**Academy of Scientific Research and Technology, Egypt**

**IUCN**
**The World Conservation Union**

***The Swiss Development Co-operation***

**April 2001**

# FINAL REPORT

**NORTH AFRICA PROGHRAMME**

## BIODIVERSITY CONSERVATION

**Conservation and sustainable Use of Biological Resources in the North Western Desert of Egypt with the Involvement of the Local Population**

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CONTENTS

# 1. INTRODUCTION

The coastal land, with its various ecosystems, offers important sites for natural resources and their development. However, these ecosystems, in view of the remarkable urbanization, are subjected to severe degradation. Population growth will continue to threaten the fragile coastal areas. The environmental impact of demographic pressure in the coastal ecosystems is exacerbated by land use policies and infrastructure development.

In Egypt the coastline has a length of about 2450 km. The population in the coastal urban agglomerations was 4 246 000 in the 1980s and was expected to increase to 8 020 000 in the year 2000. The coastal land is subjected to innumerable human activities, with drastic impacts on all the components of the environment. The biodiversity is affected and threatened by the human activities. The area in the western Mediterranean coastal zone of the country is an example of the different affected coastal ecosystems in Egypt, as well as the other Arab countries.

# 2. AIM OF THE PROJECT

In view of the deterioration of the biological diversity due to many reasons, it seems that there is a great need for the conservation and sustainable use of the different components of the biological diversity.

The present project aims at:

<u>Conservation and sustainable use of the wild medicinal plants, as well as other plants of economic importance and/or ecological value in the ecosystem</u>

To reach the targets of conserving the biological diversity and its use on a sustainable basis, one needs:

a- Survey and document the components of biological diversity in the study site
b- Hold meetings with Bedouin to explain the points of view of the project and reach mutual understanding of the issue
c- Agree with some Bedouin to establish nurseries on their land to cultivate transplants and seeds of endangered plant species, especially those of economic importance
d- Understand the points of view of the Bedouin and other stakeholders

It has been clear to the group of investigators, scientists and other implementers that the success of the project depends on:

a- Understanding of the local authorities of the issue of conservation
b- Understanding of the local people of the issue of conservation
c- Ability of the implementers to deal with Bedouin and local authorities
d- Availability of funding
e- Sustainable and continuous work and gathering of the indigenous knowledge related to conservation of biodiversity
f- Information about the issue and the project through various mass media
g- Making use of the thoughts of all stakeholders

## 3. BACKGROUND & PREVIOUS RELATED PROJECTS

The activities in the present phase (Phase II) depend mainly on:

- **The guidelines, strategies and action plans prepared in phase I, as well as the experience gained in phase I represent a good basis for the present phase.**
- **The immense experience in working with the Bedouin in the site and other sites was acquired during the implementation of the following projects:**

= The project on **conservation of biodiversity, phase I**. This was funded by the present donor; Swiss Development Cooperation (SDC). That phase covered many sites and different issues in Egypt. The Project leader was Prof. Dr. K.H. Batanouny, Professor of Ecology. The results of the first phase gave a good basic information and experience to be used in the present phase.

= The project on **conservation of biodiversity in the rangelands of northern western desert of Egypt.** This was implemented by the Egyptian Botanical Society; an NGO. (President: Prof. K.H. Batanouny, the project leader of the present project). This society has all the botanists, ecologists and other related fields as members. The Global Environmental Facility (GEF) funded that project. The present phase builds upon the experience and achievements of the GEF project (GEF small grants project Int/92/G31). This saved money and effort for phase II. Also, it guaranteed the sustainability of the GEF project in the site.

= The project on conservation and sustainable use of medicinal plants in St. Katherine protectorate, Sinai, Egypt. The project was implemented by the Egyptian Environmental Affairs Agency (EEAA) and funded by the Global Environmental Facility (GEF). In this project, a document was prepared and it was accepted to be funded by GEF in the coming 5 years. The project Director was Prof. K.H. Batanouny.

## 4. ENVIRONMENTAL SETTING OF THE PROJECT SITE

The study Site is located along the Mediterranean coast in an area extending almost thirty kilometers from east to west and 15 kilometers from north (the coastal line) to the south in the Western (Libyan) Desert. Fig. 1 shows the location of the site.

**[The detailed environmental setting is given in the Appendix]**

## 5. CONSERVATION IN BEDOUIN'S LIFE

Bedouin are related to their environment since times immemorial. Their life depends on the harmony between their behaviour and the prevailing environmental conditions. They adopted, over years of trial and error, a knowledge of the proper land use patterns. They are exceptionally protective of their environment and work to maintain a balance between themselves, their herds, and wild resources.

When there is no good rainfall for many years, the Bedouin is obliged to press on the available resources to a degree causing their degradation. No body can ask a Bedouin in the cold winter to stop cutting of plants fore firewood. Also, one cannot ask him to stop grazing. They understand that pressure on the ecosystem is dangerous, but need for sustaining their life is greater than such an understanding.

Bedouin adopted ***'Orf',*** which is their unwritten law, which covers several issues, Among the items of this law, there are rule regulating the collection and cutting of herbs and wood. It is forbidden to cut the green parts of the trees, and who does so, he is subject to a penalty of 50 L E.

The Bedouin woman is responsible for numerous things in the daily life of the household. The following activities are performed by the Bedouin woman:

1. Brings water from the wells and water points.
2. Participates in the collection of the fuelwood.
3. Participates, usually before marriage, in herding the sheep and goats
4. Weaves woolen rugs and other materials

Through her activities, the woman has a paramount effect on the biodiversity.

It is to be noted that the socio-economic changes in the Bedouin society affects the culture and behaviour controlloing the conservation of biodiversity. The indigenous knowledge respecting the biodiversity is apt to be extinct.

## 6. PLANT LIFE IN THE SITE

The plant life in the site is diverse. The diversity in ecosystems, habitats and the prevailing environmental conditions is reflected upon the pant life. Each habitat, and even each microhabitat, supports different plant assemblages. The variation is not only spatial, but it is also temporal. Before the wet season, the vegetation is formed of a perennial framework. After rainfall, usually in December, the interspaces between

the perennials are occupied by a dense growth of annuals (ephemerals). The phonological aspects of the vegetation show considerable seasonal variations.

The rich species diversity in the site is threatened through the impact of numerous human activities. This will be given later.

A list of the recorded plant species in the site is given in the Appendix. The list shows that 234 species are recorded, including 94 annual species and 140 perennial ones.

## 7. Status of the Plant Biodiversity

**The coastal dunes as the first landing site for migratory birds (Fig. 2)**

Many bird species migrate south from Europe in the north towards the African coastland on the dunes of the study area. The most famous are the quail *(Coturnix coturnix* Arabic: *Semman)* and the golden oriole *(Oriolus oriolus* Arabic: *Soffeir).* The fame of quail is due to its delicious meat; it was trapped by nets fixed on the dunes to be sold in Alexandria markets or along the highway from Alexandria to Mersa Matrouh. The quail is mentioned in the Old Testament, Exodus *(Taur'at)* and the Qur'an ['And sent down to you manna and quails' Surat II: 57, also VII: 160, XX: 80] as a food for the Children of Israel during the Exodus and Wandering in Sinai. The presence of new buildings and denser populations in new villages affect the landing of the quail. It has been observed that the birds were directed west, away from the concrete constructions and their inhabitants; some quails have been recorded dashing into buildings and being unable to fly out again.

**Loss of Plant Diversity**

The previously recorded species in the area are not all found in recent investigations. The disappearance of many species from the area is a clear indicator of the deterioration of the plant diversity. Among the plants, which cannot be found in the site, one mentions the following:
*Arisarum vulgare, Bryonia cretica, Centaurea pumilio, Eminium spiculatum*, etc

**Reduction in the total plant cover**

Overgrazing, over collection, urbanization, off-road vehicles and other human activities caused a great reduction in the plant cover, either directly by uprooting or indirectly by changing the environment.

**Increase of the number of endangered species:**

Some endemic and medicinal species become endangered due to human impact through different ways of utilization, such as *Bryonia cretica, Colchicum ritchii, Centaurea pumilio, Thymus capitatus, Teucrium polium, Hyoscyamus albus, etc*

**Increase of growth and cover of non-palatable species**

Non-palatable species, especially non-ligneous plants show a considerable cover and growth, e.g. *Zygophyllum album*

Some species recognized as indicators for disturbance exhibit an appreciable growth and cover, e.g. *Nicotiana glauca, Echium* spp., *Urtica* spp., *Chenopodium murale, Malva parviflora, Enarthrocarpus strangulatus,* etc.

**Disapearance and decrease of medicinal plants**

Overcollection of some medicinal plants caused the disappearance of many species in many localities.

Among the over-collected species, one mentions:

*Thymus capitatus, Teucrium polium, Centaurea pumilio, Bryonia cretica, Colchicum ritchii, Haplophyllum tuberculatum, Citrullus colocynthis, Posidonia oceanica, etc.*

## 8. Threats and Problems

The precarious balance among the components of the fragile arid ecosystem within the Protectorate is easily disturbed due to several threats. These include:

1- Human-induced threats and
2- Nature-induced threats.

**I-Human induced Threats:**

**1- Over-collection of ligneous species for fuelwood:**

The woody plants are the main, and in many instance the only, source of fuel to the inhabitants of arid and semi-arid lands. The dearth of fuel aggravates the problem. Even in the presence of gas ovens and availability of gas tubes, there is still a need for fuelwood for particular practices, e.g. baking of bread. It is to be noted that regeneration of woody species on shallow soils with an annual rainfall less than 100 mm is extremely slow.

