

**THE ARAB REPUBLIC OF EGYPT**  
**NORTH SINAI INTEGRATED RURAL DEVELOPMENT**

**THE FEASIBILITY STUDY**  
**ON**  
**PRIORITY SUB-PROJECTS**

**(MAIN REPORT)**

**AUGUST 1989**

**JAPAN INTERNATIONAL COOPERATION AGENCY**



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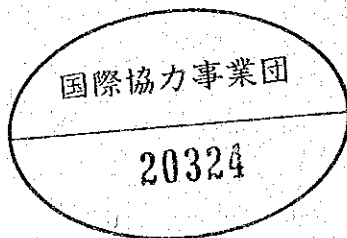
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**(MAIN REPORT)**

**AUGUST 1989**

**JAPAN INTERNATIONAL COOPERATION AGENCY**



## P R E F A C E

In response to a request from the Government of the Arab Republic of Egypt, the Government of Japan decided to conduct a Master Plan Study and Feasibility Study of Priority Sub-projects on North Sinai Integrated Rural Development and entrusted the study to Japan International Cooperation Agency (JICA).

JICA sent to the Arab Republic of Egypt a study team headed by Mr. Kazunori Tamaki, Sanyu Consultants Inc., four times from April, 1988 to July, 1989.

The team held discussions with the officials concerned of the Government of the Arab Republic of Egypt and conducted field surveys in North Sinai area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will serve for the development of the project and contribute to the promotion of friendly relations between our two countries.

I wish to express my sincerest appreciation to the officials concerned of the Government of the Arab Republic of Egypt for their close cooperation extended to the team.

August, 1989



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KENSUKE YANAGIYA

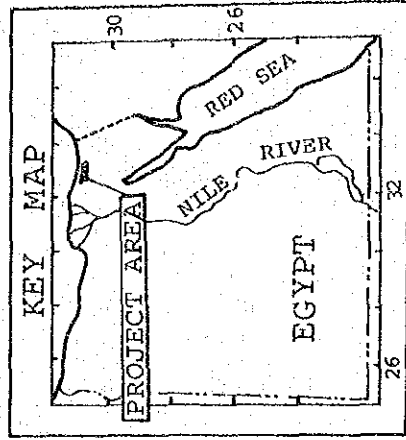
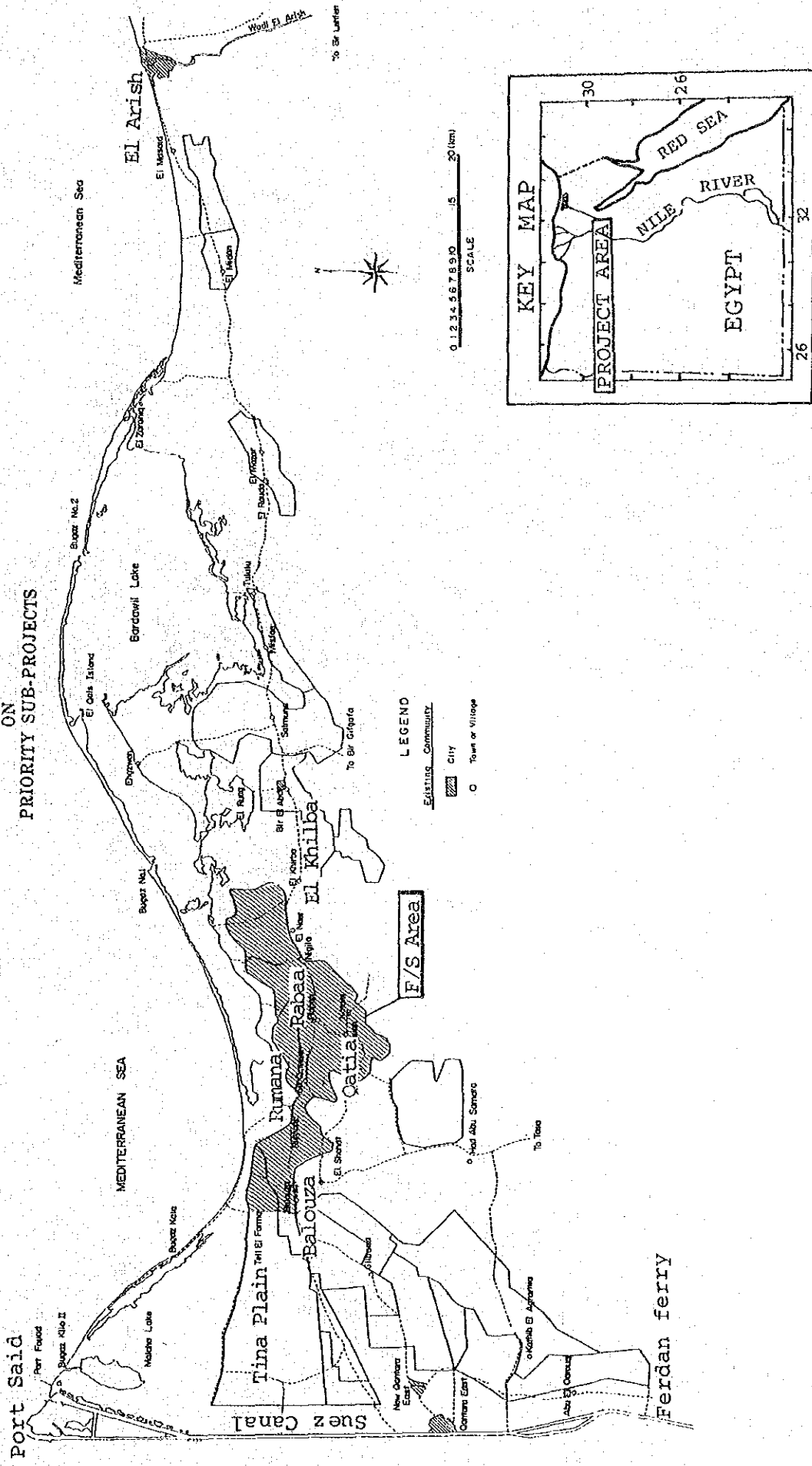
President

