السلام عليكم ورحمة الله وبركاته


Agriculture Research Center
Soil & Water and Environmental Research Institute
Water Requirement and Field Irrigation Research Department

Project title

Control and Rehabilitation of Natural Resource Degradation of Arid Land in Egypt

Integrated Practices for Dry Land Management in North West Coast of Egypt


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Abstract

Profitable agricultural activities in dry areas based upon the efficient and sustainable utilization of the limited water supply from rainfall and other water resources (ground water). Rainfall in these zones is low, variable and undependable which seriously constraints the achievement of sustainable agricultural development, it is essential to manage the soil as a water capture and storage medium that buffers the needs of plants against the irregularities of supply. In rainfall farming, all improvement must come in the farmer's field, holding and storing the water where it falls.

Improvement to on–farm water harvesting techniques and the rational utilization of surface runoff would be of great benefit to Egypt. A number of runoff utilization techniques are being applied in North West Coast of Egypt and the main problem is to select the most efficient technique for a given situation at the lower cost. The rangeland in North West Coast (NWC) is subjected to degradation as a result of overgrazing, salinization, loss of fertility, and wind erosion. This was necessary to pay attention for rangelands management and rehabilitation. In NWC water management is the key challenge for improving food production due to the extreme variability of rainfall, long dry season and recurrent droughts, floods and dry spells.

The focus in this proposal will be on the current conditions for key water management challenges facing rain-fed agriculture from the perspective of water productivity and water management spectrum to up-grade rain-fed farming systems.

The objectives are:

1. **To establish demonstration sites in the North West Coast of Egypt to evaluate, develop and apply water harvesting and supplemental irrigation technologies for improving crop production and plant growth for grazing, establishment of fruit trees and sand dune fixation**

2. **To develop improved and integrated soil, water, nutrient, vegetation and livestock management technologies.**

3. **To optimize soil and water use for sustainable agricultural development**

4. **To enhance human skills and knowledge in respect to efficient soil and water use management and improving livelihood of rural communities (Bedouins).**

The methodology include:

1) review and identification (possibly using GIS technology) of sites suitable for the use of water harvesting and supplemental irrigation technologies for agro-forestry application;

2) selection of pilot project sites and suitable on –farm water harvesting techniques;

3) identification, involving local participation, of plant (shrub) species to be used ;

4) establishment of field trials on : techniques for soil surface management develop improved runoff coefficients , appropriate techniques of water harvesting on small watersheds, introduction of supplemental irrigation techniques to fulfill irrigation needs of the agro-forestry system created, extrapolation of site-specific information on optimizing soil & water use through use of modeling techniques ;

5) training of engineers, technicians and farmers for the implementation of the appropriate technologies;

6) socio-economic assessment of the systems developed.

Project benefits and the expected impact (outputs) include the following:

1. Development and demonstration of improved technologies for arid land management involving agro- forestry;

2. Inventory of suitable sites within Egypt for water harvesting application;

3. Development of appropriate techniques of water harvesting on small watersheds;

4. Better understanding of precipitation patterns to promote more effective interception and retention of water;

5. Develop new techniques to control crusting, retention of water and promote infiltration;

6. Quantitative understanding and mapping of evaporative demand and evapotranspiration, more efficient and economical supplemental irrigation techniques;

7. Computerization of data to fill gaps in existing databases and create new data bases where required;

8. Enhanced human skills and knowledge in respect to efficient water-use management in dry area agro-forestry;

9. Economic appraisal leading to identification of investment opportunities in this form of sustainable arid land management;

10. Provision of alternative forms of income;

11. Encouragement of rehabilitation of arid land productivity and bio-diversity; and

12. Provision of reliable information and guidelines for policy makers in respect to efficient water use management techniques acceptable to dry area farmers.


Project Objectives

The expected general outcomes of the project and should be achievable within the suggested project duration could be identified as follows:-

1- Adopting innovative approaches in North West Coast (NWC) development through;

1-1.Community participatory- Based Approach; this approach is based on the involvement of local communities (Bedouins of NWC) in planning, programming, monitoring and evaluation of project activities. Communities were involved in characterization of their area, identifying the threats and problems facing their natural resources and their priorities, suggesting solutions to these problems based on their indigenous knowledge and in implementing the agreed upon technical interventions.

