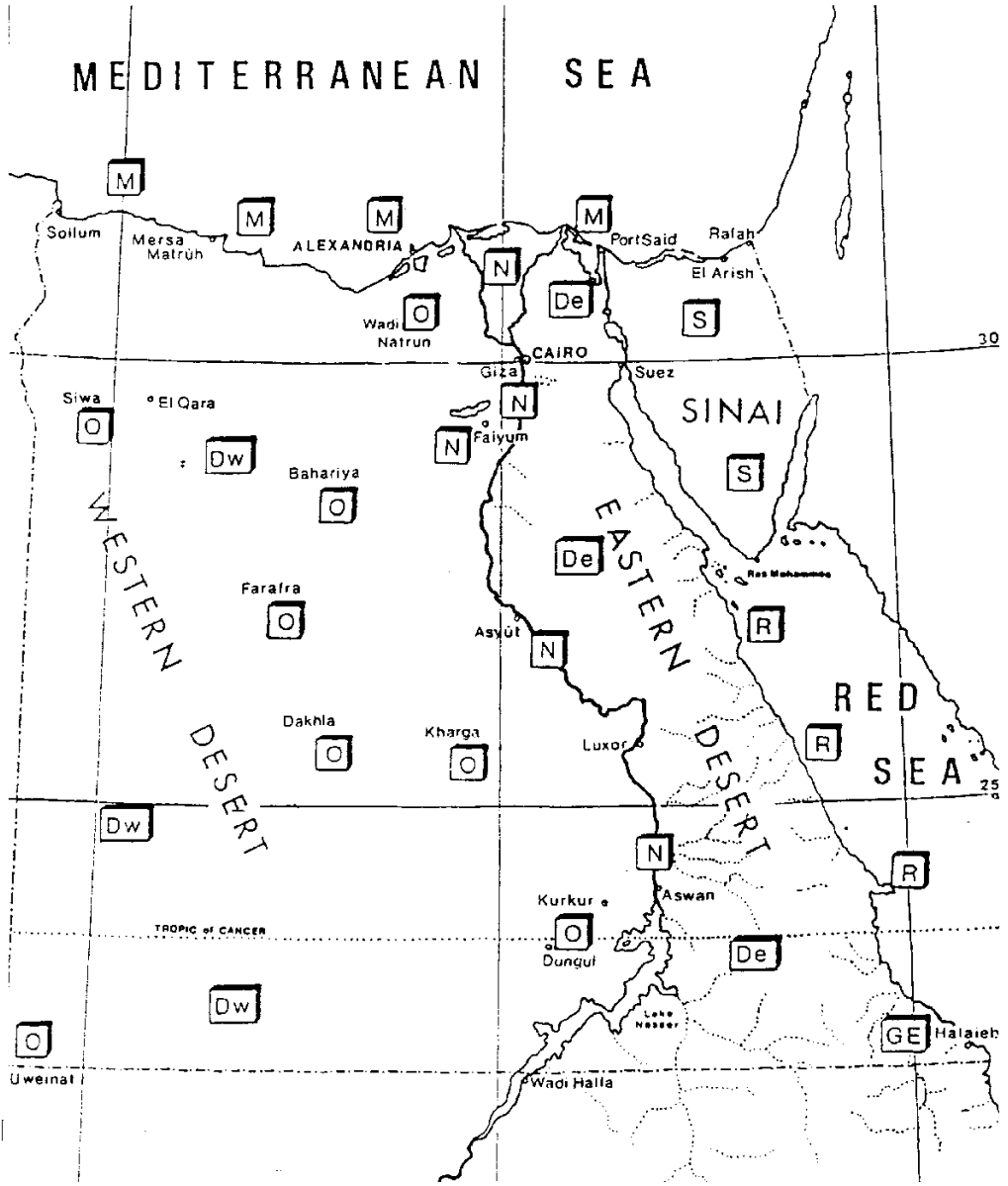


Fig. 1: Map of Egypt see the Abbreviations in the back side.

The Egyptian economy has traditionally relied heavily on the agricultural sector as a source of growth. This central role was reinforced by the strong performance of the sector in the 1960's and 1970's. While this dominance has declined in recent years, the agricultural sector still accounts for about 20 percent of both GDP and total exports, and about 34 percent of employment. The relative decline in the role of agriculture partly reflects the strong growth in other sectors, particularly in petroleum (and to a smaller extent in services and construction). In addition, prior to the initiation of the sector policy reforms in the 1980's, the agricultural sector was characterized by distortions which impacted negatively on the development of the sector; it also received a declining share of the total public sector investment during the last 25 years, which in turn was not always optimally allocated between the different subsectors.

Agricultural GDP grew in real terms at an average annual rate of 2.7 percent in the 1960's, 3.5 percent in the 1970's (reflecting the beneficial effects of the Aswan Dam) and 2.5 percent in the 1980's.

The target growth rate for agriculture is projected at an average of around 3.0 percent per annum for the 1990's. This will allow for realizing a target GDP growth rate of between 4-5 percent by the end of the decade, and for positive per capita agricultural growth given a population growth rate of around 2.5 percent.

Farm sizes in Egypt are generally small, averaging less than 2 feddans. It is estimated that nearly 50 percent of the farmers own less than one feddan each, and 84 percent of small farmers hold only 50 percent of the total area; fragmentation is common, though leasing does play an important role in consolidating fragmented holdings. Agricultural land is generally privately owned, though an estimated 250,000 feddans of the reclaimed "new" lands are owned and operated by public sector companies; the government has started selling off the publicly owned lands to private farmers and investors (Table 1).

Table 1 Distribution of Land Ownership

Ownership size	Percent of Land Owners	Percent of Area Owned
Less than 5 feddan	95.5	53.9
5 to 10 feddan	2.4	10.5
10 to 20 feddan	1.2	10.2
20 to 50 feddan	0.7	11.5
50 to 100 feddan	0.2	7.4
More than 100 feddan	0.1	6.5

Source: CAPMAS, Statistical Yearbook, 1985 Data

The agricultural land base of Egypt totals about 7.5 million feddans (feddan = acre = 4,200 m²). Some 5.4 million feddans are "old" lands, 1.9 million feddans are "new" lands, reclaimed since 1952 and the remaining 200,000 feddans elsewhere (rainfed and in oases). The total cropped area in 1990 was estimated at about 12.1 million feddans, giving a cropping intensity of around 180 percent for the country as a hole, after taking into account perennial crops. The major crops are wheat, maize, rice, berseem (clover), cotton, broad beans, sugar cane, vegetables, and fruits(see table 3). It is presently estimated that cotton, wheat, rice, maize, and berseem together account for 80 percent of the cropped area. Natural pastures are only confined to the northern coastal areas.

The production of wheat, maize, beans, fruits, and vegetables has recorded significant increases over the past decade; cotton production has however, declined.