Japan International Cooperation Agency



# PROJECT LOCATION MAP

NORTH SINAI INTEGRATED RURAL DEVELOPMENT  
THE FEASIBILITY STUDY  
ON  
PRIORITY SUB-PROJECTS



LEGEND  
 Existing Community  
 City  
 Town or Village

F/S Area

Ferdan ferry

# NORTH SINAI INTEGRATED RURAL DEVELOPMENT GENERAL MAP



MEDITERRANEAN SEA

BARDAWIL LAKE

BALOUZA

RUMANA

SIX OCTOBER

RABAA

DATIA

NIGILA

EL KHIRBA

### LAND USE PLAN

Land Use	Area (feddan)	
	(gross)	(net)
<b>Cultivated Land</b>		
Smallholders (sand flat)	27,700	23,500
" (clay flat)	2,400	1,800
Graduates	5,400	4,600
Investors (livestock)	7,000	6,000
" (fruits)	6,700	5,700
(Sub-total)	(49,200)	(41,600)
<b>Livestock Shelter</b>	1,400	
<b>Investors Complex</b>	50	
<b>Agricultural Development Center</b>	50	
<b>Existing Town &amp; Village</b>	400	
<b>Settlement Village</b>	1,050	
<b>Ruins &amp; Military Areas</b>	150	
<b>Mobile Sand Dune</b>	550	
<b>Wet Sabkha</b>	550	
(Sub-total)	(4,200)	
<b>Total</b>	<b>53,400</b>	

### LEGEND

- PROJECT AREA (FOR F/S)
- EL SALAM CANAL
- BRANCH CANAL
- MAIN DRAINAGE CANAL
- PUMP STATION
- ASPHALT ROAD
- SETTLEMENT VILLAGE WITH LIVESTOCK SHELTER
- EXISTING VILLAGE AND TOWN
- RUIN OR MILITARY
- INVESTORS COMPLEX WITH LIVESTOCK SHELTER
- AGRICULTURAL DEVELOPMENT CENTER