1.2. Innovative approach in selecting project area: An innovative approach was developed in selecting the proper area for project implementation. The selection criteria considered the watershed as a basic unit for NWC development, and for the technical and socio-economic interventions. The approach utilized the GIS and RS techniques in integrating biophysical and socioeconomic factors in selecting proper watershed for project intervention.

2- Integrated Resource Management Technical Interventions:

2.1. Technical intervention; intervention adopted by the project address the sustainable and integrated resource management (IRM) of NWC by implementing , with community participation, water harvesting interventions and fodder shrub plantations and drought tolerant fruit trees, that conserve the soil and water, increase fodder production, and improve natural vegetation, and improve farmer income. These include micro-catchments (planted to atriplex and salsola, or fruit trees), check- dams, and ponds.

2.2. Introduction of mechanized water harvesting tools; the project in cooperation with Matrouh Resources Management Project (MRMP), introduced machines for the construction of water harvesting structures. The machine provides the opportunity to construct water harvesting structures for larger areas in a short period of time and make such interventions economically viable. The mechanized system provide the planted fodder shrubs with better environment to survive, control soil erosion, and enhance natural vegetative cover.

3- Building Capacity for Farmers (Bedouins) and local staff:

3.1. **Exchange of experiences among Bedouins and technical staff ; farmers and technical staff visited the project sites at NWC of Egypt. These visits provide the opportunities for Bedouins and technical staff interaction and exchange experiences. Likewise, in- country visits to the project sites were conducted by farmers from other areas in Egypt.**

3.2. **Farmers training; the project team trained the Bedouins on the selection , implementation and maintenance the water harvesting structures that were partially damaged by rain.**

3.3. **staff training : several training courses and training workshops were organized during the project duration to train technical staff on the project techniques, such as water harvesting techniques, GIS and RS, data measurements and analysis ……..etc.**

4- Extending project Approach at the National and Regional levels:

4.1. Extending the project approach to other projects

4.2. Expanding the approach at the national level

4.3. National collaboration: the project was pioneer in bringing national institutions and scientists together in planning and implementing project activities.

4.4. Regional collaboration

5- Technology Dissemination and project sustainability:

The project efforts in disseminated its outputs followed several approaches and mechanisms that are centered on community involvement in the dissemination process which will ensure sustainability of project activities; these could be summarized in the followings:

5.1. Field days: field days for farmers (Bedouins) from the communities where the project is implemented and farmers from the neighboring villages organized annually to show them the performance of the introduced interventions.

5.2. Farmer training; training farmers on project interventions was achieved through field days and on site training on water harvesting structure establishment and shrub plantation.

5.3. Community managed nurseries for shrub and fruit trees seedling production.

5.4. Community participation in project management.

5.5. **Brochures: in order to increase the adoption process, a brochure describing project objectives and activities is being prepared. Brochures are distributed to all farmers in the area and in other villages.**

5.6. **Public awareness program: the project develop a public awareness program to raise the knowledge of the public on the issues of sustainable land management and water conservation in the very fragile system of the NWC (North West Coast) of Egypt. The public awareness program include: visits of local people in the project area and neighboring villages to project site, and visits by public figures such as parliament members, religious people, and women organization. Also radio and TV interviews are being conducted and broadcasted address the public on the project activities that aiming at the integrated resource management, also several newspapers articles were published at the national level. Other tools such as T-shirts and Caps and posters will be also used in the Public Awareness (PA) campaigns.**

Materials and Methods


Activity 1
Forecast of rainfall

It is well recognized that one of the most likely options to improve the accuracy of rainfall forecasts is improvements in the timeliness and accuracy of precipitation estimates from enhanced Numerical Weather Prediction (NWP) models using data assimilation and ensemble forecasting. Modern NWP forecast models results are encourage by enhancements gained from using remotely sensed data and means of ensemble forecast.

This would contribute to increase the efficiency of predicting rainfall amounts and places somewhat becomes effective tools in harvesting of rainfall. This gives the opportunity to control and early warning of the storm during the next two days. It is therefore proposed to use the state of the art NWP model, Weather Research and Forecasting model (WRF), to predict the rainfalls.

To this account, in this project precipitation is pursued using two new resources available in Egypt.