The main plant species collected for fuel include: *Thymeleae hirsita, Anabasis articulata, and Limoniastrum monopetalum.*

**2- Over-collection of medicinal plants:**

Many plants used in folk medicine are gathered in such quantities that they were almost exterminated in many sites. The continuous collection of these plants made them vulnerable. This represents the most direct threat to the plants.
This is due to two main reasons:

a- The need for these plants as a remedy for diseases
b- The lack of alternative livelihood and other sources of income
(Collection of *Teucrium polium, Varthemia candicans, Thymus capitatus Haplophyllum tubrerculatum, Colchicum ritchii., Capparis spinosa Achillea santolina, Centaurea pumilio, Citrullus colocynthis, etc.*

These plants are collected for many reasons:

**a- For trade (in and outside the region)**

Collection of medicinal plants used in folk medicine for selling in the region and mainly outside it is very serious. Easiness of transportation and travel to the different localities in the protectorate facilitates the collection for trade.

It is interesting to mention that the boys and girls herding the sheep and goats in the area perform a function known as "*Yoa'kken*". This Arabic word denotes the collection of "*Oknah*". *Oknah* is the Arabic name of *Colchicum ritchii*. They use a special tool called *Al-Jizz*, a small spade for digging the corms of *Colchicum*. They sell the collected material to shops to dry it and sell it to drugstores in Alexandria and other cities. This represents a livelihood support for the Bedouin.

The collection of the thick roots of *Centaurea pumilio* is threatening the plant to a great measure. In addition, the habitat supporting this species, i.e. the coastal sand dunes, is severely eroded. The plant is called *Akash* in Arabic. The collected roots are divided longitudinally into small pieces to be sold to the *Attarin* It is one of the vulnerable species..

Due to the over-collection and degradation of the habitat conditions, *Bryonia cretica* is now on the brink of extinction. Supplies of this plant are obtained now from Libya. The fleshy roots of this plant are used in treating diabetes and are called *Le'eba Murra.*

**b- For medical uses by *Hakims***

*Hakims*, men or women, are the most acquainted persons with the medicinal plants as regards their use, geographical distribution and abundance in the different localities of the protectorate. It is interesting to know that they are knowledgeable of the rare and the endangered plants and know where they grow. For the rare plants, the *Hakims* themselves collect them from their habitats. This can be for the secrecy and confidentiality. Boys and girls may collect other plants when they are herding the goats and sheep. They sell what they collect to some traders for a cheap price. They send it for sale to Cairo, Alexandria or other cities in the Delta and Nile Valley.

**c- For household use**

The majority of the households keep samples of the common medicinal plants at home. They keep them for their only use or for helping the neighbours in emergency cases. These species include *Centuarea pumilio, Colchicum ritchii, Haplophyllum tuberrculatum, Bryonia cretica, Thymus capitatus, etc.* One notes that it is now very difficult to collect a few specimens of *Thymus capitatus*. It is now obtained from Libya.

**d- For research**

Researchers in phytochemistry, pharmacognosy and pharmacology collect huge amounts of plants expected to have medicinal value. The lack of knowledge of the previous investigations and studies on these plants causes the researcher to collect more material. Perhaps he repeats the study on more material, despite other researchers have already undertaken that such a study.

Also, the use of old methods of analyses consumes more material than modern methods.

The difficulty by which researchers obtain material for analysis makes them eager to collect more material whenever possible. They lack the security of obtaining these plants again.

**3- Overgrazing**

Degradation of vegetation and even the whole ecosystem due to overgrazing is manifest in almost all the localities in the protectorate. The communal system of grazing is followed in the protectorate, as well as the other arid and semi-arid ecosystem in the region. While the communal grazing system has certain advantages in an arid range area, it can be an obstacle to rational utilization of the range and to range improvement practices. Individuals try to increase the size of their flocks to obtain the highest possible income, and there is no interest to protect the range by limiting the number of animals or to improve the range by any means.

**4- Tourism**

Doubtless the unplanned tourism in the area enhances the deterioration of the fragile ecosystems resulting in obvious changes in the plant cover. There may be direct destruction of the plant cover as well as the degradation of the ecosystem by accelerating soil erosion.

Resorts tourism, especially along the coasts outside the protectorate: production of voluminous amounts of solid waste thrown within the premises of the protectorate in the eastern sector of it. This causes destruction of the habitat and killing of biota. Widespread phenomenon of feral dogs and the increase of rat population are just a few examples of the consequences of the summer resorts.

**5- Urbanization**

The human influence on the landscape of some parts in the protectorate has been affected to a great extent. Construction activities are continuously increasing, either by the Bedouin or by the Government to afford the needs of the increasing population and the rising demands.

With more vehicles and more access to previously inaccessible areas in the protectorate, the damage has become substantial and the vegetation has been removed from considerable area.

Construction activities include:

**a- Summer resort Villages** Increasing in the last two decades due to increase of population and increase of demands to dwellings and related infrastructure.

**b-Roads**. Long paved roads and trails affect the land and the biota along the sides of the roads. Additional roads mean more destruction of the habitats and degradation of the biota. Also, this facilitates the collection and gathering and transportation of the medicinal plants from their natural sites.

**c-Infrastructure** Telephone and electricity cables, tunnels for the sewer and other needs to support the population in the area cause considerable disturbances in the ecosystem. Some species dominate; others disappear due to such disturbances and digging.

**d-Wells** Adequate water points means more grazing and more settlements, etc. This results in the destruction of the ecosystem and disappearance of some biota.

**6- Quarries**

Quarrying is widespread in the area for building material, gypsum and cement industries. This process, in addition to its direct effects causing eradication of considerable acreage of plant growth, engenders changes in the vegetation due to its influence on the components of the ecosystem. In many cases the soil is severely eroded, runoff increases and no water would be allowed to permeate to deep soil layers. Hence retrogressive changes are apt to occur. It is regretted that a vast areas of the rocky ridges are quarried and removed for building materials. Doubtless this caused the disappearance of habitats supporting important medicinal plants as *Teucrium polium* and *Thymus capitatus, Globularia arabica,* and *Hyoscyamus albus*, etc.

**7- Solid waste**

The resort sites, the settlements here and there in the site produce tremendous amounts of solid garbage. Garbage, with a heavy load of plastic bags, is discharged in the eastern side of the protectorate. Doubtless, this has serious effect on the biota.

**II-Natural Threats**

1- **Drought and Shortage of water Resources**
The rainfall is irregular in the area, both spatial and temporal

2- **Floods and Soil Erosion**
Thunderstorms in early autumn or late spring come with heavy downpours. These rains cause torrents destroying the land and the biota

# 9. ACTIVITIES

## A- The Preparatory Phase:

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**1- Meetings with project implementers:**

These were held with different stakeholder: The Bedoiun – Local Authorities in the site – Sheikhs and Majors in the site – School Headmasters and teachers – Members of an NGO for the protection of environment – Scientists and researchers in related fields from different universities and faculties.

The Bedouin showed an interest in the objectives of the project. They have immense indigenous knowledge about the nature and the components of biodiversity. They raised some environmental problems in the site, which resulted from the summer resort village along the shore, including the garbage and solid waste, the dogs, etc.

The Bedouin in the southern sector of the site raised the problem of water shortage. Generally, all claimed that the water shortage due to drought in the last few years represent the most serious problem.
This caused the delay of the implementation of some activities.

2- **Contracts with local site coordinators and technical advisors**:

A-Contracts were issued with some consultants:
The finished reports include:

a- Physiography and soil characteristics in the various habitats of El-Hammam region, North-west Mediterranean coast, Egypt.
By: Dr. Ashraf Mohsamed Mostafa, Ass.Prof. Soil and Water Sciences, Faculty of Agriculture, Univ. of Alexandria.

b- Plants reported in the Omayad Protectorate
By: Dr. Ibrahim El Garf, Faculty of Science, Cairo University.

c- Revision of the fauna in the Omayed Protectorate
By: Prof. Dr. Wafaei Mikhael, Inst. African Res. & Studies, Cairo University

d- Studies n the plant species recorded in the Western Mediterranean Coastal Zone, Egypt
By: Prof. Dr. Abdel Salam El Noweihy, Dept. of Botany, Faculty of Science, Ain Shams University

e- Many consultants gathering in meetings to discuss the activities of the project, mainly the members of the National Committee for the Conservation of Nature and Natural Resources, Academy of Scientific Research & Technology

B- A local site coordination committee was established; including:

- Mr. Maher Breidy – Local Governor of El-Hammam
- Mr. Hamed Ali Abdel Gelil - Chief of El-Omayed Village
- Mr. Saad Omar Eid - Chief of Sahel El Omayed Village
- Mr. Sabri Omran – Chief of Awlad Gebril Village
- Mr. Ramadan Tawfik Taher – Chief of Shammama Village
- Mr. Sheikh Ghenewa Abde Sadek Mohammed, Sahel El Omayed

The responsibilities of the Committee were defined as follows:

1- Reestablishment of new nurseries
2- Taking care and follow up of the nurseries
3- Training of students in the schools about Biodiversity
4- Training of the young Bedouin in cultivation of medicinal plants
5- Public meetings and workshops
6- Activation of the NGO in the site
7- Supply the project leader with information, maps, population census, land use ,etc.
8- Hold a meeting about catching of quails
9- Help in gathering the indigenous knowledge about biodiversity
10- Collection of needed data and information as required.