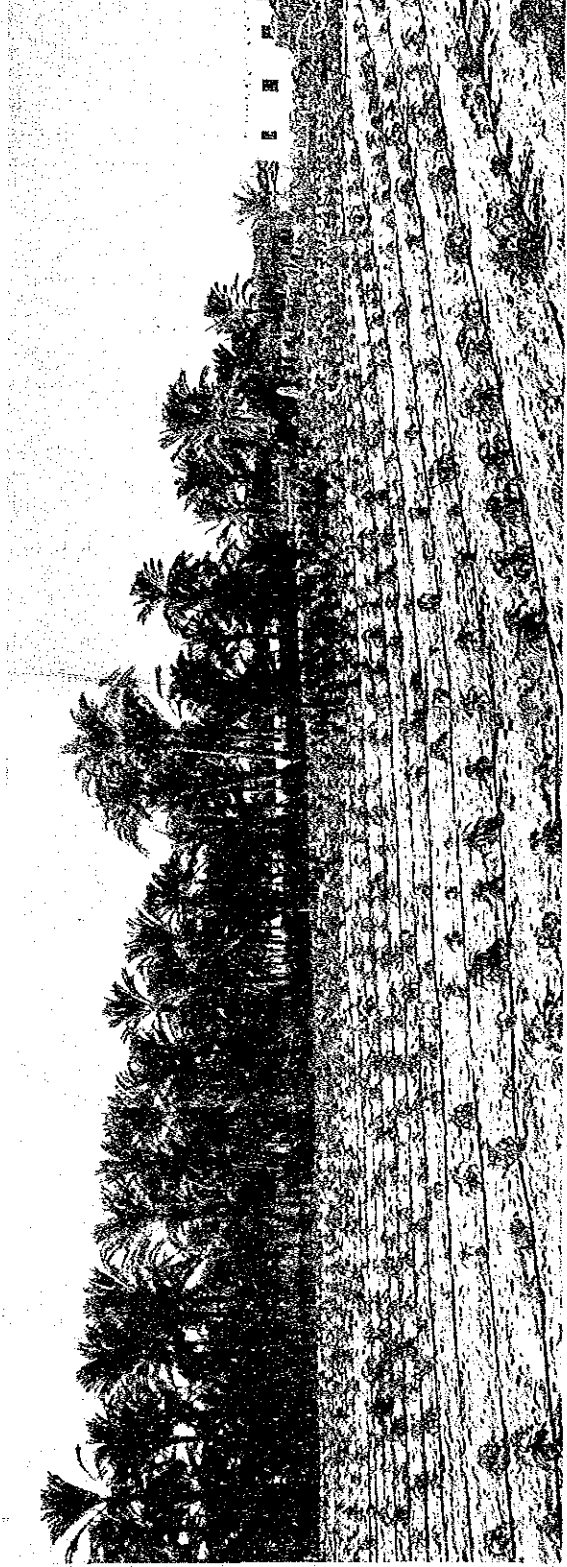






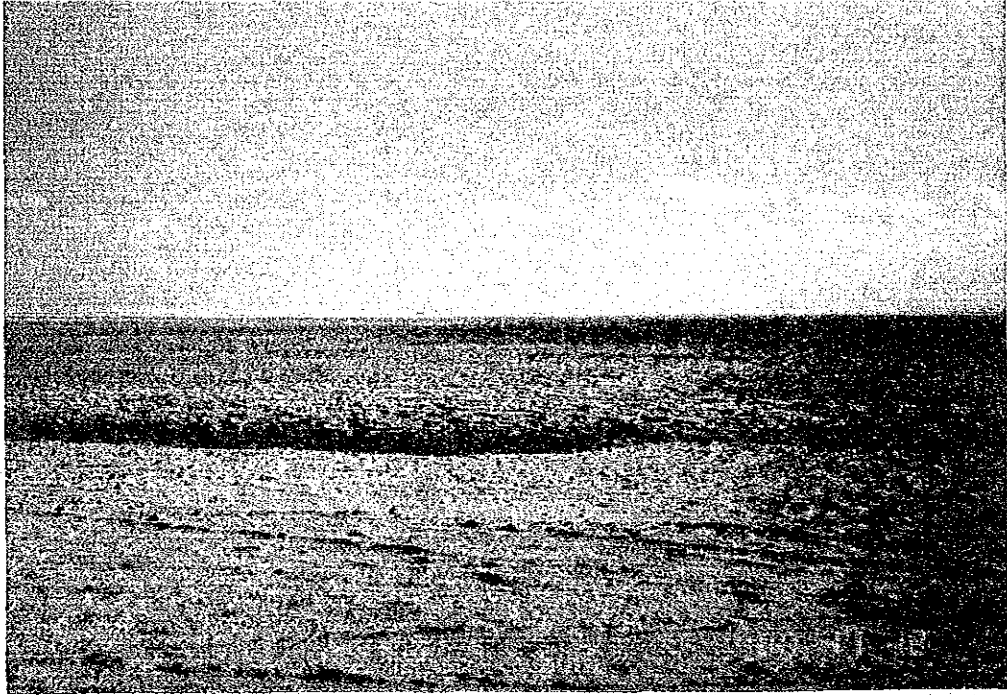


Sandy Terrain near Baiouza



Drip Irrigation in Qatia Village





Tina Plain



Sandy Area and Inland Sabkha



## CONTENTS

PROJECT LOCATION MAP  
GENERAL PLAN MAP  
ABBREVIATION AND UNITS

### SUMMARY

	<u>Page</u>
CHAPTER 1. INTRODUCTION	
1.1. General .....	1
1.2. Feasibility Study Procedure .....	5
1.3. Existing Development Plans Concerned .....	7
CHAPTER 2. THE PROJECT AREA	
2.1. Outline of the Project Area .....	8
2.2. Population and Landholding .....	12
2.3. Meteorology and Hydrology .....	14
2.4. Soil and Land Use .....	17
2.5. Crop and Livestock Production .....	35
2.6. Agro-Industry and Marketing .....	40
2.7. Infrastructure and Social Services.....	42
2.8. Farmers' Organization and Agricultural Supporting Services .....	46
CHAPTER 3. THE DEVELOPMENT PLAN	
3.1. Basic Concept of Development Plan .....	50
3.2. Land Settlement Plan .....	62
3.3. Crop and Livestock Production Plan .....	68
3.4. Land Reclamation Plan .....	89
3.5. Irrigation and Drainage Plan .....	98
3.6. Water Conveyance Plan by the El Salam Canal .....	122
3.7. Agro-Industry and Marketing Plan .....	150
3.8. New-Community Development Plan .....	166
3.9. Agricultural Supporting Services Plan .....	188
3.10. Agricultural Development Center Plan .....	192

	<u>Page</u>
CHAPTER 4. PROJECT IMPLEMENTATION PLAN	
4.1. Project Organization .....	197
4.2. Construction Schedule .....	201
4.3. Consulting Services .....	204
4.4. Operation and Maintenance .....	205
4.5. Construction Cost Estimate .....	208
CHAPTER 5. PROJECT JUSTIFICATION	
5.1. General .....	213
5.2. Project Cost .....	214
5.3. Project Benefit .....	218
5.4. Economic Efficiency of the Project .....	221

#### APPENDICES

- A. Population and Economic Indices
- B. Meteorology and Hydrology
- C. Soil Survey
- D. Irrigation and Drainage
- E. Land Reclamation
- F. Crop and Livestock Production
- G. Farm Economic Survey
- H. Agro-Industry and Marketing
- I. New-Community Development
- J. Agricultural Development Center
- K. Facility Design
- L. Cost Estimate
- M. Project Evaluation