***First*, a numerical model based on a mesoscale simulation will be used. This model will be run on the recently supercomputers at the institute (SWERI).**

***The second one* will use remote sensing and ground observations data to enhance the model results. Both models will be compared with available meteorological data on the site. Furthermore, the numerical model can supply forecasting data regarding the possibility of rainfall occurrence.**

During the course of the project, three sub activities will take place:

***First**, a stage of data collection,*

in this stage initial data such as land use, topography, initial conditions, available meteorological measurements, remotely sensed images for the studying areas will be collected and processed. Such data is needed to build the numerical model for the studying areas and then, to enhance the model results. In addition, it will initialize both the numerical and remote sensing aspects of this activity, and for data validation purposes.

In the second phase,

numerical simulation of the mesoscale model, and estimation of rainfall based on remote sensing will proceed.

The latest state of the art,

Weather Research Forecast (WRF) model will be used to investigate the prediction of rainfall over the mentioned areas. This phase is expected to continue for approximately 15 months. In the last phase, documents, papers, and reports will be prepared for publishing and dissemination of information to appropriate authorities.

Dr. Gamal Elafandi, will arrange that all appropriate tools needed for successful completion of the activity are available to present a good rainfall forecasting.

Dr. Gamal is a staff member at Al Azhar University, Faculty of Science, Department of Meteorology. He is experienced in atmospheric physics and has been conducting research with numerical weather prediction models for over 10 years and has managed several M. Sc. and Ph.D. students in this field of interest. He contributed in many national and international projects.

Dr. Mohamed Ismail **(Remote Sensing Unit, SWERI),** ***Dr. Samiha Ouda*****, *Dr. Ala El-Bably*****, and** ***Dr. Nemait Allah Osman*** **(Water Requirements and field irrigation Research Department; Soil, Water and Environment Research Institute, ARC) according to their experiences in this field of interest will be involved and sharing the implementation of this activity.**

Activity 2

The term of water harvesting is used to describe the process of collecting and storing water for later beneficial use from an area that has been modified or treated to increase precipitation runoff.

A water harvesting system is the complete facility for collecting and storing the runoff water. The fraction of rainfall that follows over landscape from higher to lower elevation is known as runoff. Runoff farming is a water harvesting system specially designed to furnish water for growing plants.

Water harvesting systems are identified as such on basis of their engineering characteristics. All systems have both catchments areas and bunds or ridges to impound or impede runoff. Water conservation strategies are based on increasing storage rainwater in soil profile to increase crop yield by using water harvesting methodology.

Engineering design for water harvesting system (except flood water system) should logically begin with the calculation of the requested contributed area; cultivated area (C:CA) ratio.

Before selecting a specific technique, due consideration must be given to the social and cultural aspects prevailing in the area of concern as they are paramount and will affect the success or failure of the technique implemented. This is particularly important in the arid and semi-arid regions and may help to explain the failure of so many projects that did not take into account the people's priorities,

most of the population has experienced basic subsistence regimes, which resulted over the centuries in setting priorities for survival. Until all higher priorities have been satisfied, no lower priority activities can be effectively undertaken.

The rain-fed coastal areas of Egypt have received considerable research and development attention over recent decades. Initially, the main aim was to facilitate the sedentarization of the Bedouin population, and projects were undertaken to rehabilitate degraded rangeland and increase runoff utilization, through Wadi terracing and the enhancement of indigenous runoff farming systems (Perrier, 1986).

More recently, the coastal areas have come to be seen as another small but potentially productive national agricultural resource, and emphasis has shifted towards more intensive development. However, the natural resource issues……. water quantity and quality, population growth, and environmental deterioration..... remain the same (Abdel-Kader et al. 1994).

This activity will include the following sub-activities:

Sub-activity 2-1

Establishment of an inventory database based on GIS and literature information on water harvesting application at NWC

This task will include the following:-

2.1.1. Select specific sites for project implementation

2.1.2. Collect available data.

2.1.3. Computerization of data to fill gaps in existing data bases and create new data bases.

2.1.4. Field visits (campaign to obtain missing information).

2.1.5. Digitize data and create GIS layers.

2.1.6. Use GIS to produce mapping units.

2.1.7. Ground truthing to verify maps.

2.1.8. Evaluate socioeconomic potential of water harvesting techniques.

Sub-activity 2-2

Establishment Establish demonstration sites to evaluate, develop and apply water harvesting technologies.