**3- Analyze phase 1 field surveys and results in relation to project site:**

This has been done and the activities of the phase 2 are depending on the results of the analysis.

The human impact detected in the site includes: cutting ligneous plants as fuelwood, collection of medicinal plants, collection of aromatic plants, construction and urbanization, etc.

**4- Analyze socio-economic benefits and impacts for local population:**

The changes in the socio-economic aspects of the Bedouins are different in the different localities in the site. The coastal part is characterised by the presence of summer resort villages.

Plant species affected by the economic and social situation of the Bedouin:

I-. Plant species collected to be sold in the market*: Colchicum ritchii, Centaurea pumilio, Citrullus colocynthis, Haplophyllum tuberculatum and Bryonia cterica.*

II-. Plant species collected as aromatic plants and for remedy: *Thymus capitatus, Artemisia herba- alba*; the latter species is overgrazed.

III-. Plant species disappearing due to construction of roads and buildings: these are numerous and a complete list will be provided.

IV- Plant species disappearing due to quarrying: These are numerous and a complete list is under preparation.

**5- Plan and organize the details of the implementation of the project:**

This has been started. A steering committee for the project has been established. Reporting about its meeting and the recommendation for activities were given in the last report.

**6- Hold workshops with all stakeholders:**

This has been implemented numerous times. However, before the end of phase II, a big workshop will be held. This will help the assessment of the previous phases and the preparation for phase III. This will be some sort of a launchuing workshop for Phase III.

*** Hundreds of persons were involved in the present project**. These include:

60 Bedouin in sites where nurseries were established
50 - 100 Bedouin involved in the meetings and workshops
20 Persons from the local authorities and the Governorate
25 Persons: employees in the Academy of Scientific Research and Technology
15 Scientists and Researchers from different Faculties in the different Universities and research Centres
30 Workers helping in the preparation of nurseries and collection of seeds
30 Members of NGOs, School teachers, Hotel personnel
Hundreds receiving the booklet on Biodiversity (in Arabic) (copies will be sent)
Hundreds receiving the book on: Wild Medicinal Plants in Egypt (a copy will be sent)

## B- The Implementation Phase:

### *Awareness and Education*:

**1- Meetings and workshops**

Meetings started already. This builds on the previous project activities (GEF project)

**2- Preparation of education materials and distribution**

Knowledge about biodiversity is still lacking among the people. So, the project leader prepared a pamphlet 32 pages and a cover (15x20 cm) in colour. This can be a good information material for mass media personnel, teachers, educated non-specialized persons. Mass media: This will be considered when wide workshops will be held

### *Training of Bedouin*:

This activity has started and three nurseries were established and activities are going on. It is a new practice to the Bedouin to cultivate wild plants. His tradition makes him believe that this something "*Rabbani*" , i.e. coming from Allah and grows in nature. The Bedouin will not try to cultivate these plants except when he feels that he is the main reason of its eradication; either by collection or changing the habitat. The practice of cultivation of these wild plants when shown to them by experts in the field, convinced them. They were satisfied to find the plants growing and they can get some resource. However, it is to be noted that the growth of the desert plants is slow. This may be among the constraints. This can be remedied by providing the Bedouin by a supporting livelihood during the first trials.

### *Traditional Land Use and Conservation of Endangered species*

1-**Identify endangered species and their key habitats.**

During the recording of the plant species in the site, this issue has been considered. It has been found that the socio economic changes impacted the biodiversity to a great measure. Many plant species are endangered. The complete list will be available after the verification of the recorded plants when rainfalls and annuals appear.

2- **Survey at local level of conservation values, ethics and traditional land use**

This has been started and the collected information will reptresent a base for the activities in Phase III. It is expected that a valuable report will be completed about the indigenous knowledge of land (Soil, plants, animals, water) use in the site.

3- **Survey of modern land use**

This has been considered as a factor affecting the biological doiversity. This is evident in the above-mentioned causes of degradation and l;oss of biodiversity.

***Prepare management plans in collaboration with local populations***

This will undertaken with the cooperation of the Egyptian Environmental Affairs Agency (EEAA). Discussion of this issue will be ndertaken in the launching workshop of Phase III.

1-Involve local population in the implementation of the management plans.
2-Arboretum-herboretum and nurseries of endangered plant species
3-Identify key habitats for medicinal plants, particularly endangered species.

***Plan for setting up of an arboretum-herboretum***

**1- Establishment of a Centre and a garden for conservation**

It happened that through the Local Site Coordinating Committee, negotiation took place between the project leader and the Governor of El-Hammam about allocating a piece of land to the project to establish an arboretum. The Governor, kindly, accepted to donate the project a piece of land (5400 sq.m) at El Hammam. This land has been defined and already allocated gratis as a donation for the Government to the project (its value is about 20000 US $). This land will be a place for

***"Centre and Garden for the Conservation of Endangered Plants"***

Partial establishment of necessary infrastructure was achieved by building a room with facilities, introduction of electrical power and water supply
The Centre will be used to: test the cultivation of important wild or endangered medicinal plants, as a scientific visiting centre for awareness, education and research in the field of conservation of endangered plants. The Centre will focus on local plant species. It will also include species from other parts of North Africa.

**2- Collection of seeds and propagules**

This has been carried out and will be continued

**3-Plan for nurseries with local authorities:**

Already, we have three main nurseries now in the Bedouin land and many small ones. There is a possibility that schools and other governmental buildings with gardens can be used as nurseries and for training.

***Develop Cheetah and Gazelle habitat management***

This activity has been **modified** to be generalized for all biota and not only cheetah, which is not present in the site.

Threats and their root causes of the loss of biodiversity will be the main issue and activities are targeted towards this.

***Regional Coordination:***

This is achieved only now by the regional meetings. It has been agreed that the IUCN will provide a form for the directory of individuals working in the projects in the five North African countries. This will help in preparing a directory.

Analysis of the regional considerations of the programme is given in the Appendix.

***Fundraising:***

This has been achieved through the allocation of a piece of land to be a centre and garden for the conservation of endangered plants. This can be a regional on the Mediterranean level as a Mediterranean centre for the conservation of endangered plants in arid and semi-arid regions.

## 10. LESSONS LEARNT

- Important knowledge and data about the medicinal plants, in Egypt as a whole, and especially in the site along the Mediterranean are gathered.
- Many of the causes and root causes of threatening the biodiversity have been identified.
- Immense indigenous knowledge has been found to occur among the Bedouin. It has been realized that it is indispensable to document this knowledge. The erosion of biodiversity will lead to the disappearance of this knowledge. Indigenous knowledge and traditional methods of the use of the components of biodiversity may be useful in solving the problem of biodiversity deterioration.
- There is a great need to provide the local people with alternative livelihoods to minimize their impact on the components of biodiversity.
- The Bedouin have a considerable fund of he medicinal plants.
- There is a trans-boundary transfer of medicinal plants from Libya to Egypt, and may be the other way.
- The Centre proposed to be in El Hammam needs: cultivation of important Wild endangered medicinal plants, preparation to be a scientific visiting center for awareness, education and research. This will be helping the issue of eco-tourism.

## 11.SCIENTIFIC AND TECHNICAL ACHIEVEMENTS

During the surveys and implementation of the project in phase II, the project leader Prof. K.H. Batanouny published the following scientific article relevant to the subject of the project.:

Batanouny, K. H. 1999.
The Mediterranean Coastal Dunes in Egypt: An endangered Landscape. Intern. Conference on the Biology of Coastal Environments. April 6-9,1997, Bahrain. Estuarine, Coastal and Shelf Science 49:3-9.

Batanouny, K.H. 1999.
**Wild Medicinal Plants in Egypt**. An inventory to support conservation and sustainable use. Academy of Scientific Research and Technology, Egypt and IUCN. Cairo. 208 pp + 48 coloured plates.

Batanouny, K.H. 1999
Indigenous knowledge and ethnobotany in the deserts of the Arab World. A plenary lecture presented at the Sixth Intern. Conference on the Development

of Dry Lands. Cairo, August 22-27, 1999.

Batanouny, K. H. 2000
Biological Diversity: Simple explanation to a difficult issue. A booklet, 32 pp with coloured photos to help public awareness of the issue (In Arabic). 2nd Edition by the Academy of Scientific Research and Technology and IUCN.

In addition to these publications, a complete list of the plant species recorded in the site is given (see Appendix).

## 12. CONSTRAINTS & OBSTACLES

Doubtless, the work in voluntary projects has its own problems. These problems are aggravated under dry conditions in the desert. Some of the constraints and problems confronting the projects in the arid and semi-arid regions are obvious in the present project. These include:

1. Drought is a major constraint for cultivation of plants under desert conditions. In dry years, the Bedouin are not able to look for cultivation of wild plants. They are busy with water supplies for themselves and their animals. There is a great to give a support to the Bedouins to enhance water harvest under desert conditions. Appreciating this, the Bedouins can be good promoters for the conservation of biodiversity.

2. The Bedouin are clever, but are not easily convinced with ideas except after realizing that they are good in reality. So, pilot plots as examples of the necessary procedures are useful. Seeing is believing.