#### DRAWINGS

## LIST OF TABLES

Table 2.1-1	Daily Labour Wage for Agricultural Works
Table 2.2-1	Population and Household (1988)
Table 2.2-2	Cultivated Area and Livestock (1988)
Table 2.4-1	Soil Distribution in F/S Area
Table 2.4-2	Relationship between Landform, Soil and Land Reclaimability
Table 2.4-3	Present Land Use in F/S Area
Table 2.5-1	Current Production
Table 2.5-2	Typical Farm Management
Table 2.7-1	Existing Public Facilities in F/S Area
Table 2.8-1	Cooperatives and Membership (1986)
Table 3.1-1	Land Classification for Irrigated Agriculture
Table 3.1-2	Land Classification Specifications
Table 3.1-3	Land Classification of F/S Area
Table 3.1-4	Land Use Plan
Table 3.1-5	Comparison between Present and Proposed Land Use
Table 3.2-1	Land Settlement Plan in F/S Area
Table 3.2-2	Number of Settlement Farmers in F/S Area
Table 3.3-1	Crop Selection Procedure
Table 3.3-2	Proposed Farming Types
Table 3.3-3	Projected Crop and Livestock Production
Table 3.3-4	Total Crop Production by Farming Types
Table 3.3-5	Agricultural Inputs at Stabilized Stage
Table 3.3-6	Labour Requirement Per Farm at Stabilized Stage
Table 3.3-7	Livestock Herd Composition and Slaughter
Table 3.3-8	Nutrition Availability and Carrying Capacity
Table 3.5-1	Project Irrigation Supply in M/P Area
Table 3.5-2	Project Irrigation Supply for Each Cropping Pattern in F/S Area
Table 3.5-3	Peak Project Irrigation Supply
Table 3.5-4	Required Storage Capacities of Main Canals
Table 3.5-5	Spacing of Field Pipe Drain
Table 3.5-6	Design Criteria of Main Drainage System
Table 3.5-7	Calculation of Drainage Surplus
Table 3.5-8	Area That Needs Field Drainage System (Tentative)



Table 3.6-1	Alternative Study on Siphon
Table 3.6-2	Gradient of El Salam Canal (Tina Plain)
Table 3.6-3	Bed Slope and Annual Cost in Sandy Area
Table 3.6-4	Design Criteria of Pumping Stations
Table 3.6-5	Alternative Study on Tina Pumping Station
Table 3.6-6	Cost of Alternative Study on Tina Pumping Station
Table 3.6-7	Alternative Study on Balouza Pumping Station
Table 3.6-8	Cost of Alternative Study on Balouza Pumping Station
Table 3.7-1	Material for Processing
Table 3.7-2	Projected Production in the Processing Sector
Table 3.7-3	Projected Consumption/Demand for Major Project Products in Year 2000 within Target Marketing Areas
Table 3.7-4	Major Perishable Product Supply in Ismailia and Current Extra-Governorate Export from North Sinai (1983)
Table 3.7-5	Exporting Destinations by Selected Crops
Table 3.7-6	Projection of Annual Consumption of Products
Table 3.7-7	Estimation of Annual Marketing Quantities of Main Products
Table 3.8-1	Public and Social Facilities of Settlement, Service and Central Villages
Table 3.8-2	Numbers of Public and Social Facilities to be Improved/Constructed
Table 4.4-1	Operation & Maintenance Cost
Table 4.5-1	Construction Unit Cost
Table 4.5-2	Summary of Project Cost
Table 4.5-3	Disbursement Schedule for the Project Cost
Table 5.2-1	Financial and Economic Project Cost
Table 5.2-2	Invested Amount for Construction Works at the West of Suez Canal
Table 5.3-1	Incremental Crop Benefit of the Project
Table 5.4-1	Internal Rate of Return
Table 5.4-2	Estimated Balance of Farm (1) - (5)

## LIST OF FIGURES

- Figure 2.1-1 Elevation Classification Map
- Figure 2.3-1 Mean Monthly Temperature and Rainfall
- Figure 2.3-2 Typical Irrigation Methods
- Figure 2.4-1 Landform Classification Map
- Figure 2.4-2 Relationship between Land form-Soil-Land Use (Vegetation)
- Figure 2.4-3 Soil Map
- Figure 2.4-4 Present Land Use
- Figure 2.5-1 Current Cropping Pattern
- Figure 2.8-1 Agricultural Extension Network
- Figure 2.8-2 Farmers Credit
- Figure 3.1-1 Land Classification Map
- Figure 3.1-2 Land Use Plan
- Figure 3.2-1 Land Settlement Plan in F/S Area
- Figure 3.2-2 Procedure of Land Settlement
- Figure 3.3-1 Crop Composition
- Figure 3.3-2 Proposed Cropping Pattern (1) - (5)
- Figure 3.3-3 Livestock Rearing Facilities
- Figure 3.4-1 Standard Farm Blocks
- Figure 3.5-1 Monthly Project Irrigation Supply for F/S Area
- Figure 3.5-2 Schematic Illustration of Irrigation Canal System (1) & (2)
- Figure 3.5-3 Typical On-Farm Irrigation System (Tina Plain)
- Figure 3.5-4 Detail of Typical On-Farm Irrigation System (Tina Plain)
- Figure 3.5-5 Typical Sections of Irrigation Canals in Typical Irrigation Block (Tina Plain)
- Figure 3.5-6 Typical On-Farm Irrigation System (Sand Terrain) - w/o Field Drainage System
- Figure 3.5-7 Typical On-Farm Irrigation System (Sand Terrain) - with Field Drainage System
- Figure 3.5-8 Typical Drip Irrigation System
- Figure 3.5-9 Typical Sprinkler Irrigation System
- Figure 3.5-10 Layout of Pump Station for Booster
- Figure 3.5-11 Drainage System in F/S Area