Table 2 Summary of Area, Yield and Production Changes 1980-90

	Area			Yield			Production		
Crops	**1980**	**1985**	**1990**	**1980**	**1985**	**1990**	**1980**	**1985**	**1990**
	'000fd	index	index	ton/fd	index	index	'000t	index	index
sugarcane	253	99	108	34.2	110	119	8,653	109	129
Gardens	361	127	183	6.1	103	102	2,218	133	186
Vegetables	880	105	107	6.4	140	144	5,675	147	154
Wheat	1,326	89	147	1.3	117	162	1,790	105	239
L. Berseem	1,722	112	96						
Sh Berseem	990	93	80						
Beans	276	123	125	0.9	122	142	240	150	178
Maize	1,905	100	104	1.7	114	144	3,227	115	149
Rice	972	95	107	2.4	100	116	2,379	96	124
Cotton	1,245	87	80	1.1	94	73	1,408	82	58
Sorghum	398	83	78	1.6	103	127	642	85	99
Potatoes	167	106	113	7.3	115	119	1,214	122	135

Source : CAPMAS, Statistical Yearbooks; Index 1980 = 100

Analysis done, shows that Egypt has a strong comparative advantage in the production of fruits and vegetables, cotton and wheat, is moderately competitive in several relatively low water consuming crops (maize, beans, potato, long berseem, and oil seeds), and has a disadvantage in producing water intensive crops, such as rice and sugar cane.

Egypt's agriculture possesses many positive characteristics and potentials, but the challenges facing the sector are significant.

The policy framework within which the agricultural sector operated until the mid 1980's was heavily influenced by government policies. Significant reforms began to be introduced in the 1980's within the framework of an agricultural sector strategy for the 1980's. Since then, agriculture has clearly been at the forefront of other sectors in initiating reforms, as evidenced by, among others, the process of liberalizing input and output prices and eliminating crop area controls. The most important outcome of the reforms of 1986, is that it sensitized the farmers to taking market induced decisions and that there are signs of increasing competition in the agricultural markets. Consequently, farmers should be able to respond to the opportunities for growth under a correct policy environment. However, there are some remaining key issues which constrain the performance and potential of the sector.

Egypt's present area of arable land, at 0.13 feddan per head, is among the lowest in the world. At the same time Egypt has only one main source of water supply (the Nile River). Water and land, therefore, represent the ultimate limiting factor on the country's ability to expand agriculture horizontally. Hence, future growth in agricultural production will need to come from a more efficient utilization of the country's limited water and land resources. The vertical expansion of agricultural production will depend mainly on the proper utilization of available and improved germplasm resources.

In the case of **pesticides**, these are mostly used for cotton and horticulture crops. The government is working hard for a reduction in the use of pesticides.
Farmers are fully aware of the important contribution of **quality seeds** to high agricultural productivity. Presently, the following agencies are involved in the production and regulatory aspects of **seed** production: The Agricultural Research Center, MALR is involved in the breeding of improved Hybrid Varieties, including the production of breeder and foundation seed, as well as in the testing of new varieties; the Central Administration of Seeds (CAS), MALR is responsible for the multiplication, conditioning and distribution of seed, as well as for fulfilling regulatory functions with regard to seed; the Egyptian Agricultural Organization imports foreign seed, and also owns seed cleaning and conditioning facilities which it makes available to the private sector; the Organization for Improvement of Egyptian Cotton, which supervises cotton seed multiplication, rouging and laboratory testing, with CAS maintaining supervisory functions to ensure varietal purity; and six private sector seed companies, which are involved in corn, vegetable and forage crops seed production.

The main objectives for the 1990's plan worked out by the government for the agricultural sector are:

- optimizing the utilization of land and water resources to expand agricultural areas.
- increasing yields in the old lands, through the wide adoption of improved technologies, agricultural and other practices including the use of high yield varieties and good quality of seeds.
- reclaiming more land and improving its production level.
- intensive research and extension efforts, and measures relating to better land and soil management.
- development of crop varieties tolerant to biotic stresses to expand agriculture horizontally in the new reclaimed land.
- further changes in the cropping patterns and the provision of the required incentives to increase production of competitive products and realizing an export surplus.
- the complete liberalization of the production, marketing and export of all crops.
- preparation of a comprehensive national agricultural research policy, with a view to enhancing the planning and coordination of research activities at the national level.
- removing the bottlenecks to competition an transparency of privati zation efforts.
- reducing dependence on the import of agricultural crops and products.

CHAPTER 2
Indigenous Plant Genetic Resources

2.1 OTHER WILD SPECIES AND WILD RELATIVES OF CROP PLANTS

In Egypt, 2,112 species and 153 infraspecific epithets (subspecies, variety, forma) of native and naturalized vascular plants are distributed over a vast area compromising a wide ecological variation. Among these species, many useful wild species and wild relatives of several crop plants are found. Several species of the following plant genus are some of the useful plants, which could be considered as important plant genetic resources for possible economic use and sources for genetically useful traits:

Hordeum., Trifolium, Vicia, Gossypium, Allium, Sorghum, Brassica, Vigna, Medicago, Citrulus, Phasuolus, Corchorus, Solanum, Phoenix.,

Many species of the above mentioned genus are still available in the wild. Quite a number of these species have either disappeared or are at the brink of disappearance.

Egypt is the home of the wild relatives of some food crops and many pastural and medicinal plant. This rich plant genetic diversity is continuously deteriorating, especially during the last decade, in view of the population explosions, modernization, and innumerable human activities using improper technologies in addition to problems related to over-grazing and the replacement of natural vegetation with other crops. The most impressive characteristic of Egypt is the presence of several isolated sites (i.e. oases), which represent enclaves for special rare and endemic plants. The coastal area of the country represents a transition from the Mediterranean climate to the Saharan one. This, together with the mountains of Sinai and the desert areas has a remarkable impact on the biodiversity found in Egypt.

There is a great need to put mechanisms for the protection of the important indigenous plants. Many of these plants could be utilized in the development and improvement of many crop varieties. Some of the available indigenous plants contain genes for disease and insect resistance, tolerant to soil salinity, heat and drought or possess other desirable traits, which might be needed in national and international crop improvement programs.

2.2 LANDRACES (FARMER'S VARIETIES) AND OLD CULTIVARS

Farmers in Egypt are planting quite a number of crops using traditional varieties and old cultivars. Improved varieties are mainly used for cotton, wheat, barley, maize, sorghum, lentil, faba beans, soya bean, sun flower, onion, peanut, flax, sugar cane, rice, cantaloupe, water melon, green pepper, carrots, egg plants, tomato, cucumber, potato, sweet potato, sugar beat, apples, grapes, mango, bananas, pears, beaches, plum, and olives (Table 3). However, landraces of some crop varieties of barley, maize, sorghum, faba beans, lentil, onion, flax, peanut, carrots, eggplant, tomato, grean pepper, citrus, mango, sweet potato and olives are still planted and maintained as old varieties.

Table 3 The most important agricultural crops cultivated in Egypt

Field crops

Wheat
cotton
Sugar cane
Egyptian clover (Barseem)
Faba bean
Rice Maize
Barley
Sorghum
Sunflower
Peanut
Sesame
Flax
Alfalfa
Egyptian lupin
Chickpea
Cow peas
Millet
Fodder beet

Horticultural Crops

Orange
Mandarin
Lemon
Grape fruit
Banana
Grapes
Strawberry
Fig
Olives
Date palm
Mango
Pomegranates
Guwafa
Apples
Pears
Apricot
Peach
Plum

Horticultural Crops

Tomato
Potato
Onion
Broad beans
Garlic
Lettuce
Cabbage
Spinach
Cauliflower
Cucumber
Carrot
Water melon
Eggplant
Jews mallow
Common mallow
Phaseolus
Peas
Green peppers
Okra
Sweet potato
Artichoke
Snake cucumber

Most of other important agricultural crops cultivated in Egypt, like Egyptian clover, alfalfa, onion, spinach, cabbage, date palm, olives, figs, pomegranates, are planted as old cultivars (Table 1).