3. The discrepancy in the socio-economic situation of the Bedouin in the various sectors of the site. The northern part along the sea coast are rich. They sold their land for building villages. Those to the south are poor. They are still performing the functions or transhumance.

4. The delay in the imprest funding is another constraint. Sometimes, the project leader is obliged to pay from his own pocket till the transfer is achieved.

5. The absence of exchange of personnel and technicians among the different countries of the region hinders making use of the different experience gained in different countries.

## 13. RECOMMENDATIONS

Reviewing the activities and the results, opne recommends the following activities to be achieved in Phase III

***Training for :**

**Community guards in the Protectorate**
**Children in the schools**
**Mass media personnel**
**Religious Sheikhs in the Mosques**
**Women : post-harvest processes**

***Raising awareness among the visitors to the villages in summer**

***Production of Educational material for various stakeholders**

***Help *ex situ* cultivation of endangered medicinal plants**

***Conservation of indigenous knowledge of land use, especially medicinal plants.**

***Conservation of IPR, especially about the uses of plants in folk medicine**

***Development of alternative livelihoods for the Bedouin**

***Support the supply with energy sources to minimize cutting for fuel-wood**

*** Enforce the activities of conservation, training, education and eco-tourism in the "Centre and Garden for Conservation of Endangered Plants" established in El Hammam. Promotion of the center to be a regional one.**

*** Encourage the exchange of visits of technicians, assistants and Bedouin among the different countries of North Africa.**

Analysis of the regional dimension and lessons learned are given in Appendix C.

# 14. APPENDIX

## A- ENVIRONMENTAL SETTING OF THE PROJECT SITE

### a- Geography

The Mediterranean coast in Egypt extends over about 900 km (Figure 1); the major part of it is bordered by sand dunes of different nature and type. Along the coastline from Alexandria to El-Alamein, a distance of about 100 km (Figure 1), the sand dunes represent a landscape with special characteristics and features. For more than two decades, due to the conspicuous socio-economic changes, privatization, open-door policy in economy and other political changes in Egypt, a great part of the coastal dune belt west of Alexandria until El-Alamein has been destroyed. This is due to the continuous construction of summer resort villages. The consequences of the human activities in the area are numerous. These include impacts on the soil, water resources, the flora and the fauna, migrating birds, trends of the indigenous people, and the cultural environment.

### b- Geology

Many workers have intensively studied the geology of the northwestern zone (NWZ) of the Western Desert of Egypt. Their studies show that the exposed rocks are exclusively of sedimentary origin. They are dated back to the early Miocene and to the Holocene with maximum thickness of about 200 m

### c. Geomorphology

#### c.1. The Coastal Plain

In several areas along the western coast, the shoreline seems to be of emergence type developed by offshore bars and lagoons. A typical and excellent example of this type is found in the area of Arab Gulf (Burg El-Arab area). There are several inland bars, which can be traced (Gebel Maryut, Ruweisat-Ben Gaber, Khashm El-Eish, Alam Halfa, Alam Shaltut). The swales in between are thought to be lagoons or lagoonal depressions. These swales are now infilled with materials brought by streams or wadis that are occasionally flooded after heavy rainfalls. Almost parallel bars and lagoons characterize the foreshore plain. Most conspicuous of them are the coastal bar and Abu Sir bar. These bars are assigned to a sequence of ten stages of the Pleistocene Mediterranean.

The following are the names which have been given to the ridges, described geomorphology and microfacies starting from the youngest most seaward ridge to the oldest most landward ridge (Map 1)

Ridge 1 The coastal ridge (Late Monasterian), +10 m. This ridge is composed of friable limestone mainly consisting of Oolitic grains together with organic components, e.g. calcareous algae, pelecypods, gastropods and a few foraminifera.

Ridge 2 Abu Sir ridge (Main Monasterian), +25 m. there is a similarity between ridges 1 and 2. Caliche layer is a product of recrystallization due to the effect of rainwater or the high humidity of the region. The ooliths in their layer have gradually lost their shape and have become smaller until they are obliterated.

Ridge 3 Gabal Maryut ridge (Tyrrhenian) +35 m. in this ridge, the appearance of quartz and heavy minerals and increase in amount of calcareous algae are noted. The faunal content of this ridge is mainly of the Mediterranean type (different from the more seaward ridges).

Ridge 4 Khashm El-Eish ridge (Milazzian) +60 m. An abundance of Indo-pacific species of foraminifera is observed in this ridge that suggests a connection between the Red Sea and the Mediterranean Sea at the time of its development. These species show evidence of a warmer climate, which accompanied the higher sea levels in the interglacial period.

Ridge 5 Alam El-Khadem ridge (Sicilian) +60 m.

Ridge 6 Mikherta ridge (Sicilian) +80 m.

Ridge 7 Raqabat El-Halif ridge (Sicilian) +90 m.

Ridge 8 Alam Shaltut ridge (Sicilian) +110 m.

Ridges from 5 to 8 are the most inland of the ridges and are similar in composition and micro-organic content. The conglomeratic appearance of the top layers of these ridges may be due to deeper re-crystallization and increase in quartz content. The organic remains consist of calcareous algae, foraminifera, pelecypods, gastropods and echinoid spins.

The cemented carbonate ridges (ridges 2-8) are capped by caliche deposits, which form a distinctive survival, indurated, brownish to pinkish carbonate crust. The thickness of this crust varies between 1 to50 cm and appears to become thicker landwards as the ridges become older and higher. These crusts are sometimes laminated and superficially resemble algal-stromatolite. Similar crusts may be found buried under the loessic sediment of the carbonate ridges.

At El-Omyed area, five well-formed beach ridges are correlated with the beach ridges to the west of Alexandria. Therefore, the northwestern beach ridges seem to continue, but may be absent at some areas, from Alexandria to Daba'a, Fuka, Matrouh, Sallum and up towards Libya. They form a continuous and well-marked chain. On the other hand, the outermost chains of ridges lying further inland and are less regularly arranged.

Borings in former lagoonal depressions reported the presence of lagoonal facies characterized by mottled clays and gypsum crystals. Large gypsum quarries are located at these depressions. The lagoonal facies appear at various depths according to its level in relation to the present sea level.

Everywhere along the coastal plain, the depressions between the dissected ridges or dunes are infilled with fine and coarse loamy materials brought to the area from the tableland and also from the oolitic ridges and dunes.

At the footslopes of the escarpments in the coastal plain, alluvial fans are building thick deposits and extending around the dissected ridges in some areas. As the soil materials in the coast are calcareous, partial but not complete leaching of carbonates occurred in the upper layers of the alluvial fans resulting in the formation of calcic horizons and caliche layers near the surface of the soils.

**c.2. The Table Land**

The tableland is bounded northwards by steep slopes at some localities leaving a wide or narrow coastal plain. In most o the Headlands "Ras" there is wrapping of the land in a more or less northeastwards monocline.

The tableland itself is almost featureless. A number of fans and fan convexities are forming along low scarp lines in the tableland. Most probably these scarp lines are corresponding to fault lines. These are the only places where there are deep soils and some natural vegetation.

**c.3. The Aeolian Landforms**

Wind-blown landforms in the area are common as Hummocks around the scattered natural vegetation and thin sand sheets.

The largest and most conspicuous one is that area extending from El-Alamein to El-Hammam. The composition of these sand bodies is mainly oolitic and quartzitic sand grains.

The sand area between El-Alamein and El-Hammam obscures the boundary between the tableland and the coastal plain.

**d. Climate**

Based on an average of about 30 years of records, climatological data are analyzed. The Meteorological Department of Egypt distributed a net of stations along the North-western Coast. Under the Preinvestment Survey of the North-western Coastal Region (FAO, 1970), new normals were calculated to evaluate the best use of rainfall, runoff and groundwater for developing agriculture and improving the grazing capacity of ranges. Isohyets up to about 50 km to the south were sketched and data collected concerning frequency, duration and intensity of rainfall.

**d.1. Rainfall**

Alexandria area is receiving the highest amount of precipitation along the whole North-western Coast of Egypt. Averages as 180 and 190 mm were recorded. It seems that the area from Alexandria to Burg El-Arab is receiving higher amounts than the other areas. The precipitation in this area ranges between 156-180 mm. and El-Hammam area receives the lowest amounts of precipitation on the studied area (Table 1) and the details data of studied pilot area are given in Table (2).

Rainfall isohyets have been arbitrarily drawn to this area, Map (2). These isohyets are drawn on the basis of the data of the Delta stations, but these isohyets cannot be extended with reasonable confidence to cross-desert areas from the coast inland.

The rainy season begins during the second half of October and ends almost in March. December and January are the rainiest months with an average of 35 mm per month. The spring is dry and receives only 10% of the total rainfall. The dry season lasts 6-7 months without precipitation.

It is not only the short rainy season that precludes dry farming agriculture, but also the unpredictable annual precipitation. Fluctuation is rather common than stability. This fluctuation in rainfall is forming a constraint for any agricultural policy. The average inter-annual variability reaches 62 mm. Such features should be

considered when planning for any development for the area. Dry years receiving less than 100 mm occur two or three years out of ten while a rainfall of more than 200 mm occurs twice in ten years.