- Figure 3.6-1 El Salam Canal Plan
- Figure 3.6-2 Alternative Routes of El Salam Canal
- Figure 3.6-3 Siphon crossing Suez Canal
- Figure 3.6-4 Cross Section of El Salam Canal (Tina Plain)
- Figure 3.6-5 Longitudinal Profile of El Salam Canal (Tina Plain)
- Figure 3.6-6 Longitudinal Profile of El Salam Canal (Sandy Area)
- Figure 3.6-7 Cross Section of El Salam Canal (Sandy Area)
- Figure 3.6-8 Monthly Fluctuation of Discharge at Tina Station
- Figure 3.6-9 Monthly Fluctuation of Discharge at Balouza Station
- Figure 3.6-10 Typical Cross Section of Branch Canals
- Figure 3.6-11 Control System of Irrigation and Drainage Canals
- Figure 3.7-1 Oil Extraction and Refinery Process
- Figure 3.7-2 Slaughtering and Cut Meat Process
- Figure 3.7-3 Possible Outlet for Projected Products
- Figure 3.7-4 Exporting Destinations from Egypt
- Figure 3.8-1 Type of New-Community
- Figure 3.8-2 Distribution of New-Communities
- Figure 3.8-3 Typical Design of Housing
- Figure 3.8-4 Typical Layout of Settlement Village
- Figure 3.8-5 Standard Village Road
- Figure 3.8-6 Potable Water Supply System
- Figure 3.8-7 Flow Chart of Sewage Treatment Plant
- Figure 3.8-8 Power Supply Transmission Line
- Figure 3.10-1 Layout of Agricultural Development Center
- Figure 3.10-2 Floor Plan of Agricultural Development Center
- Figure 4.1-1 Organization for Executing Agency
- Figure 4.2-1 Project Implementation Schedule
- Figure 4.4-1 Organization for Operation and Maintenance

## ABBREVIATION AND UNITS

### Abbreviation

CAPMAS	Central Agency for Public Mobilization and Statistics
CICCAS	Cairo International Center for Consultation and Studies
DRTPC	Development Research and Technological Planning Center, Cairo University
DRI	Desert Research Institute
EC	European Communities
EIRR	Economic Internal Rate of Return
FAO	Food and Agriculture Organization
GAFRD	General Agency of Fishery Resources Development
GARPAD	General Authority for Rehabilitation Projects and Agricultural Development
GNP	Gross National Product
GOPP	General Organization of Physical Planning
JICA	Japan International Cooperation Agency
LMP	Land Master Plan
MOA	Ministry of Agriculture and Land Reclamation
MOD	Ministry of Development, New Communities, Housing and Utilities
MOT	Ministry of Tourism
MPWWR	Ministry of Public Works and Water Resources
NSG	North Sinai Governorate
PBDAC	Principal Bank for Development and Agricultural Credit
PPU/GARPAD	Project Planning Unit of GARPAD
REGWA	General Company for Research and Groundwater
RIWR	Research Institute of Water Resources
SDA	Sinai Development Authority
UNESCO	United Nations Educational, Scientific, and Cultural Organization

### Unit

fed.	feddan = 0.42 ha
cu.m	cubic meter
MCM	million cubic meter
mS/cm	millimho/centimeter
ppm	parts per million
sq.m	square meter
sq.km	square kilometer

### Currency

LE	Egyptian Pound
PT	Egyptian Piastre
Yen	Japanese Yen

Exchange Rate (1988)

LE	=	100 PT
"	=	¥56
"	=	US\$0.43
US\$	=	LE 2.325
"	=	¥129.6

Others

F/S	Feasibility Study
M/P	Master Plan
S/W	Scope of Work
EL	Elevation

## SUMMARY



## S U M M A R Y

### BACKGROUND

#### 1. Objectives of the Feasibility Study

The Master Plan Study on the North Sinai Integrated Rural Development proposed the following five development components;

- Agricultural development
- Agro-industry and supporting services
- New-community development
- Inland fishery development
- Tourism development

In the course of M/P Study, a package of priority subprojects for agricultural development as shown below was selected to be studied for its technical and economic feasibility;

- El Salam Canal extension up to El Khirba including a siphon crossing the Suez Canal
- Land reclamation of the Rabaa/Qatia area, which includes new-community development, agro-industry and supporting services in the Area

The feasibility study was made to formulate the agriculture development plan in the Rabaa/Qatia area (F/S Area) through the extension of El Salam Canal for increasing agricultural production and creating employment opportunities and for raising the living standard of inhabitants and settlers.



## THE PROJECT AREA

### 2. Location

The F/S Area covers a gross area of 53,400 feddan. The area lies between latitude 30°55'N-31°04'N and longitude 32°33'E-32°55'E, and occupies a part of Bir El Abd Markaz in the North Sinai Governorate. It encompasses eight villages, such as Balouza, Rumana, Rabaa, Qatia, and Nigila, etc. It is bounded by the Mediterranean Sea and the Bardawil Lake to the north, the Tina Plain to the west, and adjoins the mobile sand dune zone on the southern and eastern edges.

### 3. Population and Landholding

Total population in the F/S Area is estimated around 27,000. Bedouin households occupy about 75 percent of the total number of households. The number of farm households amounts to 620 with existing farmland of 1,300 feddan, and an average farm size is 2.1 feddan per household.

### 4. Meteorology and Hydrology

The mild Mediterranean type climate prevails in the F/S Area, but hot and dusty, southern or southeastern winds, locally known as "Khamseen" blow during the period from April to June. The lowest air temperatures occur in January with an average monthly minimum of 10°C. On the other hand, the average monthly maximum temperature of 31°C occurs in August.