The farmers still use old cultivars or landraces for the following reasons:

- Improved varieties are not available.
- Improved varieties are available but the growing of such varieties need special care, high input costs, knowledge and experience.
- Landraces are more adapted to harsh conditions and are resistant to desease and pests.
- the products of landraces and old cultivars of many crops better meet the needs (taste, aroma etc.) of local consumer than of improved varieties.

The government, generally encourages the use of landraces and old cultivars, especially of those species that need to be maintained and protected. On the other hand, it discourages the use of the same if these are strategical crops (like improved high yielding varieties of wheat, rice, maize, among others).

People in Egypt, with some exceptions, are generally not completely aware of the value of indigenous plant genetic diversity. The Government however has paid increasing attention to these problems. The Egyptian Environmental Affairs Agency (EEAA) has been established 1982 as an affiliate of the Council of Ministers. This body is responsible for setting national environmental policies and for their implementation, including conservation of natural heritage. Egypt has established institutions, passed laws and initiated activities to protect a variety of plant and animal species. Public and mass media campaigns for environmental protection including genetic resources conservation, has strongly increased. Egypt has been blessed with numerous places (16 areas under protection) with rare species of living creatures, especially in Sinai, the Red Sea and the North-West coast.

It is clear that more efforts toward the protection of wild and wild relatives of important plant, landraces and old cultivars are very much needed.

This can only be achieved if the following program can be implemented in the near future:

- conduct survey on present situation.
- conduct collection missions according to given plan.
- conserve base collections in proper way (*in situ*, *ex situ*).
- characterize and evaluate the germplasm.
- provide computerized data and genetic material to users and encourage farmers to grow and maintain such varieties.

The planned NPGRU/E will be responsible for the above mentioned activities (see chapter 5).

CHAPTER 3
National Conservation Activities

3.1 *IN SITU* CONSERVATION ACTIVITIES

As mentioned under 2.3, a program for the conservation of biodiversity, including wild and wild relatives of plant genetic resources has been established. The most important projects in the already established protected areas are the following:

- The Saint Catherine National Park in Sinai is a complex system of mountains and valleys harboring a rich endemic flora and substantial wildlife. The area contains large Bedouin populations and is important to the major religions.
- El Omayed Protected Area is a UNESCO Biosphere Reserve. It provides a better understanding of the management problems of the Western Mediterranean.
- The Ras Mohammed National (marine) Park; coral reefs, desert ecosystem, mangroves, endemic species. This was established in 1989 with the assistance of EEC, a management plan was set and implemented including a visitors center, a field research and monitoring laboratory and necessary infrastructures.
- Nabeq Protected Area, is a unique systems of linked critical ecosystems. These include coral reefs, sea grass beds, most Northerly mangroves in the Red Sea-Indian Ocean complex, wetlands, dunes covered by a characteristic stabilizing vegetation, desert ecosystem, brackish water oasis and desert / mountain ecosystems containing a good representation of desert fauna. This was established in 1992 with the assistance of EEC.
- Abu Galum Protected Area; coastal and mountain desert ecosystem, coral reefs, genetic resources, landscapes, cultural heritage. This was established and funded in 1992 with the assistance of EEC.
- Wadi El Assiuty Protected Area; desert ecosystem, genetic resources, wildlife management.
- Wadi Allaqi; a UNESCO Biosphere Reserve Research, wildlife genetic resources, cultural heritage, test area for sustainable agricultural development.

- Wadi Rayan; Desert springs, complex ecosystem consisting of 20 plant species, more than 100 bird species, 16 reptile species; Saharan sand dune ecosystem; marine mammal fossils.
- Elba Conservation Area; important vegetation, mangroves, wildlife, micro climates, landscapes, cultural heritage.

The above mentioned *in situ* conservation sites are mainly managed by technical experts.

Much more efforts are needed in the future to protect plant genetic diversity in different areas, especially at the Northern coast, in oases, Sinai, and in other remote areas.

A new pilot project "Peace Campus", has started in the region to conserve crop genetic resources in gene parks in the Central and East Mediterranean. Scientists from Italy, Germany, Egypt, Israel, Jordan and the West Bank of Palestine Territories are involved in this project.

The scientists have jointly set up strategies and approaches for this project.

Within this project, Egypt will maintain indigenous varieties of date palm, figs, and olives at different locations in Sinai, the coastal strip and in Siwa Oasis. The project will help in providing some farm inputs. The farmers (Users) will maintain the palms and trees and will benefit from the products of these plants. The final aim is to protect and maintain the diversity of important plant genetic resources under their natural growing condition.

3.2 *EX SITU* CONSERVATION

A national program for *Ex situ* conservation has only recently been developed. The new National Plant Genetic Resources Unit/Egypt (NPGRU/E) will be responsible for the *Ex situ* conservation program (see under chapter 5).

In the past, institutions and individuals have collected crop germplasm all over the country according to their need and in the absence of a national program.

Coordination between the involved parties was not achieved. The absence of adequate seed technology, conservation, evaluation and data documentation facilities, as well as qualified staff, were factors which have caused the loss of most germplasms collections in Egypt.

The plant Genetic Resources Section in Bahteem of the Field Crop Research Institute, ARC, MALR (see under 3.3) was not in the position to fulfill the national needs. The following seed collections are stored under unreliable storage conditions in Bahteem PGR Section at - 20°C with duplicate accessions at - 5°C:

- 1,576 wheat accessions and 1985 barley accessions collected from Egypt in the 1980's by scientists from Assiut University, Egypt in cooperation with the University of California, USA. Information on these collections is not available.
- 1,034 accessions of different crops were delivered by different sections of the Field Crops Research Institute, ARC, MALR. Information on these collections was not given by the scientists.
- 2,297 samples of different species were collected during the 1980's and 90's in cooperation with IBPGR (IPGRI) and ICARDA. Passport data is available.

Apart from the above mentioned germplasm collections, breeders and scientists at several institutions are maintaining some germplasm collections under short-term conservation conditions. Most of this germplasm is continuously threatened of loss due to the very poor storage conditions. Data on such germplasm collections is made manually and is difficult to obtain (see working plan and strategies of the newly established National Plant Genetic Resources Unit of Egypt in chapter 5).

The Horticultural Research Institute of the Agricultural Research Center, MALR has started with the establishment of a Field Genebank in order to preserve the most important fruit trees and "land races" in the country.

Preparation of about 500 acres land in the Northwest of the delta is underway.
In Egypt several botanic gardens had been established. Plant spices in theses garden were introduced into the country during the last 120 years. Following botanic gardens can be found:

Name of Botanic Garden	Area in acre	Time of establishment and location	Number of plant spices
Orman	28	1873, Cairo	215
Asswan	17	1928, Asswan	371
Zoo Garden	80	1890, Cairo	342
Zohria Garden	8	1868, Cairo	329
Kubba Garden	124	1960, Cairo	350
Faculty of Science, Ain Shams Univ.	2	1954, Cairo	1,500

Several herbarium of dried native plants (specimen) can be bound in Egypt. The Botanic section of the Faculty of Science, Cairo University, Ain Shams University and the Agriculture Museum, MALR are maintaining, among other herbarium in Egypt, a big herbarium collections. The herbarium serves as an reference for the vegetation of several groups of native germplasm in Egypt.