Two Wadis (one east and the other west Matrouh city) will be selected to demonstrate the following water harvesting technologies:-

a- micro catchments or small basins with different sizes and shapes for olive and fig trees.

b-water spreading system and contour furrowing system for shrubs (Acacia,.....etc).

c- optimum catchment area (size) collecting rainfall to fill the cisterns.

d- roaded catchments for cultivating special trees (apple, almond and peach).

e- stone dikes and strips (wheat and barely).

The main objectives of such demonstrations are with the participation of Bedouins to select the proper techniques of water harvesting for improving crop production and plant growth for grazing, establishment of fruit trees and sand dune fixation.

The basic technical selection criteria for the different water harvesting techniques are:

Slope: The ground slope is a key limiting factor to water harvesting. Water harvesting is not recommended for areas where slopes are greater than 5% due to uneven distribution of run-off and large quantities of earthwork required which is not economical.

Soils: **Should have the main attributes of soils, which are suitable for irrigation: they should be deep, not be saline or sodic and ideally possess inherent fertility. A serious limitation for the application of water harvesting are soils with a sandy texture. If the infiltration rate is higher than the rainfall intensity, no runoff will occur.**

Costs: **The quantities of earth/stone work involved in construction directly affects the cost of a scheme or, if it is implemented on a self help basis, indicates how labor intensive its construction will be.**

Background, technical details, design of water harvesting techniques, layout and construction and quantities of earthworks are described in **(Salem, 2000; Abd el-Kader, 1995 and Shakshouk, 1998).**

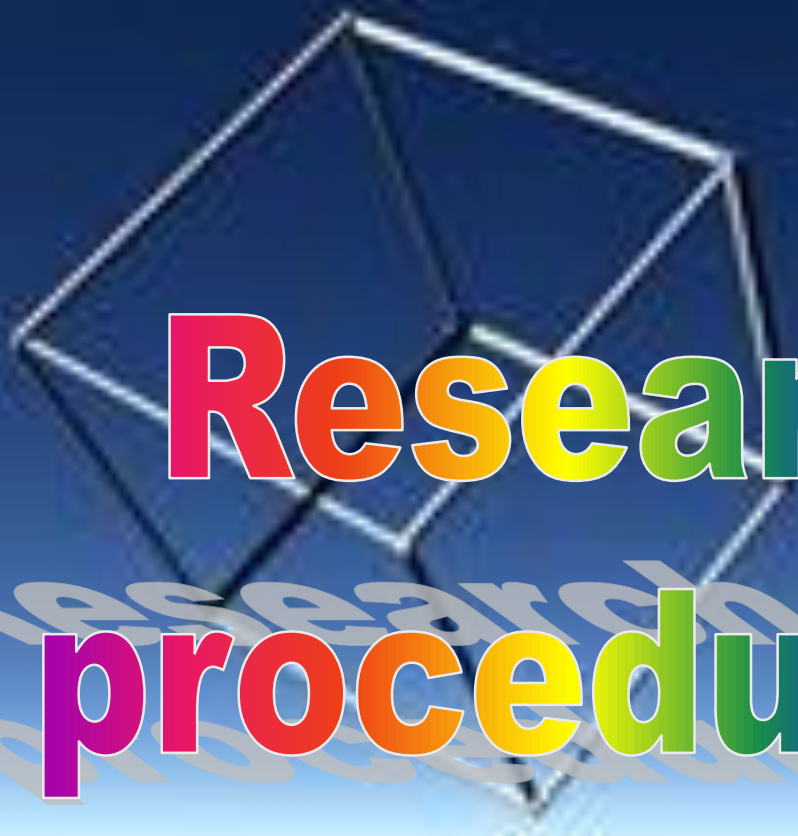

Sub-activity 2-3
optimize
soil and water use
for sustainable agricultural development

This task will be carried out or implemented at the Wadis bottom (the two selected Wadis for sub-activity 2.2) aiming at to develop improved and integrated soil, water, nutrient, vegetation and livestock management technologies.