The average annual rainfall is about 80 mm. Most of rainfall occurs during the winter. Practically, no rainfall is expected during the four months in summer from June to September. No streams exist in the F/S Area. Only groundwater is available and 290 wells have been dug to the pleistocene aquifers, with 38,000 cu.m/day of estimated mean recharge capacity and 14,000 cu.m/day of estimated discharge. Groundwater is used for irrigation of 750 feddan of farmland.

## 5. Soil and Land Use

The soil maps were prepared by GARPAD. Based on these maps, a soil survey was carried out through soil profile investigation by digging a test pit (3 m deep) or by auger boring (2 m deep) over a grid of one kilometer (one per 250 feddan). In addition, chemical and physical analyses of soil samples taken from the representative profiles were conducted.

The F/S Area consists of two major landform units, i.e., the Tina Plain and sandy terrain. The former is low-lying flat land derived from the fluvio-lacustrine deposits of the Nile river, that has a shallow, saline water table, called "wet or dry Sabkha". The latter derives from aeolian sand deposits that is subdivided into level terrain, undulating terrain, and active dunes. The predominant soil in the F/S Area is represented by the deep sandy soils with a deep water table (Typic Torripsamments in USDA Soil Taxonomy).

<u>Great Group of Soil Taxonomy</u>	<u>Area</u>	
	<u>(feddan)</u>	<u>(%)</u>
Typic Torripsamments	43,500	81.5
Typic Psammaquents	2,200	4.1
Typic Hydraquents	1,600	3.0
Typic Salorthids	1,800	3.4
Aquic Torripsamments	4,300	8.0
<u>Total</u>	<u>53,400</u>	<u>100.0</u>

About 95 percent of the F/S Area is desert with scarce shrubs where the Bedouin breed camels, sheep and goats. Present farmland covers only 1,300 feddan, or 2.5 percent of the total area. This is concentrated in El Moraiah, Rabaa and Qatia where groundwater is available.

Land Use	Area	
	(feddan)	(%)
Agricultural land	1,300	2.5
Town and village	400	0.7
Ruins and military space	150	0.3
Mobile sand dune	550	1.0
Wet Sabkha (partly used for salt pan)	550	1.0
Desert	50,450	94.5
<b>Total</b>	<b>53,400</b>	<b>100.0</b>

## 6. Crop and Livestock Production

The Bedouin who were formerly engaged in nomadic activities have gradually settled and begun farming, digging shallow wells. Mainly summer crops such as tomatoes, sweet melons and watermelons etc. are cultivated using drip irrigation at present. Some fruit-trees are planted as well as dates palm plantation. However, they are still in an immature stage. They also feed sheep and goats with natural grasses in the desert. Their income comes from sales of crops and livestock as well as off-farm wages.

Two forms of marketing are recognized. Firstly, marketing by individual farmers, and secondly, through middlemen or merchants who provide them with loans. No common marketing facilities are found.

## 7. Infrastructure and Social Services

The existing road systems in the F/S Area consist of a highway traversing the Area as an axis, seashore roads stretching northward from the highway, and interior road connecting villages located to the south of the highway. In 1986, construction of the highway was almost completed, replacing the old trunk road.

Electricity is supplied through the national power grid from the El Qantara substation and distributed to each village through terminal lines branching out of the trunk power line along the highway. A diesel power station equipped with three generators was installed at Six October.

Domestic water is supplied to each village through existing pipelines with diameter of 300 mm and 700 mm, respectively. New pipeline with diameter of 1,100 mm is planned to cope with the additional demand. A water purification plant for the new pipeline is under construction at El Qantara East.

#### 8. Farmers' Organization and Extension Network

The North Sinai Cooperative Organization has a network encompassing the entire Governorate with its headquarters in El Arish. Six cooperatives have been established in the F/S Area. Village type cooperatives deal with credits for irrigation equipment, agricultural machinery and stock animals. There is a traditional consultative group within the Bedouin population, contributing to keep the community in good order.

Agricultural extension services are provided by more than 400 extension workers under the supervision of the Governorate Agriculture Office. A branch office in Bir El Abd has more than twenty extension workers in service.

### THE DEVELOPMENT PLAN

#### 9. Basic Concept of Development Plan

The F/S Area is located adjacent to the Tina Plain. Various landforms and soil types are found in the Area. It is expected that the F/S Area will serve as a pilot project for all reclamation projects in North Sinai.

Land classification was carried out in order to evaluate land reclaimability. Class-1 land is not found within the F/S Area. Class-2 land is found near Rabaa and Qatia, covering 8 percent of the total area. The most widely distributed Class-3 land is sandy and gently undulating, occupying about 55 percent of the total area. This is followed by the undulating sandy terrain, classified as Class-4 land, representing 34 percent of the total area. Class-6 land consists of mobile sand dunes and Sabkha, representing 3 percent of the total area, respectively, which is excluded from the land reclamation plan.

Land Class		Area	
		(feddan)	(%)
Class-2 (arable)	2s	4,400	8.3
Class-3 (arable)		29,200	54.7
	3st	(25,150)	
	3sd	(4,050)	
Class-4 (arable)		18,150	34.0
	4st	(15,050)	
	4sd	(3,100)	
<u>Sub-Total</u>		<u>51,750</u>	<u>97.0</u>
Class-6 (nonarable)		1,650	3.0
	6st (sand dune)	(550)	
	6sd (wet Sabkha)	(550)	
	Ruin & military	(150)	
	Town & village	(400)	
<u>Total</u>		<u>53,400</u>	<u>100.0</u>

Reclaimed land is to be distributed to smallholders including the Bedouin, graduates and investors. The categories and sizes of the settlement are determined as follows;

Smallholders including Bedouin	:	5 feddan/household
Graduates	:	10 feddan/household
Investors	:	80 feddan/unit

As a result, 61.2 percent of the reclaimed farmland will be distributed to smallholders, 11.0 percent to graduates and 27.8 percent to investors. As a whole, 7,720 households including non-farming households will be settled in the Area.