Table (1): Average of monthly and annual rainfall (mm) at different stations

| Station | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sep. | Oct. | Nov. | Dec. | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alexandria | 46.4 | 27.3 | 8.9 | 3.0 | 1.7 | 0.0 | 0.0 | 0.0 | 0.5 | 7.8 | 33.4 | 51.6 | 180.6 |
| Burg El-Arab | 42.1 | 22.1 | 4.7 | 4.1 | 0.6 | 0.0 | 0.0 | 0.0 | 0.4 | 13.7 | 31.4 | 35.5 | 156.6 |
| El-Hammam | 28.5 | 18.7 | 5.3 | 1.5 | 0.5 | 0.0 | 0.0 | 0.0 | 3.1 | 8.9 | 25.1 | 28.3 | 119.9 |

**d.2. Air Temperature**

Table (2) shows the mean monthly maximum (M) and minimum (m) temperatures observed during the period 1951-1965 at Burg El-Arab station. The data indicate that the lowest temperatures are observed in January and February and the region enjoys a typical Mediterranean climate, being strongly influenced by the presence of the sea.

Spring begins in the first weeks of April and there is a marked increase in the maximum day temperature (above 20°C) but the nights in general remain cool. April is characterized by frequent “Khamasin” winds, bringing the maximum temperature over 30°C or even 35°C for two or three days at a time.

The summer lasts over 5 months, from May till the end of October. The day temperature is warm but temperate, fluctuating between 25 and 30°C. The night temperature is rather high, particularly in July and August (more than 20°C).

Table (2): Mean maximum monthly (M) and minimum (m) temperatures (°C) 1951-1965.

| Station | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sep. | Oct. | Nov. | Dec. | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Burg El-Arab | | | | | | | | | | | | | |
| M | 16.7 | 17.7 | 19.0 | 24.6 | 26.0 | 28.9 | 29.3 | 30.4 | 27.3 | 27.3 | 23.1 | 19.5 | 24.2 |
| m | 6.4 | 8.0 | 8.8 | 10.8 | 15.0 | 18.1 | 19.9 | 19.4 | 18.6 | 14.9 | 12.1 | 8.8 | 13.4 |

**e. Water Resources**

**e.1. Hydrography**

In the region from El-Alamein to Burg El-Arab region, the coastal sand dunes rise up to 10 meters just immediately south of shore and extend inland for about 500 m. South of the dunes, two limestone ridges, each parallel to the shoreline, are present. The second limestone ridge is about 4 km south of the shore, rises to an altitude of more than 30 m. The flat, scrub-covered area between the two ridges represents an ancient extension of lake Maryut, which presently ends near Alexandria. South of the second ridge, the topography gradually rises to an altitude of about 130 meters at a distance of about 15 km south of the coast. There is no marked escarpment to indicate the southern limit of the coastal plain. No definite drainage pattern is developed, although some drainage channels are still affected by the tidal waves of the Mediterranean Sea. Accordingly, they may form some salty marshes with a complex of soils, salts and sometimes gypsum.

**e.2. Runoff**

According to FAO (1970), and on the basis of the available data of climate, soils and the flow of wadis, a rough estimate of the total annual runoff of the wadis in the coastal zone area was made. In relatively flat areas, like El-Alamein to Burg El-Arab, an average figure of 4.73% will be taken (Table 3).

Table (3): Annual runoff in El-Alamein to Burg El-Arab region.

| Region | Catchment Area (Km2) | Average Rainfall (mm) | Annual rainfall (mm/y) | Runoff (%) |
|---|---|---|---|---|
| El-Alamein to Burg El-Arab | 1962.00 | 92.00 | 181.99 | 4.73 |

**f. Soils**

**f.1. Soil Morphology, Genesis and Classification**

The soils of the western coast of Egypt are highly calcareous. This is due to the calcareous nature of the parent materials from which these soils were derived and the insufficient and limited leaching.

Dissolution of carbonates and translocation of the dissolved carbonates occur throughout the soil profiles, but complete leaching is not possible because of the arid climatic conditions. The limited translocation of carbonates results in the formation of accumulation zones of horizons. In some profiles they are qualified as calcic horizons, while in others the secondary enrichment of carbonates is not enough to qualify them as calcic horizons.

**f.2. Origin of Parent Materials**

There are at least four origins of parent materials:

a) Alluvial origin

This is assigned to most of the soils of the coastal plains, the alluvial fans and outwash plains and the depressions between eroded and dissected ridges. The fans on the plateau are also formed of alluvial materials though not transported for long distances. In almost all cases, the materials are loamy and highly calcareous.

b) Marine origin

The Oolitic sand grains are of marine origin. Their structure of which was studied during the study of the stranded beach ridges. In many cases, they have concentric structures. The nucleus is usually a detrital particle or shell and microfauna members. In some other cases, however, the grains are structureless. Generally, they consist of carbonates of calcium and/or magnesium. This Oolitic sand forms the beach ridges and inland-consolidated dunes. They have been transported by alluvial or aeolian processes.

c) Aeolian origin

Prevailing winds transport sand grains whether of calcareous Oolitic nature or of quartzitic composition. Aeolian deposits are found covering wide and narrow tracts either on the plateau or in the coastal plain.

d) Lagoonal origin

Lagoonal parent materials are in the depressions between stranded beach ridges. Between older ridges inland depressions are filled with alluvial and/or aeolian materials. In some depressions near the beach, aeolian Oolitic sand grains cover many parts. The original sources of these loamy soils are, generally, the siliceous limestones of the plateau and consolidated ridges. It was noticed that silicium increases in the older ridges, nearer to the tableland.

### f.3. Pedogenic Processes and Diagnostic Horizons

The only visible formations in these soils are the accumulation of lime and salts at depth within the profiles. As the parent materials are very rich of carbonates, one should be careful in interpreting the values of the equivalent $CaCO_3$ contents reported in the soil analysis. Some increase in carbonates in some horizons can be related to the Oolitic sands if they are forming a layer within the profile. $CaCO_3$ contents reported range from about 12% to almost 100% and this variation depends on whether the parent materials are from Oolitic marine sands or from the limestones of the plateau.

a) The calcic horizon and C horizon

As defined in the Soil Taxonomy, the calcic horizon is a horizon of accumulations of calcium and/or magnesium carbonates. In most areas of Egypt, these secondary accumulations are usually in C horizons. A and B horizons do not occur in these soils (Hammad, 1969). As the lime content in these soils can inherently be more than 15%, this value is not a valid test of a calcic horizon. The other criteria is the presence of secondary formations of carbonates more than 5% by volume of identifiable secondary carbonates as pendants on pebbles, concretions or soft powdery forms. Almost all the soils of the area (except the lagoonal depressions) are underlain by highly calcareous rocks and secondary carbonates increase with depth. Other criteria are valid, concerning the thickness of the calcic horizon and the decrease of carbonates below the calcic horizon.

b) The salic horizon

The enrichment of cold water soluble salts are found in the lagoonal depressions and at the ends of some elongated wadis near the sea in the eastern side of Mersa Matruh area. In almost all cases, this is associated with saturation with water from a high water table.

c) Cementation and diagenesis of the Oolitic sand deposits

The dissolution of the outer layers of the Oolitic grains result in the formation of cementing material for the grains. In the most recent beach ridges and dunes, cementation has not yet occurred. The cementation phenomena is well expressed in the inland ridges where the grains are transformed from dolomites to calcite composition and the Oolitic sand grains are cemented into a hard layer. The process results in the consolidation of the ridges. Several degrees of consolidations occur in the Oolitic sandy bodies.

Some can be penetrated by the spade and others can not be penetrated. In some cases, the ridges are consolidated to form a hard cap on top, while the grains underneath this cap are loose. In the older inland ridges, silicification occurs in the top of the ridges and the induration in this case is pronounced.

In the irrigated lands two phenomena were observed; the formation of a very thin crust, though very weak and not indurated, but it adversely affects the germination of seedlings. This crust should be managed very carefully. The soil should not be left to dry and should be frequently irrigated while seedlings are getting established. The other observed feature is the presence of calcic horizons in nodular or concretionary forms. These calcic horizons have impermeable crusts and a perched water-table form above them. The permeability may be reasonable but the infiltration may be seriously limited.

**f.4. Categories of the Classification**

Two orders were found in the soils of the studied area, namely the *Entisols* and the *Aridisols*.

a) The *Entisols*

These are the soils that are lacking subsurface diagnostic horizons. Under the arid conditions prevailing at the Northern Coast, the moisture regime is Torric and the temperature regime is dominantly hyperthermic. There are only two suborders present in the area; the *Psamments* and the *Orthents*. Where the material in all other horizons below a depth of 25 cm or (Ap) horizon, whichever is deeper, have a texture of loamy fine sand or coarser, either to depth of 1 m or to lithic or paralithic contact whichever is shallower, the suborder is *Psamments*. The designation of these sands as a calcic subgroup need not to be included, because this is not in the system of classification. However, the calcareous nature will be considered at the family level, namely as carbonatic mineralogy.

If, however, the texture is finer than loamy fine sand within 1 m of the surface layer, the soil could no longer be considered as *Psamments*. Therefore, only one great group is present and that is the *Torripsamments*.

Where the material below the top layer of the profile is finer than loamy fine sand, the soils are considered *Orthents*, great group *Torriorthents*.

b) The *Aridisols*

Where the horizon in the soil profiles can be qualified as calcic, the soils are considered *Haplocalcids*. If the calcium carbonate enrichments can be qualified as petrocalcic, the soils are *Petrocalcids*. If there are Salic horizons and if a layer within one meter is saturated with water for at least one month in most years, the soils are *Aquisalids*.