All lands in NWC are located in arid and semi- arid areas (rainfall less than 150 mm/year). The use of this land is in its present stage, not yet economical. The main problems are: shortage of water; irregular rainfall; soil erosion; low productivity of soil and inadequate knowledge and skills in relation to rainfed agriculture in dry land areas. **(FAO, 1970 and Abd El-Kader 1995)** showed that rain-fed farming and spate irrigation to supplement water for those areas are very significant in the NWC. Land and water resources survey which were carried out in these areas revealed that more areas could be cultivated upon the available water resources. The efficiency of the conjunctive use of supplementary irrigation with rainfall becomes evident. Supplementary irrigation was needed because of the irregularity of rainfall.

Dwib Oweis, 1998; Shakshouk, A. M. 1998; and El-Saidi, M.T.A, 1998, concluded that the supplemental irrigation proved to improve and sustain the dry land agriculture through the application of small amount of water, in addition to increasing the crop productivity (full crop production) and water use efficiency. They added that implementation of water harvesting technology, use of modern irrigation techniques (drip and sprinkler) to supplement the irrigation of vegetables, fruit trees, wheat, beans, and barely considered very important measures to achieve and sustain the agriculture production and development in dry land areas.

Ahmed Gamal Abd el-Samie, 1998; reported that olive tree production could be doubled by the application of supplementary irrigation (800 m3/feddan), the amount of irrigation water to supplement the irrigation of some fruit trees, beans and cereals was estimated. He added that many of the hydro geological studies carried out in the North West Coast (NWC) of Egypt proved that the ground water existed in the region could be used as a source for the supplemental irrigation (at the rate of 500 m3/ feddan/ year) and for the conjunctive use of water resources (ground water and surface runoff water).



Research procedures

To achieve the goal of the activity, tow field trials are proposed, designed, replicated and implemented in the two selected Wadis as follows:

The first field trial:-

This trial to be designed to assess and evaluate the supplemental irrigation of wheat and barely crops (mixed with Acacia range and other preferable shrubs planted in the borders of the field) using the sprinkler irrigation system (portable solid-set system) and to irrigate vegetables during summer season. The source of the irrigation water is rainfall harvested water in underground built reservoir (the reservoir and its catchments area will be designed by the project staff and will be implemented in cooperation with the owner of the field or the Bedouin himself), and the field trial will be treated as demonstration plots and replicated four times (two replicates at each Wadi bottom).

The second field trial:-

This field trial to be designed and implemented to test the performance of drip irrigation system as a tool for the supplementary irrigation of winter vegetables intercropped with fig and olive trees and to irrigate the summer vegetables (water melon, melons, and tomatoes) and replicated in four sites (two sites at each Wadi bottom).The source of irrigation water is wells or cisterns which contain and store groundwater and harvested rainfall water or surface runoff water together and permit conditions for the conjunctive use of different water resources and optimize its uses in the concerned areas. Treatments are; supplement irrigation for winter vegetables, fig and olive trees (irrigate to replenish total water balance requirements), and irrigate the summer vegetables. These trials will be implemented and treated as demonstration plots.

Slow release fertilizer (Enciabeen) will be added at the recommended doses to the vegetables fields and introduced to the farmers as an approach to optimize the fertilizers use (decreases the losses of plant nutrients and save the environment). These types of fertilizers and fertilization techniques proved to be efficient and viable tool in terms of the results obtained from the previous research work in such areas. Enciabeen is the trade mark of a local slow release nitrogen fertilizer, made in the Soil & Water and Environment Research Institute (SWERI) according to Abbady (1997) and it is so-called urea form or urea formaldehyde compound. An agronomic evaluation was performed on different crops and the results obtained indicated by Abbady et al (1997) and 2003.

Characters or parameters undertaken:

- Analysis of the meteorological data from the nearest station (Matrouh meteorological station) and rainfall pattern.
- Calculation of reference evapotranspiration (ET0) using Penman-Monteith method, crop factor (Kc), and actual evapotranspiration (ETa) of crops and trees introduced in this project.
- Determination of the amount of irrigation water to supplement the irrigation for crops and trees (irrigate to replenish total water balance requirement)
- Comparison of crops and trees production under both supplemental irrigation and full rain fed (no irrigation) treatments.
- Cost-Benefit analysis.
- Socio-economic assessment and the adoption of Bedouins to the supplemental irrigation techniques using the modern irrigation systems.