<u>Category</u>	<u>No. of households</u>	<u>Population</u>
Smallholders	6,020	30,100
Graduates	540	2,700
<u>Sub-Total</u>	<u>6,560</u>	<u>32,800</u>
Non-farming households*	1,160	5,800
<u>Total</u>	<u>7,720</u>	<u>38,600</u>

\* : 15 percent of total households.

Food crops, oil crops, fodder crops, vegetables and fruits are to be grown by drip or sprinkler irrigation and beef cattle, goats and sheep are to be raised.

An oil extraction and refinery plant and a slaughterhouse with cut-meat plant are also proposed to be established. Twelve new communities will be constructed for new settlers and four existing villages will be rehabilitated. Agricultural Development Center is planned to be established in the F/S Area in order to assist the farmers in terms of technical support.

The land use plan of the F/S Area is determined as follows:

Land Use Plan	Area (feddan)	
	(Gross)	(Net)
Cultivated land		
Smallholders (on sand flat)	27,700	23,500
Smallholders (on clay flat)	2,400	1,800
Graduates (on sand undulating)	5,400	4,600
Investors (for livestock)	7,000	6,000
Investors (for fruits)	6,700	5,700
<u>Sub-Total</u>	<u>49,200</u>	<u>41,600</u>
Livestock shed	1,400	
Investor's complex	50	
Agricultural Development Center	50	
Existing town & village	400	
Settlement village	1,050	
Ruins & military space	150	
Mobile sand dune	550	
Wet Sabkha	550	
<u>Total</u>	<u>53,400</u>	

## 10. Crop and Livestock Production

The crops are selected among those currently cropped in the Area and peripheral areas, or those considered to be promising based on experiments conducted in experimental stations.

The following five farm types (cropping patterns) are proposed:

- 1) Sand flats, smallholders; CP-1 (27,700 feddan)  
Labour intensified, diversified cropping (animal feed, oilseed, vegetables, and olive)
- 2) Clay flats, smallholders; CP-2 (2,400 feddan)  
Surface irrigation, flood leaching (cereals including rice, feed and vegetables)
- 3) Sand undulating, graduates; CP-3 (5,400 feddan)  
Soil conservation, diversified cropping (feed, oilseed, food, vegetables and orchards)
- 4) Sand undulating, investors; CP-4 (7,000 feddan)  
Livestock management, soil conservation (feed)
- 5) Sand undulating, investors; CP-5 (6,700 feddan)  
Orchard fruits, reclaimed on natural slopes, contour line planting, with drip irrigation

<u>Farm Types</u>	<u>Crop Rotation</u>	<u>Crop Intensity</u> (%)
CP-1: Smallholders (5 feddan)	4 years	200
CP-2: Smallholders (5 feddan)	3 "	200
CP-3: Graduates (10 feddan)	3 "	200
CP-4: Investors (80 feddan/unit)	5 "	200
CP-5: Investors (80 feddan/unit)	-	all perennial



Crop production in a target year is anticipated as follows;

Crop	Cropped Area (feddan)	Production (ton)
(Food Crops)		
Rice	630	1,200
Wheat	450	600
Maize	460	700
Other Food Crops	460	400
(Oil Crops)		
Sunflower	4,930	4,500
Safflower	2,810	1,500
Flax	2,810	1,500
(Vegetables)		
Tomatoes	3,080	21,900
Cucumber/Squash	1,320	8,400
Cantaloupe	1,180	7,100
French Bean	270	1,400
Other Vegetables	1,510	7,600
(Fodder Crops)		
Alfalfa	14,380	431,400
Fodder Beet	10,540	338,700
Sordan	4,740	152,500
Napier Grass	2,990	80,400
Other Fodder Crops	2,850	43,800
(Perennial Crops/Fruits)		
Olive	4,700	14,100
Orange	1,490	12,000
Grapes	2,060	12,300
Apples	3,200	6,400
Other Fruits	2,630	14,300

Use of farm machinery is confined to investors. Smallholders have an opportunity to earn off-farm income, taking advantage of surplus labour working on investors' farms or in related industries.

Livestock such as beef cattle, goats and sheep were chosen. In a target year, about 27,000 heads of cattle, 130,000 heads of goats and 65,000 heads of sheep will be raised in the F/S Area.

## 11. Land Reclamation Plan

Reclaimable land was estimated at 51,750 feddan according to the land classification survey, of which 49,200 feddan(gross) will be reclaimed to farmland after reducing areas for livestock's shed, investor's complex, settlement villages etc. As the results of study on standard farm blocks for respective farm types, the layout of reclaimed farmland was drawn. Land gradient of each farm type will be adjusted taking field irrigation methods into consideration shown below;

<u>Farm Type</u>	<u>Landform</u>	<u>Irrigation Method</u>	<u>Land Gradient</u> (%)
CP-1	Sand flats	Sprinkler & drip	3
CP-2	Clay flats	Surface	0 - 3
CP-3	Sand undulating	Sprinkler & drip	5
CP-4	"	Sprinkler	5
CP-5	"	Drip	8

Farmland will be protected by windbreaks with intervals of 100 m for main windbreaks and 210 m for secondary windbreaks. Two types of standard farm roads are planned, one is 8 m wide main road and the other is 6 m wide farm road.