3.3 STORAGE FACILITIES

The Field Crop Research Institute of the ARC, MALR has established 1987 its Plant Genetic Resources Section in Bahteem, near Cairo. Attempts towards the upgrading of this unit to serve more scientists or to improve its activities at acceptable standards have failed. The Bahteem Unit was established from funds allocated by the Field Crops Research Institute and later the unit has received additional support from IBPGR/IPGRI and from the USAID.

The following seed storage facilities at the Bahteem Section are available:

Storage capacity of cold or drying rood	Temperature	Information
Cold rooms		
124 m³	- 20°C	The given storage conditions
57 m³	- 5°C	are not reliable because:
63 m³	+ 5°C	• cold stores and drying units are not properly isolated • breakdown of the system is frequent due to problems with electricity and the maintenance of the facilities
Seed Drying Rooms		
63 m³	+ 25 °C and 20% relative humidity	

- Equipment for seed processing and data computerization is partly available in Bahteem PGR Section. Other facilities like for seed testing and germplasm evaluation is missing.
- In addition a 120 m³ cold store (+ 15°C) at ARC Head Quarter is available for the working collections of maize germplasm.

- The Cairo University Field Crops Section of the Faculty of Agriculture , has a 40 m³ cold store (+5 °C) to conserve working collections of maize seed accessions.
- Field Crops Section, Faculty of Agriculture, Assiut Univ. is provided with a 25m³ cold store (+ 5°C and 40% relative humidity).

3.4 DOCUMENTATION

Most of the germplasm information is documented in registers belonging to individual breeders and scientists working in different institutions at several places. Only at few places, records are computerized but not in a form similar to the one normally found at Genebanks. Exchange of germplasm information between institutions and individual scientists was, therefore, very limited. This situation is the result of not having a kind of germplasm system in the country and because of the absence of a national genebank.

Information on plant genetic resources in Bahteem PGR section are very limited (see under 3.2). With other words, this PGR section had very little information to exchange and no role to play in terms of coordination of documentation work at any level (see plans of the NPGRU/E in chapter 5).

3.5 EVALUATION AND CHARACTERIZATION

Like other genebank activities, evaluation and characterization of germplasm works are not coordinated in the country. No standardized crop descriptors are developed or in use. Exchange of genetic material and its information was therefore, inadequate. Farmers are in most cases not directly involved in the germplasm evaluation work.

In the past, many plant breeders and other scientists had characterized and evaluated a big proportion of the economically most important germplasm. On the other hand, and because of the lack of coordination and the absence of an adequate documentation system, the information on germplasm is either incomplete, very difficult to find, or even lost. Only a small proportion of the national collections (landraces) has been properly characterized, evaluated (about 15%) but the germplasm information still needs to be compi led and computerized.

During the last two decades much more attention has been given to the evaluation of introduced genetic materials under local conditions.

Egypt is producing a relatively big number of good scientific institutions and an adequate number or qualified specialists.

One of the main objectives of the planned National Genebank is the mobilization of all these available working resources and the coordination of genebank activities. With current resources it is possible, that most of the locally valuable germplasm is evaluated during the coming years.
Egypt has already started with collaboration activities especially with international agricultural research centers in order to improve work with germplasm evaluation and utilization.

Activities concerning the evaluation and characterization of genetic resources held *in situ* are still inadequate, but some programs have been initiated in cooperation with several international organizations during the last 3 years. More assistance is required, if notable progress is to be achieved.

3.6 REGENERATION

At almost all plant breeding and research institutions, scientists are keeping germplasm samples under unfavoured storage conditions.

As a result, the germplasm holders have to generate the germplasm accessions in short intervals. This exercise is not only expensive, but also extremely time consuming, and accompanied by many other risk factors, especially in the absence of adequate working facilities or in the presence of limited ones like at the Bahteem PGR section.

A national plan for germplasm regeneration which involves all available working resources does not exist. Programs for up-grading the working facilities were not developed.

The main efforts in the past were directed towards the regeneration of the germplasm kept as working/active collections by breeders which they are using in their programs. The rest of germplasm remains without regeneration.

A national program for germplasm regeneration will be developed and implemented as soon as the new NPGRU/E with its network begins functioning (see under chapter 5).

The Agricultural Research Center (ARC), MALR is mainly the responsible institution for the introduction, local collection and the production and release of improved germplasm varieties.

In addition, scientists, mainly at local universities, at the National Research Center (NRC), and the Desert Research Center (DRC), are also involved in the collection, evaluation, regeneration and utilization of crop plant genetic resources.

CHAPTER 4
In-Country Uses of Plant Genetic Resources

4.1 USE OF PGR COLLECTIONS

The most frequently used genetic resource collections in national programs are wheat, maize, cotton, faba beans, clover, alfalfa, sorghum, barely, sugar beet, sugar cane, sun flowers, garlic, onion, tomato, water melon, grape, peach, apple, pears, banana, citrus, olives, mango, cantaloupe, strawberry, cauliflower, cabbage, egg plant, peas, okra, taro, sweet potato.

The germplasm accessions of different corps are under the control of many germplasm holders in the country.

Germplasm of many Egyptian crop landraces are still in use in commercial agriculture.

Berseem clover (*Trifolium alexandrinum* L.), barley maize, faba beans, onion, sorghum, date palm, Guava, and some other medicinal, forage, oil and horticultural crops are the most important ones to be mentioned.

Egypt, particularly during the last few decades, has introduced enormous numbers of germplasm species from abroad and has used them commercially either without or after their involvement in crop improvement programs.

Computerized data on germplasm activities is very limited. Therefore, and because of the lack of co-ordination in germplasm activities, no reliable information on the exchange and frequent utilization of available germplasm collections can be given.

Farmers have access to genetic resources through a different way. Farmers in many cases prefer to maintain their own plant genetic resources for one or more seasons, for later utilization in the field. Egyptian clover, barley, wheat, faba beans, and quite a number of horticultural species are only examples of this way of self-supply.

The nation wide distributed private and governmental nurseries, seed supplying shops, and agricultural co-operatives are another source for crop germplasm of landraces, improved varieties, and hybrids.

4.2 CROP IMPROVEMENT PROGRAMS AND SEED DISTRIBUTION

The main functions of the national breeding programs are concentrating on the adaptation or further improvement of the imported germplasm (mainly of horticultural crops, wheat, maize, sugar cane, sugar beet, and rice, among others) and on the improvement of local varieties, like cotton, faba beans, sorghum, clover, and others (Table 4).

The introduction of germplasm with specific characteristics for the use in breeding programs and in the biotechnology is also in practice.

4.3 USE OF FOREST GENETIC RESOURCES

(See Annex 1)

Table 4 List of Bred Plant Crop Varieties Released During the last 5 Years in Egypt

Crop	Released varieties 1989-1994
Cotton	Giza 45, Giza 77, Giza 70, Giza 76, Giza 84, Giza 75, Giza 81, Giza 86, Giza 80, Giza 83
Wheat	Giza 157, Sakha 8, Sakha 92, Sakha 61, Sakha 69, Giza 155, Giza 160, Giza 163, Giza 164, Giza 165, Gimeza 1, Sohag 1, Sohag 2, Sohag 3, Bani Sweaf 1
Barley	Giza 123, Giza 124, Giza 125, Giza 126, Giza 127, Giza 128
Maize	Giza 2, Single cross (white) 9, 10-S.C. (yellow) 151, 152, 155 Double-way cross (Giza 204, Giza 215) Three-way cross (white) (310, 320, 3221, 322) T.W.C. (yellow) (351, 352)
Sorghum	Giza 15, breading line No. 113, local variety No. 129, selection no. 1007, Dorado
Rice	Giza 171, Giza 172, Giza 175, Giza 176, Giza 181, Giza 177, Giza 187
Flax	Giza 5, Giza 6, Giza 7, Giza 8
Peanut	Giza 1, Giza 2, Giza 3, Giza 4, Giza 5
Sesame	Giza 23, Giza 24, Giza 25, Giza 32
Lentil	Giza 370, Giza 9
Lupin	Giza 1, Giza2
Other crops	14 varieties

Source: Crop Research Institutes of the Agricultural Research Center, MALR

4.4 BENEFITS DERIVED FROM THE USE OF PLANT GENETIC RESOURCES

Some other foreign institutions have shown interest in several of the available germplasm collections in Egypt. A number of local institutions are maintaining such germplasm for request from outside the country. Some species of medicinal, forage and ornamental plants are examples to be mentioned. The purpose of sending such germplasm to foreign users is either to strengthen the relationship with those countries or for gaining direct or indirect benefits such as receiving results on germplasm evaluation and utilization or to learn about the possible potential use in/or outside the country.