Socio-economic activities:

Appraisal of the socio economic impact of implementing the irrigation system in the project sites is based on comparison of the socioeconomic components of the farming system in the project sites with those of the control site (rain fed).The pumped water is used for supplemental irrigation for winter crops and timely irrigation for summer vegetable crops. In the control site, rain fed agriculture is practiced. Using the collected input-output, the farm recourse budgets will construct for the project sites and the control site. The budget details recourses used, output produced and economic returns associated with each crop produced. Moreover, annual cost estimates of pertinent items related to pumped water as well as the actual costs of crop production will established. Assessment of the farm inputs and outputs in Cost-Benefit Analysis (CBA) is based on the principal of opportunity cost. These activities will be carried out according to (El-Rasoul, 1992 and Tang (1997).

Enhance human skills and knowledge activities:

The main objective of such activities is to improve technical skills of research staff and Bedouins and knowledge generated by the project dissemination through the following:

- **Research support staff will be trained through in-country courses.**
- **Village based extension workers will be trained on-the job through the researchers involved in the project implementation. Training will cover agricultural practices, water harvesting techniques, supplemental irrigation, and integrated soil and water management practices for sustainable agricultural development.**
- **Conduct stakeholder training, including awareness raising for policy makers, training of researchers in non -formal education techniques, training of extensionists in techniques and methods used in farmer participatory training and a awareness campaigns.**

- **Disseminate successful technologies through extension services, field and harvest days and involvement of lead farmers using participatory approaches and farmer's schools.**

The staffing expertise involved in Activity 2 are; Dr; Abd-elhafez; Dr. Mohamed Ismail; Dr. Hani Ramadon; Dr. Nemait allah Osman; Dr. Alaa El-Bably; Dr. Fouad A. Fouad, and Dr. Khadra Abbady (SWERI), Dr.Shaban (Economist expert and Dr. Eid extension expert; two expertise from Desert Research Center (to be nominated later); director of agriculture research station (Matrouh) and Director of Desert Research Station (Matrouh), see the attached available C.V.'s.

Activity 3

This activity will include the following sub-activities :-

Sub-Activity 3.1.
Establishment of an inventory database based on GIS and Literature information on native rangeland species.

Many projects dealing with ecological studies and improvement practices of some rangeland in the Egyptian Deserts had been carried out (FAO; 1970, 1984 and 1990; MRMP, 1992). Therefore, it is very important to establish and update an inventory database on the existed native rangeland species in the NWC of Egypt, to help in the planning of a suitable strategy for the conservation and management of natural rangelands to cover the growing requirements for feeding and avoiding their deterioration under the influences of overgrazing and wood collection.

Sub-Activity 3.2.
Identification, classification and characterization of native rangeland species.

This sub-activity will be implemented in close cooperation and participation between project experts and the Bedouins themselves (or their leaders) in order to identify, evaluate and conservation of rangeland species of potential economic and ecological importance. This sub-activity will help in the process of exploitation of desirable native and exotic range species in the revegetation (rehabilitation) of rangelands in the project area.

Sub- Activity 3.3.
Collection of promising rangeland species (seed collection)

Revegetation is among the most effective procedures for rangelands improvement. Using native species, which are completely adapted to the prevailing environmental conditions of the NWC of Egypt, is recommended. To fulfill this target field trips must be carried out in the suitable duration to collect ripen seeds of range plants (both perennials and annuals) to be propagated further, after the dissolving of germination constraints and either sown (in case of annuals) or transplanted (in case of perennials) in the project area under management. After preparing a list of plant species of which seeds are collected, seeds to be collected from different localities along the NWC zone and are soon preserved in deep freezers (-21oC) in the Desert Research Center Station at Matrouh or other available institutions.

Sub-Activity 3.4.

Establishment of a botanical garden and associated nursery in El Qasr Research Station (Matrouh)

Fodder shrubs improvement under NWC of Egypt condition through select the best fodder shrubs, spread and cultivated the selected on the Bedouin farmers to control overgrazing and improved the present seedling production methods in the nursery to obtain good quality and reduced costs will be important for improving the natural rangeland and stopped the soil degradation in this area. The seedling represents an important step towards the success of the planting in the dry land area especially in the NWC of Egypt where the limited rainfall and low quality of the soil.