In very rare instances, gypsum accumulations were reported. The gypsum accumulations are in ancient lagoons and are not pedogenic. The do not qualify for a gypsum horizon. If, however, there is gypsum accumulation in the lagoonal depressions, because of the high salinity content, the soils are *Gypsic Haplosalids*

## B. PLANT SPECIES RECORDED IN THE SITE

### GYMNOSPERMAE

**EPHEDRACEAC**

*Ephedra alata* ***Decaisne***

### ANGIOSPERMAE

### DICOTYLEDONEAE

**AIZOACEAE**

***Mesembryanthemun crystallinum** L.

***Mesembryanthemun nodiflorum** L.

**CARYOPHYLLACEAE**

**Herniaria hemistemon** J. Gay

**Paronychia arabica** ( L. ) DC.

*Illecebrum arabicum* L.

***Polycarpon tetraphyllum** (L.) L.

*Mollugo tetraphylla* L.

***Silene colorata** Poir.

**Silene succulenta** Forssk.

***Silene villosa** Forssk.

**Spergularia marina** (L.) Griseb.

*Arenaria rubra* (L.) var. *marina* L.

*Arenaria marina* (L.) All.

**Spergularia salina *J. & C. Presl***

**CHENOPODIACEAE**

**Arthrocnemum macrostachyum** ( Moric) K. Koch

*Salicornia macrostachya* Moric .

*Arthrocnemum glaucum* (Delile ) Ung. - Sternb.

*Salicornia glauca* Delile

**Atriplex glauca** L.

*Atriplex alexandrina* Boiss.

*Atriplex crystallina* Boiss.

*Atriplex palaestina* Boiss

*Atriplex stylosa* Viv.

**Atriplex halimus** L.

**Atriplex inflata **F. Mueller***

*Blackiella inflata* ( F. Mueller) Aellen

*Atriplex spongiosa **F. Mueller***

*Senniella spongiosa* ( F. Mueller) Aellen

***Bassia indica** ( Wight) A. J. Scott.

*Kochia indica* Wight

***Bassia muricata** ( L.) Asch. & Schweinf.

*Salsola muricata* L.

*Kochia muricata* (L.) Schrad.

*Chenopodium murale L.

Halimione portulacoides (L.) Aellen
*Atriplex portulacoides* L
**Halocnemum strobilaceum** (Pall.) M. Bieb.
*Salicornia strobilacea* Pall .
**Haloxylon salicornicum** (Moq.) Bunge . ex Boiss .
*Caroxylon salicornicum* Moq.
*Hammada salicornica* (Moq.) Iljin
*Hammada elegans* (Bunge ) Botsch.
**Noaea mucronata** ( Forssk.) Asch. & Schweinf .
*Salsola mucronata* Forssk .
***Salsola kali** L.
**Salsola longifolia** Forssk.
**Salsola oppsitifolia** Desf.
**Salsola tetragona** Delile
**Sarcoconia fruticosa** (L. ) A . J. Scott.
*Salicronia europaea* L. var. fruticosa L.
*Salicornia fruticosa* (L.) L.
*Arthrocnemum fruticosum* (L.)Moq.
*Sueada pruinosa* Lange
**Sueada vera** Forssk. ex J. Gmelin
*Chenopoduim fruticosum* L.
*Salsola fruticosa* (L. ) L.
*Sueada fruticosa* (L.) Dumort.

**BORAGINACEAE**
**Anchusa undulata** L.
**Echiochlon fruticosum** Desf .
*Lithospermum divaricatum* Spreng .
**Echium angustifolium** Mill. subsp. **sericeum** (Vahl ) Klotz
*Echium sericeum* Vahl
*Echium distachum* Viv.
**Heliotropium digynum** ( Forssk.) C. Chr.
*Lithospermum digynum* Forssk.
**Heliotropium lasiocarpum** Fisch. & C.A. Mey.
*Heliotropium europaeum* L. var. *tenuiflorum* Boiss.
**Moltkiopsis ciliata** (Forssk.) Jonnst.
*Lithospermum ciliatum* Forssk.
*Lithospermum angustifolium* Forssk.
*Lithospermum callosum Vahl*
*Moltkia ciliata* (Forssk.) Maire

**CISTACEAE**
**Helianthemum kahiricum** Delile
**Helianthemum lippii** (L.) Dum. Cours.
*Cistus lippii* L.
**Helianthemum velutinum *Pomel***
**Helianthemum sphaerocalyx** Gauba & Janch. **(Endemnic)**

**COMPOSITAE**
**Achillea santolina** L.

***Amberboa lippii** ( L.) DC.
*Centaurea lippii* L.
***Anacyclus alexandrinus** Willd .
***Anthemis microsperma** Boiss. & Kotschy
**Artemisia herba-alba** Asso
*Artemisia incula* Delile
**Artemisia monosperma** Delile
****Astriscus spinosus*** ( L. ) Sch. Bip.
*Buphthalmum spinosum* L .
*Pallenis spinosa* ( L. ) Cass.
**Atractylis carduus** ( Forssk. ) C. Chr.
*Atractylis flava* Desf.
*Centaurea carduus* Forssk.
***Calendula arvensis** L.
*Calendula aegyptiaca* Pers.
*Calendula gracilis* DC.
*Calendula micrantha* Boiss.
**Carduncellus mareoticus** ( Delile ) Hanelt
*Carthamus mareoticus* Delile
***Carduus getulus** Pomel
**Carthamus glaucus** M. Bieb. subsp. **alexandrinus** (Boiss. & Helder. ) Hanelt.
*Kentrophyllum alexandrinus* Boiss. & Helder.
**Carthamus glaucus M. Bieb. var. *alexandrinus* (Boiss. & Helder.) Boiss.**
**Carthamus temuis** (Boiss. & Blanche ) Bornm.
*Kentrophyllum tenue* Boiss. & Blanche
*Carthamus glaucus* M. Bieb. var. tenuis (Boiss. & Blanche) Boiss.
***Centaurea alexandrina** Delile
***Centaurea calcitrapa** L .
***Centaurea glomerata** Vahl
*Centaurea acaulis* Forssk .
**Centaurea pumilio** L.
*Aegialophila pumilio* L.
***Chrysanthemum coronarium** L.
***Cichorium endivia** L.
*Cichorium pumilum* Jacq .
***Conyza bonariensis** ( L . ) Cronquist .
*Erigeron bonariensis* L.
*Conyza linifolia* ( Willd.) Tackh.
*Conyza ambigua* DC.
***Cotula anthemoides** L.
**Echinops spinosissimus** Turra**.**
*Echinops viscosus* DC.
***Filago desertorum** Pomel
***Garhadiolus angulosus** Jaub. & Spach**.**
*Garhadiolus hedypnois* (Fisch. & Mey) Jaub. & Spach.
*Rhagadiolus hedypnois* Fisch. & Mey
**Helichrysum conglobatum** (Viv.) Steud.
*Gnaphalum conglobatum* Viv.
**Helichrysum siculum** Boiss .
**Hyoseris radiata** L. **subsp. graeca** Halacsy .

*Hyoseris lucida* L.
*__Ifloga spicata__ (Forssk.) Sch. Bip .
*Chrysocoma spicata* Forssk .
__Inula crithmoides L .__
*Limbarda crithmoides* ( L . ) Dumort
__Launaea nudicaulis__ (L.) Hook. fil.
*Chondrilla nudicaulis* L.
*Zollikoferia nudicaulis* (L.) Boiss.
*__Launaea resedifalia__ (L.) Kuntze
*Scorzonera resedifalia* L.
*__Onopordum alexandrinum__ Boiss.
__Phagnalon rupstre (__L. ) DC.
*Conyza rupstre* L.
*__Picris asplenioides__ L.
*Crepis radicata* Forssk.
*Picris lyrata* Delile
*Picris pilosa* Delile
*Picris radicata* ( Forssk.) Less.
*Picris coronopifolia* (Desf.)DC.
__Pluchea dioscoridis__ ( A. Rich.) Dandy
*Baccharis dioscoridus* L.
*Conyza dioscoridis* (L.) Desf.
*Baccharis aegyptiaca* Forssk .
*__Reichardia tingitana__ (L.) Roth
*Scorzonera tingtana* L.
***Scorzonera orientalis* L.**
*__Senecio glaucus L. subsp. coronopifolia__ (Maire) C. Alexander
*Senecio coronopifolius* Desf.
*Senecio desfontanei* Druc.
*__Urospermum picroides__ (L. ) F. W Schmidt
*Tragopogon Picroides* L.
__Varthemia candicans ( Delile ) Boiss.__
*Chrysocoma candicans* Delile
*Linosyris candicans* ( Delile ) DC .
*Jasonia candicans* ( Delile **)**
*__Xanthium spinosum L.__

**CONVOLVULACEAE**
__Convolvulus althaeoides__ L.
*Convolvulus elegantissimus* Mill.
__Convolvulus arvensis__ L.
__Convolvulus lanatus__ Vahl
__Cressa cretica__ L.
*__Cuscuta planiflora__ Ten .

**CRUCIFERAE**
*__Brassica tournefortii__ Gouan
*__Cakile maritima__ Scop.
*Cakile aegyptiaca* Willd.
*Cakile hispanica* Jord.