The collaboration with other national and international institutions is an important policy of the Government of Egypt.

It is believed that the benefits from such co-operation and the exchange of germplasm and its information are great.

4.5 IMPROVING PGR UTILIZATION

In case of horticultural and many other field crops the plant genetic resources activities were mainly concentrating on the introduction of improved species for local adaptation in the last 15 years. That means that priority was given to the utilization of foreign collections.

Some local germplasm collections were involved in the utilization in the commercial plant production.

It can be readily noted that available local germplasm is not sufficiently utilized in Egypt. The reasons for this under-utilization can be summarized as follow:

- Many local valuable germplasm has not been collected.
- Collected germplasm is stored under unfavoured storage conditions and needs to be properly evaluated. The information on germplasm activities is inadequate and difficult to obtain.
- Activities with germplasm evaluation and utilization are poorly co-ordinated and efforts are duplicated.
- A clear strategy and goal-oriented project planning towards the collection and utilization of locally available germplasm is missing.

- In order to overcome all above mentioned constraints, the establishment a well functioning germplasm system was very required (see chapter 5).

CHAPTER 5
National Goals, Policies, Programs and Legislation

5.1 NATIONAL PROGRAMS

As mentioned earlier, the plant genetic resource activities are not organized into a "National Program". Activities are scattered and poorly coordinated.

The following Institutions, mainly, are involved in plant genetic resource activities:

1. Agriculture Research Center (ARC), MALR is the main institution involved with PGR activities (collection, evaluation, conservation and improvement of crop varieties).
2. Desert Research Center (DRC), MALR (mainly involved with desert crop plants).
3. National Research Center (NRC), Ministry of Scientific Research (mainly involved with medicinal plants and with some of the field crops).
4. 13 agricultural faculties and 15 faculties of science of different Egyptian universities.
5. The National Biodiversity Unit (NBU) of the Egyptian Environmental Affairs Agency, as an affiliate of the Council of Ministers (mainly involved with the preservation of wild species and wild relatives of indigenous PGR *in situ*).
6. A number of NGOs, mainly involved with the problems relating to the protection of existing plant biodiversity and creation of public awareness for the same.

The Government of Egypt has recently decided to give top priority for the establishment of a functioning plant genetic resources system in the country. In January 1995, the Deputy Prime Minister, the Minister of the MALR issued a ministerial decree announcing the decision of establishing a "National Plant Genetic Resources Unit in Egypt" (NPGRU/E), under the ARC, MALR. At the same time, a qualified Genebank expert was nominated as Director of the NPGRU/E. One genebank documentalist was attached to the NPGRU/E to help the NPGRU/E in the establishment of a proper data base system.

As a first step, the NPGRU/E has worked out a draft proposal regarding the strategy and the coordination of national activities, including a 2 year working plan. This draft proposal was presented and discussed during an organized national workshop, which was held in March, 1995 involving all concerned persons and institutions. The final working strategy and plans have been prepared.

The NPGRU/E will be constructed in Moshtohor (38 km North of Cairo), about 98 acres will be available for the NPGRU/E activities there. Adequate agricultural land areas will be made available at several ARC stations in the country for the NPGRU/E's field activities.

The NPGRU/E will be responsible for and will provide the following services:

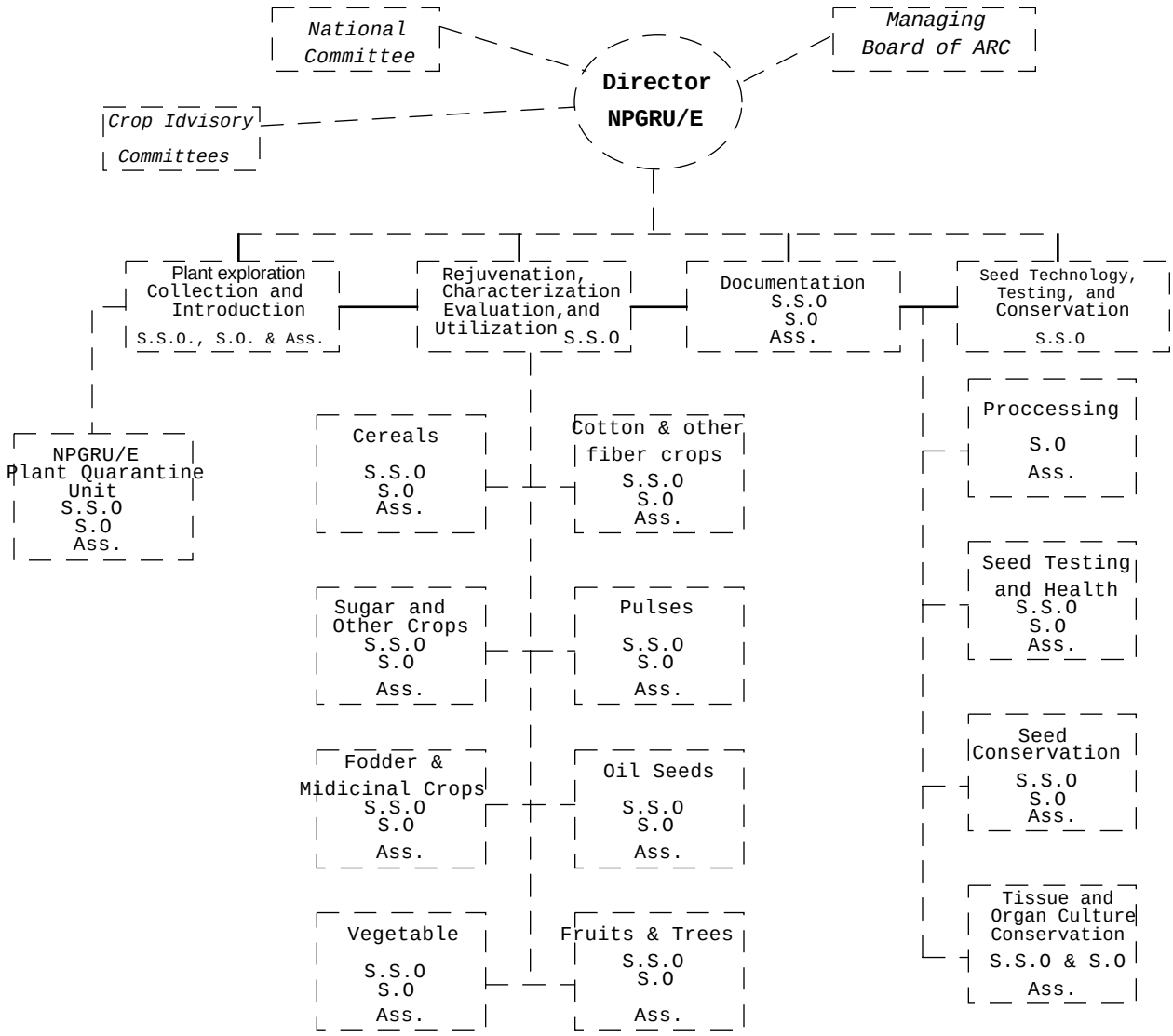
- A survey on the available and useful germplasm in and outside the country, will be conducted.
- Exploration and collection of valuable plant genetic resources (PGR) will be planned, and missions systematically conducted according to given priorities.
- Germplasm will be properly multiplied, characterized, evaluated, tested, and preserved.
- A national strategy for the activities concerning PGR, its coordination, implementation, and follow up, will be worked out and persued.
- Research work on genebank related areas of work will be undertaken.
- A data base on all national activities related to PGR will be establishe d.
- Cooperation with other national and international institutions will be intensified.
- Technical advice and assistance will be provided to local scientists and institutions working with PGR.
- Training programs will be worked out and a follow up of their implementation is necessary.
- Genetic material and its information will be provided to the concerned users in order to maximize the utilization of PGR.