The new techniques were used in the nursery at El-Qasr research station, ARC. The Regional Initiative for Dryland Management project established this nursery on 2003 and distributed about 5500 seedlings of different species on the Bedouins and planted as a field guide. This nursery will be rehabilitated and expanded under this proposed project. Five feddans will be selected at El-Qasr research station to establish botanical garden for seed production and monitor the plant growth of the selected fodder shrubs, these shrub species will be planted to evaluate and select the best ones under NWC condition and also for seed production purposes.

Sub-Activity 3.5.

Production of a field guide of native rangeland species (ecological and economic characteristics)

In this regard, producing a field guide describing the ecological and economic characteristics of the native rangeland species existed in the NWC of Egypt are of great important, to identify their potentialities for grazing and other purposes. This field guide together with other Sub-Activities planned aiming to shed the light on the mechanisms and strategies of our native flora which can point to the way through which environmental stresses can be overcomed.

Sub- Activity 3.6.

Monitoring of rangeland species

In this regard, ecological and phytosociological studies are to be updated through the survey of plant cover of the presented phytoecogeomorphological units along two transects. The first one extend from the shoreline up to the tableland whereas the second one will curry out along Abu-Ghlila area which lies to the west of Sidi Barrani region which is known as the most promising range area due to its distinguished geomorphologic setting and where rainfall reaches its highest average compared to other extensions of the NWCZ (North Western Coastal Zone). associated soil profiles with each habitat type will be also concerned.

Along the surveyed N-S sector of El-Obyed region, west of Matruh. Five phytoecogeomorphological units were discriminated; mobile and consolidated coastal sand dunes, depressions (wet and dry salt marshes), Coastal drainage lines, slopes or runoff areas of the plateau and ridges, the second transect (Abu-Ghlila region west of Sidi - Barrani) traverses ,from north to south; partially consolidated oolitic sand dune complex, Wadi-like depressed parts, coastal ridges and the different local phytoecogeomorphological units of the undulated coastal plain (commencement of the piedmont plain). Two sites in each type of habitat will be studied. Vegetation analyses include density, plant cover percentage, frequency, relative density, relative frequency and importance value. Determination of plant height, fresh weight of the tender parts and productivity of the recorded species will be also reported. The nutritive value of palatable perennials including total protein, total carbohydrates, total ash and other extracts will be also concerned. Soil samples associated with each site will be analyzed physically and chemically (pH, Ec, Na+, K+, Ca++, Mg++, Cl--, So4--, organic carbon and Co3--).

Sub- Activity 3.7.

Training programs for rangeland specialists, extension and Bedouins or farmers leaders.

Studies of the training needs of the extension workers showed that most of them have not received training in water harvesting and dryland management. Moreover, the lack of knowledge and skill and inadequacy of extension services were viewed as major factors of hindering the adoption of the recommended water harvesting practices.

Thus training programs are needed for the technicians and extension workers in the project areas (NWC) to gain necessary knowledge and skills in the area of water harvesting and related issues to integrated dry land management and this, in turn, enables them to participate actively in the project activities.

Objective and justification

The success of the project demonstration sites in changing the management practices of the Bedouins depends on the a wareness and training of the subject matter specialists and extension workers in the field and farmers living in the demonstration sites.

For the rate of adoption of improved practices by the Bedouins in the demonstration sites depends on the effectiveness of the interaction between the project technical staff, extension workers and Bedouins, permitting two-way connection between the three groups.

The project will introduce a practical training program to expose the participating technicians, Bedouins leaders and extension workers to the following subjects and issues:-

1. Water harvesting techniques- technical and socioeconomic aspects.
2. Supplemental irrigation and on -farm water management.
3. Rangeland maintenance and improvement.
4. Socio-economic aspects of soil and water resources use in the dry land farming system.
5. Farm budgets and records.
6. Geographic information systems (GIS), and components as well as methods and application.
7. Nurseries techniques and botanical garden.

The training activities through seminars, workshops and lectures will be conducted at El-Qasr Research Station and Desert Research Station (Marsa-Matrouh governorate) .

In the last day of each training program, an evaluate will be made for the training course, and a formal will be designed for such purpose. The participants will be asked to report about their views to the presented subjects, method of information delivery and timing of the seminars and field days. Positive and negative responses with respect to the gained knowledge and skill from the training courses will be recorded and evaluated.