***Carrichtera annua** (L.) DC.
*Vella annua* L.
***Enarthrocapus lyratus** (Forssk. ) DC.
*Raphanus lyratus* Forssk.
**Eremobium aegyptiacum** (Sprengel) Asch. & Schweinf.
*Molcomia aegyptiaca* Sprengel.
***Lobularia arabica** (Boiss.) Muschl.
*Koniga arabica* Bioss.
**Lobularia maritima** (L.) Desv.
*Clypeola maritima* L.
***Matthiola longipetata** (Vent.) DC.
*Cheiranthus longipetalus* Vent.
**Moricandia nitens** (Viv.), Durand & Barratte.
*Hesperis niteus* Viv.
*Moricandia dumosa* Boiss.
***Sisymbrium irio** L.
**Zilla spinosa** (L.) Prantl
*Bunias spinosa* L.

**CUCURBITACEAE**
**Bryonia cretica** L.
**Citrullus colocynthis** (L.) Schrad **.**
*Cucumis colocynthis* L.
**CYNOMORACEAE**
**Cynomorium coccineum** L.

**FRANKENIACEAE**
**Frankenia hirsuta** L.
**Frankenia pulverulenta** L.

**GERANIACEAE**
**Erodium glaucophyllum** (L. ) L' Her
*Geranium glaucophyllum* L.
***Erodium laciniatum** (Cav.) Willd**.**
*Geranium laciniatum* Cav.

**GLOBULARIACEAE**
**Globularia arabica** Jaub.& Spach

**EUPHORBIACEAE**
***Euphorbia forsskaolii** J. Gay
*Euphorbia aegyptiaca* Boiss.
**Euphorbia paralias** L.
***Euphorbia peplus** L.
**Euphorbia retusa** Forssk.
**Euphorbia terracina** L.

**LABIATAE**
**Ajuga iva** (L.) Schreb.
*Teucrium iva* L.

***Marrubium alysson** L.
*Marrubium plicatum* Forssk.
**Phlomis floccosa** D. Don.
**Salvia aegyptiaca** L.
*Salvia pumila* Benth.
**Salvia lanigera** Poir.
**Thymus capitatus** (L.) Link.
*Satureja capitata* L.
**Teucrium polium** L.

## LEGUMINOSAE

**Alhagi graecorum** Boiss.
*Alhagi mannifera* Jaub. & Spach.
***Astragalus annularis** Forssk.
***Astragalus boeticus** L.
***Astragalus mareoticus** Delile
**Astragalus spinosus** (Forssk.). Muschl.
*Colutea spinosa* Forssk.
***Hippocrepis areolata** Desv.
*Hippocrepis bicontorta* Loisel.
*Hippocrepis cornigera* Boiss.
***Hippocrepis cyclocarpa** Murb.
***Hymenocarpos circinatus** (L). Savi
*Medicago circinnata* L.
*Hymenocarpos nummularis* (DC.) G. Don
***Lathyrus. aphaca** L.
*Lathyrus pseudoaphaca* Boiss.
*Lathyrus polyanthus* Boiss & Blanche.
**Lotus creticus** L.
*Lotus salzmanni* Boiss. & Reut.
**Lotus polyphyllos** E.D. Clarke.
*Lotus argenteus* Webb & Berthel.
***Melilotus indicus** (L.) All.
*Trifolium indicum* L.
*Melilotus parviflours* Desf.
**Onobrychis crista-galli** (L.) Lam.
*Hedysarum crista-galli* L.
***Ononis serrata** Forssk.
*Ononis glaucescens* pomel.
**Ononis vaginalis** Vahl.
*Ononis vestita* Viv.
**Retama raetam** (Forssk.) Webb.
*Lygos raetam* (Forssk.) Heywood
*Genista raetam* Forssk.
***Scorpiurus muricatus** L.
*Scorpiurus sulcatus* L.
*Scorpiurus subvillosus* L.
*Scorpiurus laevigatus* sm.
*Scorpiurus acutifolius* Viv.
***Trifolium resupinatum** L.

*Trifolium suaveolens* willd.
***Trigonella laciniata** L.
***Trigonella maritima** poir.
***Trigonella stellata** Forssk.
***Vicia monantha** Retz.
*Vicia biflora* Desf.
*Vicia calearata* Desl.
*Vicia cinerea* M. Bieb.
***Vicia sativa** L.

**MALVACEAE**
***Malva aegyptia** L.
***Malva parviflova** L.
***Malva sylvestris** L.

**OROBANCHACEAE**
**Cistanche violacea** (Desf.) Beck
*Phelipaea violacea* Desf.
*Orobanche phelipaea* willd.
*Orobauche violacea* (Desf.) wallr.
**Orobanche ramosa** L.
*Phelipaea ramosa* (L.) C.A. mey
**Orobanche schultzii** Mutel.
*Phelipaea schultzi*.

**PAPAVERACEAE**
***Fumaria bracteosa** Pomel
***Fumaria densiflora** DC.
*Fumaria micrantha* Lag.
***Papaver rhoeas** L.

**PLANTAGINACEAE**
**Plantago albicans** L.
**Plantago crassifolia** Forssk.
***Plantago crypsoides** Boiss.
***Plantago notata** Lag.

**PLUMBAGINACEAE**
**Limoniastrum monopetalum** (L.) Boiss.
*Statice monopetala* L.
***Limonium lobatum** (L.fil.) Chaz.
*Limonium thouinii* (Viv.) Kuntz
*Statice thounii* Viv.
**Limonium pruinosum** (L.). Chaz.
*Statice pruinosa* L.
**Limonium tubiflorum** (Delile) Kuntze
*Statice tubiflora* Delile.

**POLYGONACEAE**
***Emex spinosa** (L.) Campd.

*Rumex spinosus* L.
**Polygonum equisetiforme** Sm.
**Polygonum maritimum** L.
***Rumex pictus** Forssk.
***Rumex vesicarius** L.

**PRIMULACEAE**
***Anagallis arvensis** L.

**RANANCULACEAE**
***Adonis dentata** Delile.
***Rananculus asiaticus** L.

**RESEDACEAE**
**Reseda decursiva** Forssk.
*Reseda alba* subsp. *Decursiva* (Forssk.) Maire.

**RUBIACEAE**
**Galium canum** Req.
**Crucianella maritima** L.
***Valantia hispida** L.

**RUTACEAE**
**Haplophyllum tuberculatum** (Forssk.) Juss.
*Ruta tuberculata* ForssK.
*Haplophyllum longifolium* Boiss.

**TAMARICACEAE**
**Reaumuria vermiculata** L.
*Reaumuria mucronata* Taub. & spach.
**Tamarix aphylla** (L.) H. Karst.
*Thuja aphylla* L.
*Tamarix articulata* Vahl.
**Tamarix nilotica** (Ehrenb.) Bunge.
*Tamarix arabica* Bunge.
*Tamarix mannifera* Bunge.

**SCROPHULARIACEAE**
**Kickxia aegyptiaca** (L.) Nabelek.
*Antirrhinum aegyptiacum* L.
*Linaria aegyptiaca* (L.). Dum. Cours.
**Verbascum letourneuxii** Asch. & Schweinf.

**SOLANACEAE**
**Hyoscyamus albus** L.
**Hyoscyamus muticus** L.
**Lycium europaeum** L.
***Solanum nigrum** L.

**THYMELAEACEAE**
**Thymelaea hirsuta** (L.) Endl.
*Passerina hirsuta* L.

**UMBELLIFERAE**
***Ammi majos** L.
***Bupleurum semicompositum** L.
**Deverra tortusa** (Desf.) DC.
*Bubon tortuosum* Desf.
*Pituranthos tortusus* (Desf.) Benth ex Asch. & Schweinf.
**Eryngium campestre** L.
***Pseudorlaya pumila** (L.). Grande.
*Caucalis pumila* L.
*Caucalis maritima* Gouan.
*Ovlaya maritima* (Gouah) koch
*Orlaya pumila* (L.) Halacsy.
***Torilis nodosa** (L.) Gaertn.
*Torylium nodosum* L.

**URTICACEAE**
***Urtica pilulifera** L.
***Urtica urens** L.

**ZYGOPHYLLACEAE**
**Fagonia arabica** L.
**Fagonia cretica** L.
**Peganum harmala** L.
***Tribulus terrestis** L.
**Zygophyllum album** L. fil.

**MONOCOTOLEDONEAE**

**ALLIACFAE:**
**Allium aschersonianum** Barbey.
**Allium roseum** L.

**AMARYLLIDACEAE**
**Pancratium maritimum** L.

**ARACEAE**
**Arisarum vulgare** Trag. Tozz.
*Arum arisarum* L.
**Eminuim spiculatum** (Blume) Schott
*Arum spiculatum* Blume.
*Arum crassipes* Boiss.