For the planned work organization of the NPGRU/E for the National PGR network see figures 2 and 3, respectively.

The NPGRU/E working facilities will include the following laboratories:

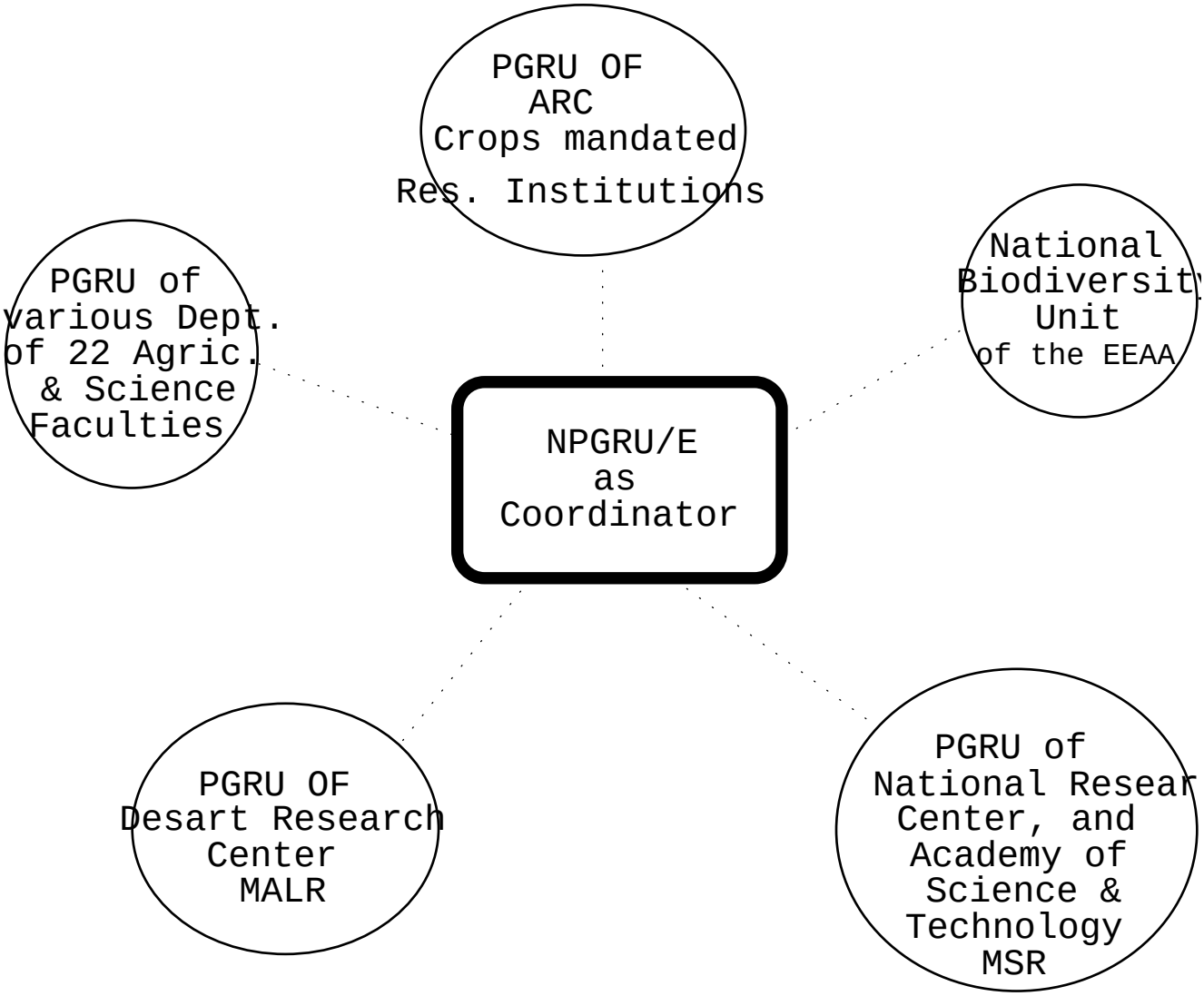
- Exploration, collection and seed processing.
- Plant introduction and vegetative propagation.
- Seed physiology and seedling establishment.
- Evaluation, quarantine and seed health.
- Data management and seed ecology.
- Germplasm conservation (cold stores + 4 °C r.h. 30%, -20°C) and cryopreservation facilities.
- Seed drying (+ 5°C and 23% r.h.).

FUNCTIONAL CHART FOR: THE NEW NATIONAL PLANT GENETIC RESOURCES UNIT / EGYPT (NPGRU/E)



S.S.O = SENIOR SCIENTIFIC OFFICER
S.O. = SCIENTIFIC OFFICER
Ass. = LABORATORY OR FIELD ASSISTANT

CHART OF NATIONAL RESEARCH NETWORK OF PLANT GENETIC RESOURCES IN EGYPT



NPGRU/E = National Plant Genetic Resources unit/Egypt
ARC = Agriculture Research Center
MALR = Ministry of Agriculture and Land Reclamation
EEAA = Egyptian Environmental Affairs Agency
MSR = Ministry of Scientific Research
PGRU = Plant Genetic Resources Unit

Base collection will be the responsibility of NPGRU/E only. Active collection will be held at NPGRU/E for distribution. Working collection will be the responsibility of any member of the National Network (see figure 3).

It is planned that the NPGRU/E will provide its facilities for conservation of local germplasm base collections as well as for the conduction of local, regional and international meetings, seminars and conferences.

Duplicate base collections will be stored at another place, preferably in genebanks abroad. The Egyptian genebank will accept foreign du plicate base collections.

The NPGRU/E will offer its working facilities and experts for any country of the region and will provided with a PGR training center.

A National Plant Genetic Resources and Crop Advisory Committees are under formulation. The two committees should give, as supporting bodies, technical advise to the NPGRU/E and help in solving problems the might arise:

The NPGRU/E will consist of the following 4 major working sections: (see fig. 2)

- Exploration and Collection.
- Germplasm Preservation.
- Multiplication, Evaluation and Exchange.
- Documentation.