Sub- Activity 3.8.
Survey on grazing characteristics.

The following surveys are of great important to be implemented and updated **(Kassas,1972 and 1977; Ayyad and Gabbour,1977; Matrouh Development Authority, 1991; and El-Naggar et. al.,1988):-**

1. Reconnaissance Survey.
2. Environmental Conditions (climate, land resources, water resources, animal production and ranges).
3. Detailed Survey: this survey will be carried out in the project area (two selected Wadis) to include ; topographic map, wells map and land cover map (land cover classes area in feddans).

The above background briefly reflects the serious situation, where degradation of the natural plant cover and desertification is rapidly expanding along the coastal zone. Consequently, the ranges in the NWC region of Egypt should be well managed and developed as they have great potentialities for supporting the animal production industry.

Sub- Activity 3.9.

Socio- economic assessment of farmers (Bedouins) and impact of project activities.

The main objectives of the study (sub-activity) are to:-

a. Examine the present condition of natural rangeland and its capacity to support livestock production especially the small ruminants.

b. Evaluate the economic impact of the technical activities which will be conducted on production costs of seedling shrubs in the nursery.

c. Assessment of the impact of rangeland improvement activities on increasing the range capacity to support livestock production.

Present conditions of rangeland

The natural rangeland vegetation is considered as a major animal feed resource. In the past few years, the natural vegetation was severally overgrazed and has deteriorated as a result of increased livestock population and rapid expansion of cereal cropping using tractors **(CALAR, 1989).** The grazing season under the natural rangeland usually lasts for 3-5 months depending on the amount of rainfall. Rangeland deterioration and fairly short grazing season has resulted – in a big gap between livestock feed requirement and the available natural range, and livestock production increasingly dependant on heavy use of concentrates and cereal grains. Thus the available information about production of traditional rangelands and the overall carrying capacity for the traditional rangeland have to be estimated and assessed.

Impact of nursery activities on seedling production

The potential benefit acquired from nursery activity is the reduction in costs of seedling production due to the use of improved production techniques. To evaluate the impact of the improved production method on seedling cost, cost items are to be specified for both the traditional and improved seedling production methods applied in the nursery at El-Qasr Research Station or other. Therefore, the total cost of seedling production for the improved and traditional method will be estimated and assessed.

Impact of Rangeland Improvement

Rangeland improvement is achieved through plantation of promising shrub species and water harvesting activities.

Cost- Benefit Analysis (CBA) will be used in this study to quantitatively evaluate the different activities undertaken. Three discount measures are to be used in this study to evaluate the different alternatives ; Benefit/Cost Ratio (BCR); Net Present Value (NPV); and Internal Rate of Returns (IRR). The CBA is conducted by weighting benefits acquired from the implemented activities against its construction, maintenance and operating costs. Evaluation of expected benefits and costs of rangeland improvement is based on comparison of rangeland improvement through planted fodder species (with project procedure), with traditional range system (without project).

The beginning step in CBA is to identify benefits and costs of implementing the different technical activities which will be conducted by the project using the with project and without project comparison. Finally, the potential impact of the project up-scaling on farm income from improved rangeland will be evaluated and a assessed **(**Aboughundia, 1985 and FAO, 1990).

Project Environmental Impact

1- Enhance food security and improve livelihood of resource poor farmers (Beduins).

2- Rehabilitation of degraded rangelands and informal seed supply to farmers.

3- Developing simple water-harvesting system for domestic water supply and household gardens.

4- Conserve the soil, increase fodder production, improve natural vegetation and improve farmer (Beduin) income.

5- Providing an early awareness of impending rainfall for all communities in NWC of Egypt (efficient use of rainfall measurements).

6- Improve and modify the present seedlings production methods to obtain good quality and reduced associated costs (establishment of botanical garden and modified nurseries).

7-Egypt native rangeland species are well-adapted to both salinity and aridity in its arid ecosystems.

8- Upgrade rain-fed agriculture through better water, soil and land management practices.

9- Maximize crop productivity and minimize N-compounds pollution through the application of slow–release nitrogen fertilizer.

10- Increased and sustained agriculture production and net income; increased job opportunities; increased soil productivity; create opportunities for crop diversity and cash crops and produced crop residues and weeds for animal feed.

11- Enhance the settlement of Beduins in the wadis.


Thank you