**CYPERACEAE**
**Cyperus rotundus** L.

**GRAMINEAE**

***Aegilops bicornis** (Forssk.) Jaub. & Spach
*Triticum bicorne* Forssk.
***Aegilops kotschi** Boiss.
*Triticum kotschyi* (Boiss.) Bowden.
**Ammophila arenaria** (L.) Link.
***Avena fatua** L.
***Brachypodium distachyum** (L.) P. Beauv.
*Bresmus distachyos* L.
*Trachynia distachya* (L.) Link.
***Bromus maditensis** L.
*Bromus villosus* Forssk.
***Bromus rubens** L.
***Bromus tectorum** L.
***Cutanclia dichotoma** (Forssk.) Trab.
*Festuca dicotoma* Forssk.
**Cynodon dactylon** (L.) Pers.
*Panicum dactylon* L.
**Desmostachya bipinnata** (L.) Stapf.
*Briza bipinnata* L.
***Hordium murinum** L. **subsp. Leporinum** (Link) Arcang.
*Hordium leporinum* Link.
**Imperata cylindrica** (L.) Raeusch.
*Lagurus cylindricus* L.
***Lamarckia aurea** (L.) Moench
*Cynosurus aureus* L.
**Lolium perenne** L.
**Lygeum spartum** Loefl. ex L.
***Parapholis incurva** (L.) C.E. Hubb.
*Aegilops incurva* L.
*Lepturus incurvatus* (L.) Trin.
*Pholiurus incurvus* (L.) Schinz & Thell.
***Phalaris minor** Retz.
**Phragmites australis** (Cav.) Trin. ex Steud.
*Arundo australis* Cav.
*Phragmites communis* Trin.
***Polypogon monspeliensis** (L.) Desf.
*Alopecurus monspeliensis* L.
*Phalaris cristata* Forssk.
***Saccharum spontaneum** L. subsp. **aegptiacum** (Willd.) Hack.
*Saccharum biflorum* Forssk.
*Saccharum aegyptiacum* willd.
***Schismus barbatus** (L.) Thell.
*Festuca barbata* L.
***Sphenopus divaricatus** (Gouan) Rchb.
*Poa divaricata* Gouan.
***Stipa capensis** Thunb.
**Stipa lagascae** Roem. & Schult.
*Stipa holosericea* Trin. & Rupr.

**Stipagrestis plumosa** (L.) Munro ex Anderson
*Aristida plumosa* L.
**Stipagrestis scoparia** (Trin. & Rupr.) de Winter
*Aristida scoparia* Trin. & Rupr.

**JUNCACEAE**

**Juncus acutus** L.
**Juncus rigidus** Desf.
*Juncus arabicus* (Asch. & Buchenau) . Adamson.

**LILIACEAE**

**Androcymbium gramineum** (Cav.) J.F. Macbr.
*Melanthium gramineum* Cav.
**Asparagus stipularis** Forssk.
**Asphodelus ramosus** L.
*Asphodelus Microcarpus* Salzm.
***Asphodelus tenuifolius** Cav.
*Asphodelus fistulosus* L. var. *tenuifolius* (Cav.) Bakeb.
**Bellevalia macrobotrys** Boiss.
**Colchicum ritchii** (L.) Delile.
*Colchicum aegyptiacum* Boiss.
**Muscari comosum** (L.) Mill.
*Hyacinthus comosus* L.
**Ornithogalum narbonense** L.

**POSIDONIACEAE**

**Posidonia oceanica** (L.) Delile**.**

**TYPHACEAE**

**Typha domingensis** (Pers.) Poir. ex Steud.
*Typha australis* Schum. & Thonn.

* **Annual species**

# C- ANALYSIS OF THE REGIONAL DIMENSIONS OF THE PROGRAMME AND LESSONS LEARNED

## Introduction

The North African Programme for the conservation of biodiversity was launched since almost four years. This happened after several meetings in the countries of the region. Without doubt, it was the first time that the North Africans meet to discuss such an important issue. All the countries are sharing a lot of their biota and also the problems threatening the biodiversity, and consequently the ecological sustainability of the use of the natural resources. The experts in the countries of N. Africa established close links with each other. This enabled them to exchange data, information and experience, which raised their capacity in the fields of conservation of biodiversity and combating its degradation.

The Swiss support through the IUCN has been very profitable in gathering the efforts of the experts in the region to cooperate in such a vital issue. To the first time, experts from the different countries have regular meetings discussing their activities for the conservation of biodiversity in their countries. Important issue were considered in the first phase, including; the hot spots issue, the Cheetah problem, the medicinal plants issue and the biodiversity and education. The successful results obtained in the first phase encouraged he donor, the experts and the IUCN to start a second phase. The projects and activities of the second phase tried to make use of the already collected data and information. The scientific achievements of the first phase represented a good baseline for the second phase. The participatory approach in managing the projects was maximized in the second phase. The awareness and participation of the various stakeholders were obvious and have their impact on the implementation of the activities. The more or less regular circulation of some reports was very effective in strengthening the regional coordination. Also the regular meetings helped in the exchange of information, data and results.

The Swiss support, and the IUCN coordination are appreciated and the experts in the region feel their impact on the regional cooperation.

| Field | Regional Evaluation |
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| *Scientific Achievements* | Books, publications in International periodicals, bibliographies, list of plants, simplified scientific articles were published.<br>These publications are very useful on both national and regional levels. To the first time in the region, we have documentation on issues of regional interest. The scientific communities appreciated these publications: national, regional and international. This will be useful to numerous stakeholders in the region. |

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| *Know-how transfer to Populations* | On the Technical Level:<br>* Cultivation of wild plants by the local people<br>* Post-harvest processes to give added value to the products of medicinal plants to support the local population<br>* Observations on the biodiversity, monitoring its degradation and loss<br>Capacity Raising on Personal level among all stakeholders:<br>* Improve knowledge about biodiversity and related issues<br>* Transfer of knowledge and know-how among the countries of the region<br>* Increase of contacts with the public and students<br>* Acquire knowledge of traditional methods |
| *Exchange and Networking* | On regional bases: Regional meetings, circulation of national reports (though not efficient) visits to the sites in different countries helped to a great extent the exchange of information, data and experience<br><br>There is a great need to find better more efficient methods for exchange and networking. Development of documentation of the indigenous knowledge is important for the region to develop it for the benefit of the local people and conservation of biodiversity.<br>On national bases: Data, information and results of the project were circulated among the national institutions, organizations, university staff members, and researchers. This was achieved through meetings and reports. |
| *Project Set-up* | The set-up depended mainly on:<br>* Participatory approaches with stakeholders especially the local people<br>* Fund raising and searching for co-funds ad subsidies for the activities of the project<br>It has been found important to:<br>• formulate the projects with well-defined activities and clear outputs<br>• need for common regional problem to be addressed in the coming phase<br>• be realistic in project proposals depending on actual human and fund resources available<br>• avoid overlapping of activities |
| *Program Management* | The management of the programme on national level was good and was based on the:<br>• National Steering Committee<br>• Local Site Coordinator Committee<br>• Consultants and scientists in the country<br>• Beneficiaries from the local population<br>On regional level, the meetings helped to incorporate different ideas in the management of the project. This was particularly about field trials and activities |

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| | Management through public participation seems to be more important to help the success and sustainability of the project<br><br>The management of the project should follow the signed contracts between the contractee and IUCN |
| *Contribution* | In view of the wide scope aspects of the project the contribution to its implementation was immense.<br>• Human resources : stakeholders (land and labour), Scientists ( reporting and advice), Government Departments and Personnel<br>• In Kind: Office facilities and spaces, vehicles, guest houses, computers, printers, photocopy machines, faxes and telephones<br>• Financial: co-funds obtained from the State, NGOs, UN agencies, donors, and local governors. This covered a great part of the necessary activities.<br>• Scientific: publications in world-wide journals, books, booklets, knowledge about the biodiversity in arid and semi-arid zones, start documenting the indigenous knowledge. The available data in the different countries and existing facilities represented a vital input to the programme<br><br>It has been evident that the indigenous knowledge of the use of the components of biodiversity in the region would play an important role in the life of the local people. This may give environmentally sound solutions to new problems. |
| *Beneficiaries* | • Local population<br>• Scientific community<br>• Government personnel and decision makers<br>• Women and Children<br>• NGOs<br>• IUCN (members in the region and in similar ecozones)<br>• Partners of the project in the different countries<br>• People living in the same ecozones in other regions |
| *Overall Critical Remarks* | • The lack of co-operation between the unit of biodiversity in the HQ of IUCN, some commissions of IUCN and the project<br>• The Arabic language should be used, in addition to English or French, in reporting<br>• The regional transparency is very important; the national reports should be circulated among all the focal points in the five countries<br>• The regional attitude should appear I the reports<br>• Visits, not only of project leaders, but also of who played roles in the project to other countries are important and fruitful<br>• There is need to find modern, easy ways for the dissemination of knowledge among the countries of the region and other region to help global use of the collected data and information<br>• Lack of facilities and shortage of funding to cover all the |

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| | activities and the relevant needed inputs<br>• Shortage of time<br>• The great need for livelihood alternatives to support the conservation of biodiversity, a matter which needs more funding and effort |
| *Participation in the Continuity of the Programme* | • Ongoing briefing of authorities on the project and its activities<br>• Coordination of the project with other ongoing relevant programmes<br>• Flexibility in implementing the project attracts other players to come in<br>• Participation of the local people helps the sustainability of the project<br>• Involvement of the programme within the national action plan guarantees the continuity of the project<br>• Fund raising is essential to support the continuity of the programme |

**PROPOSED PROGRAMME FOR THE COMING PHASE (Phase 3):**

- Indigenous Knowledge: survey, documentation, development for ecologically sustainable use and conservation of biodiversity in arid and semiarid zones of N. Africa

- The medicinal plants, which have been eradicated in some countries, are replaced by the same species or a substitute from the neighbouring country. As example medicinal plant from Libya are sold in Mersa Matruh, Cairo and other cities in Egypt. There is a great need to assess this phenomenon and find solutions for the problems encountered in the process.