The Government of Egypt has requested the Government of Japan to assist by helping the establishment of the NPGRU/E's project.

5.2 TRAINING

During the last 10 years a total of ten staff were trained on the field of PGR collection, seed technology and data documentation. Only 2 of them are still working with the Bahteem PGR section. The rest have been transferred to other places and are not directly involved with genebank work.

The following Genebank staff is required. Their nomination as NPGRU/E staff has already been initiated:

- Director
  was nominated and assigned since January 1995
  is a high qualified Genebank expert.
- Genebank Documentalist
  with 6 yeas working experience.

Both NPGRU/E staff members mentioned above are presently available.
17 senior scientific officers, 15 scientific officers, 35 field and laboratory assistants will be required as indicated in the functional chart (fig. 2). Their assignment and training will begin in the near future.

5.3 NATIONAL LEGISLATION

The quarantine laws in Egypt are strict. Importation and exportation of plant genetic resources are possible if the given regulations are followed.

This applies also to the passage of *in vitro* materials through the quarantine. Planting out of imported vegetatively propagated material is only possible if the germplasm has been inspected and tested in isolated greenhouses according to given rules and regulations.

The legislation Nr. 53 from 1966 governs the production, certification, import distribution and registration of seeds. The government controls these activities in order to make sure that farmers are getting a good quality of seeds.

The government is subsidizing the seed prices to encourage farmers to use high quality of seeds. Farmers' varieties can be traded legally as seed if they are registered and recommended by the government.

A legislation for Intellectual Property Rights doesn't exist. The government is planing to issue such a legislation in the near future. Assistants for preparing the legislation will be needed and a request will be made accordingly.

The general policy of the government is the free exchange of plant genetic resources. In some cases, like with cotton germplasm, special regulations with the exchange of cotton germplasm have to be followed. The president of the Egyptian government in consultation with the Minister of Agriculture can

decide whether or not to export particular plant genetic resources. Factors that influence these decisions are mostly related to market competition.

Foreign collection missions are generally allowed, except for strategically important crops, like cotton.

5.4 OTHER POLICES

As mentioned earlier, the government subsidizes the price of production and sale of improved varieties to encourage farmers to use the germplasm.

Credits for the provision of agricultural inputs are provided. Other kinds of subsidies are not provided any more.

Plant breeders and seed production experts are usually involved in the planning of major agricultural development projects.

Because of the absence of an adequate germplasm system in the past, projects appraised were found to have not been properly monitored and evaluated for their impact on the conservation and utilization of plant genetic resources.

This situation will change after the establishment of the new NPGRU/E.

5.5 TRADE, COMMERCIAL AND OTHER INTERNATIONAL AGREEMENTS

The government of Egypt is concerned with the impacts of the GATT agreement, which has already been signed, on the production, export and import of the main agricultural products, and particularly on the export of cotton, rice, vegetables and fruits. The government is trying to maximize the benefits and at the same time to minimize the burden of this agreement.

Egypt has already signed both agreements on:

- The International Undertaking on Plant Genetic Resources.
- The Convention on Biological Diversity.

For other international agreements see chapter 6.

CHAPTER 6
International Collaboration

6.1 UNITED NATIONS INITIATIONS

Egypt had adopted agenda 21 (UNCED and the Convention on Biological Diversity).

Egypt throughout the past decades, has paid increasing attention to maintain natural resources including genetic resources of plants, that are threatened with extinction. The Ministry of Agriculture (Egyptian Wildlife Service established in 1970's) was the focal institution for implementation. EEAA (see chapter 2), the Egyptian Wildlife Service, and environmental officers in each Governorate came to coordinate their contribution towards implementing Law 102 (1983) concerning the establishment and management of natural protected areas. The prime Minister was empowered to enact decrees for earmarking areas in the desert, islands in the River Nile, and coastal marine and freshwater systems to be national parks (see chapter 2). Several universities throughout the country have new environmental curricula and research programs and provide technical advice to government agencies. Public and man media campaigns for environmental conservation have increased.

The Government has established two funds to provide for the financial needs of protected areas in the country. The first through law 101/19835 and the Prime Ministerial Decree 1488/1985, the second, in accordance with article 6 of Law 102/1983.

Egypt is a member of the commission (FAO Global System). Through this system, Egypt has gained a number of benefits; technical cooperation, the praising of several projects, and the flow of information and technical advice are only examples. For the future, projects are urgently needed in order to protect biological diversity in the oases, at the coastal belts, Sinai and other remote areas. Regional programs have to be worked out and implemented; these projects should help the country members in exchanging information and PGR to maximize the use of available germplasm and to preserve it for the coming generations.

In addition, Egypt has signed and ratified a number of international conventions that commit the country to conservation of biological resources (UNEP 1985): Convention of International Trade in Endangered *Species* of

Wild Fauna and Flora (CITES), Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar), Convention for the Protection of Migratory Species of Wild Animals (Bonn), the World Heritage Convention, Protocol Concerning Mediterranean Specially Protected Areas and Biological Diversity Convention.

The African Convention on the Conservation of Nature and Natural Resources (African Convention 1968) is considered as the most comprehensive multilateral treaty for the conservation of nature. It requires parties to establish conservation in areas for ecosystem protection and scientific conservation plans for the protection of other important sources.

6.2 INTERNATIONAL AGRICULTURAL RESEARCH CENTERS

Egypt have received support from several CGIAR centers. Intensive cooperation programs with ICARDA, CIMMYT, IRRI, CIP, ICRISAT, IITA were maintained. Exchange of germplasm and information which helps in identifying high yielding and widely adapted crop varieties are results of this cooperation. IPGRI has helped Egypt in providing information and references on issues related to germplasm collection and characterization. IPGRI, ICARDA in cooperation with local scientists have conducted several germplasm collection missions in Egypt.

During the coming decade, IPGRI should place more emphasis on:

- establishing regional data base centers on PGR..
- promoting germplasm evaluation and working out programs for better germplasm utilization.
- working plans for staff training on the above.
- developing better methods and techniques for germplasm evaluation and conservation.

Egypt is a member of the Arab Organization for Agricultural Development.

This regional organization gives assistance to Arab countries to improve their agricultural sector. Projects related to the protection and utilization of plant genetic resources have been incited and proposals for its implementation prepared. It is expected that this organization will in the future play a bigger role in PGR activities.

For International commercial and other international agreements (see chapter 5 and 6).

CHAPTER 7
National Needs and Opportunities

In the past, many activities concerning plant genetic resources were undertaken, but a national program with clear defined goals did not exit. The undertaken activities were poorly coordinated, and as a result:

- many activities have been duplicated,
- precise information on germplasm activities (collection, evaluation, conservation) are missing and/or are hard to be found,
- a lot of local germplasm has been lost and other remains endangered,
- working facilities and qualified personnel are inadequate and cannot be mobilized,
- therefore, the proper utilization of available local germplasm is heavily handicapped.

To overcome the constraints, and to hinder the systematic loss of valuable germplasm, to preserve and utilize it properly, the following actions have to be taken:

- establishing a National Plant Genetic Resources Unit,
- assigning a qualified genebank expert as national PGR coordinator and NPGRU/E's Director (has already been assigned in Feb. 1995),
- analyzing the situation of PGR activities, preparing a preliminary working strategy and program (finalized),
- discuss working strategy and plans with all concerned and produce strategy paper (finalized).

The following activities will be finalized during the months and years:

- conducting a survey on all PGR activities,
- preparing a final situation analysis and work plans,
- nomination of the rest of the Genebank staff and provision of training,
- constructing NPGRU/E buildings and provision of working facilities,
- conducting germplasm collection missions,
- characterization, evaluation and conservation of valuable PGR according to identified priorities,

- establishing an adequate data documentation system,
- storage of safety duplicate base accessions in other genebanks,
- conducting research work according to plan,
- coordinating activities at national, regional and international levels,
- exchanging germplasm with others and
- undertaking suitable measures for optimizing the use of available germplasm.

At this stage an assistant is needed in the following areas:

- Construction of the NPGRU/E building and provision of working facilities (the Egyptian Government has requested Japan to assist in the establishment of the NPGRU/E).
- Short-term experts are required for setting up a working strategy for the evaluation, data documentation and for activity coordination (an assistant from national or international organization is urgently needed) at this stage.

CHAPTER 8
Proposal for a Global Plan of Action

The following elements are proposed for inclusion in the global plan:

- Priority given to the collection and preservation of PGR in arid and semi arid areas (much more endangered than in any other areas).
- Initiate regional programs for the identification, collection and utilization of PGR under a-biotic and biotic stresses.
- Optimize coordination and exchange of information, genetic material and experience at all levels.
- Program for ensuring the sustainability of the above mentioned activities should be worked out and resources for its implementation identified.

Proposals for Priority Activities to be Undertaken at the International Level:

- completion and analysis of knowledge regarding diversity of PGR,
- working out multilateral programs of collaboration (activities with PGR),
- reviewing working strategies, modalities for control of the actions,
- setting up an international data bank which consists of information on PGR world wide,
- setting up an international observatory on PGR diversity,
- drawing up programs of education and training on biodiversity and setting up regional centers for education and training.

Species	Information
Hordeum Spontaneum	grow along the coastal strip of the Mediterranean
Panicum turgidum (Gramineae)	Perennial grass, observed along the Red Sea Coast and Northern coastal plains, useful as pasturage with good palatability
A triplex spp (Chenopodiaceae)	Plants are herbs or shrubs various species are present near the Red Sea coast and the East Mediterranean coastal strip.
Kochia Spp (chenopodiaceae)	Common in Nile Delta and more frequent under moist conditios
Salicornia Spp, Arthrocnemum Spp, and Halocenemum spp (ChenopodiaCeae)	These species are succulents, leafless plants with good palatability.
Nitraria Spp (Nitrariaceae)	Thorny shrubs with small leaves, observed near Red Sea Coast and the East Mediterranean Coastal Strip.
Juncus Spp (JuncaCeae)	It is used in papers industry and making mats.
Legume Species *Prosopis Tetragonolobus* *Acacia - Argyrolobium* *Cassia Pisum* *Lygos Lathyrus* *Crotalaria Vicia* *Scorpinrius Lotus* *Trifolium Hymenocarpus* *Medicago Onobrychis* *Melitotus- Hippocrepis* *Ononis Astragalns* *Trigonella*	These species are important natural vegetation and provides forage products in the North-West Coast Region.

ANNEX 1
Report on Forest Genetic Resources in Egypt

INTRODUCTION

Egypt supports certain heterogeneous plant communities which show great variation in their structure and composition.

Ecologically and phytogeographically the most important original factor in Egypt is the climate, but it is of interest to consider the effect of soil within the country, both as modifying the flora and vegetation and for the comparison with the edaphic (soil) factors under other climatic conditions. The edaphic factors which may act directly or indirectly and chemical or physical and biotic factors which are due to the actions of men and animals, are here certainly secondary in importance to the climatic factors.

Climate, more than anything, also influences the distribution of the different species and communities in Egypt.

The main plant communities dependent upon climatic factors especially on rain, includes the xerophytic plant community and the forest plant community. The former is characterized by limited water supply, whilst the latter is developed under much rain.

THE EGYPTIAN FORESTS

In this respect, there are 2 different natural types of forests in Egypt as follows:

A. Climatic Formation
This type of forest community is mainly confined to Gebel Elba, which represents the last North point of tropical rain forests extended into Egypt.

Gebel Elba lies within the boundaries of Egypt in the extreme south-eastern corner between the North Latitude 22° and 22°30'. It is a region of high mountains and situated about 26 Km far from Mersa Halaib of the coast (see attached country report, fig. 1). It may be considered as a continuation of the granitic formation of the Red Sea hills. It is the last of these hills to the

North, and it terminates this chain of mountains. Some of which reach 1,428 meters above the sea level. Gebel Elba itself is a chain of hills between which exist valleys varying in size, direction and altitude. Rain is the main water source. It falls in winter and forms streams which have a rapid flow. Springs and rock pools are abundant. The annual precipitation is probably not less than 400 mm. Thus, the flora of the Gebel Elba region is different from the flora of any of the other six regions of Egypt.

The forest community is the most important community because of its wide distribution. It consists mainly of Micro and Nano-phanerophyts (including climbers). It forms an open woodland without a close canopy and low thorn-bearing trees singly or in thickets, and a general herbaceous ground covering "therophytes". Acacias form the main feature of the vegetation. Loranthus curviflorus Benth. occurs at the top of Acacia spirocarpa Hochst. (as parasitic on high branches). This community is only one which shows srativication in Egypt, where the semi-parasite Loranthus occurs at the top of the crowns of the Acacias. Then, comes the tree stratum itself, then a shrub stratum and eventually a herb stratum. Thus, the vegetation is closed and stratified, in places where water is accumulated or abundant. Different shrubs occupy different zones on the mountains. But, as a whole, the upper parts of the mountains support shrubs or dry grasses. In summer, the herbs disappear, only the Acacia trees and a few dry shrubs remain.

The following trees, shrubs and subshrubs occur in the forest community of Gebel Elba region:
A. nubica
A. spirocarpa
A. tortilis
Cocculus pendulus
Commiphora opobalsamum
Acacia ethaiea
A. laeta
A. mellifera
Dodonaea viscosa
Ficus salicifolia
Grewia occidentalis
Lantana salvifolia
Loranthus curviflorus
Poinciana elata
Triumfetta flavescens
Zizyphus spina-christi

B. Edaphic Formation

The mangrove forest of the Red Sea region is not to be referred to the climatic formation because it belongs to the maritime plant community which determined mainly be edaphic factors. If the sea is near, (e.g. the Red Sea region), the term maritime plant community may be used, if not the term halophytic community is more adequate, (e.g. in salt areas of the desert). Therefore, this two communities occur wherever the soil is saline.

The Red Sea region is the coastal strip of the Eastern desert and consists of flat expance which characterized by its great length (1,100 Km) and comparatively narrow though variable width.

Aviccenia officinalis L. (= A. marina) is the most important mangrove association of the Red Sea and is confined to it. The plant grows on the flat muddy shores where the water is calm and where the soil is flooded with water permanently or at high tide. Generally, the relief is slightly sloping towards the sea and covered by calm water, the depth of which reaches 120 cm. The ground is soft, deep and composed of black mud full of organic matters and rotting leaves. The feet sink in the soil.

Avicennia officinalis form here a luxuriant, dense and closed pure association. It extends in many places far inland along the shores and assumes the form of a low dense forest of Bushland, the height of which is about 2-6 m. The ground is covered by the respiratory roots which raise above the water surface as erect naked sticks.

The Tamarix forests in Sinai region (Un-Natural Forests) are not to be referred to the previously mentioned two types, because these forests are grown under cultivation.