## 12. Irrigation Plan

Gross water requirement necessary for the proposed five cropping patterns was estimated at 341.3 MCM per annum for 41,600 feddan (net) of farmland shown below:

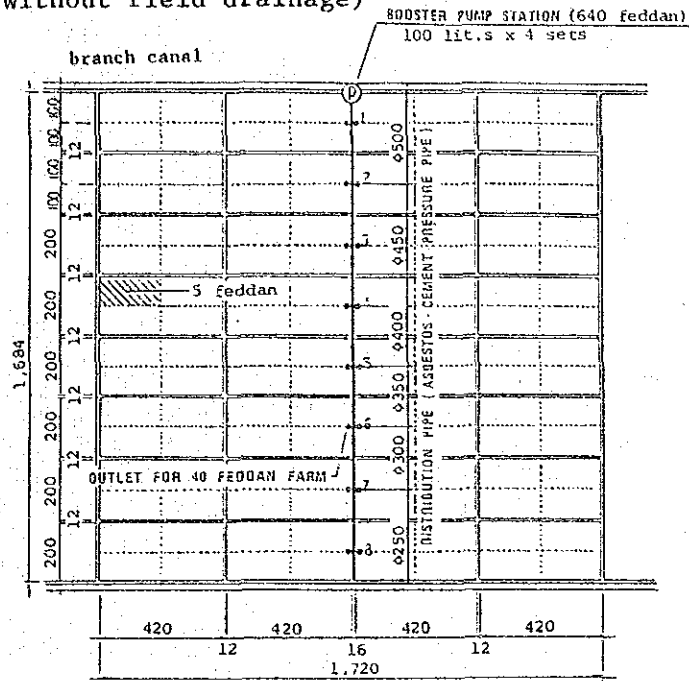
Cropping Pattern	Gross Water Requirement per Feddan		Net Cultivable Area (feddan)	Gross Water Requirement Supply (MCM)
	(Peak) (lit/sec)	(Annual) (cu.m)		
CP-1	0.421	8,190	23,500	192.4
CP-2	0.634	10,830	1,800	19.5
CP-3	0.383	7,100	4,600	32.7
CP-4	0.391	9,930	6,000	59.6
CP-5	0.364	6,510	5,700	37.1
<b>Total</b>			<b>41,600</b>	<b>341.3</b>

Three irrigation methods, i.e., surface irrigation, sprinkler and rip irrigation will be applicable to the Area. Surface irrigation will be applied for CP-2 clay flats in the northwestern part of the Area. In sandy terrain, on the other hand, sprinkler irrigation will be applied for field crops, and drip irrigation for orchards. Hand-move sprinkler will be adopted by smallholders, while solid sprinkler will be used by graduates and investors for labour-saving.

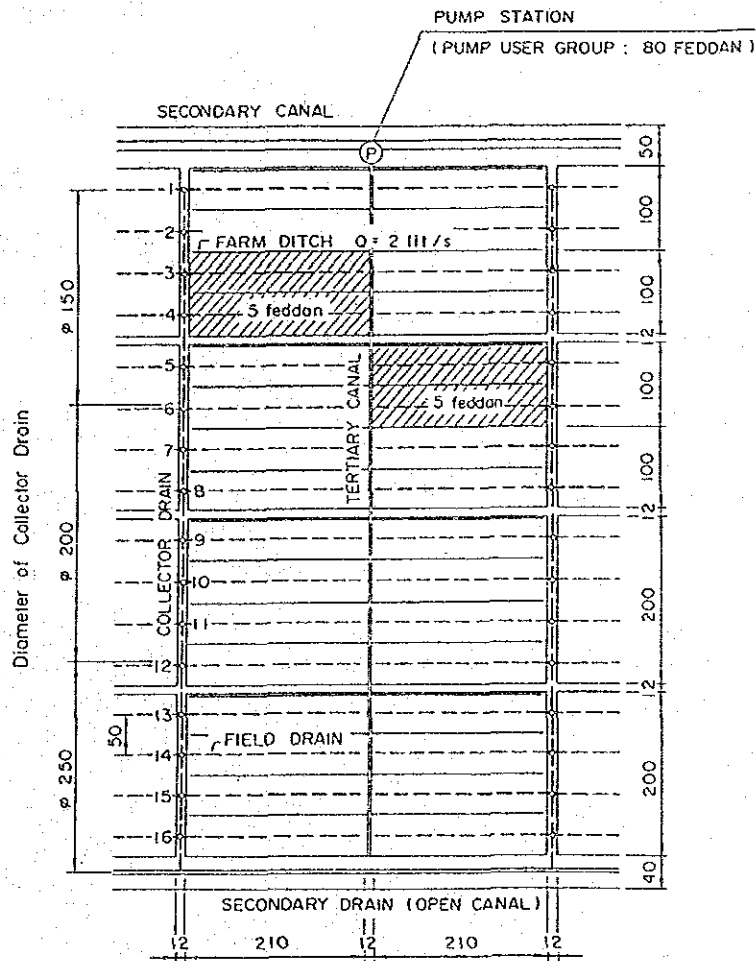
In the Tina Plain where surface irrigation method is applied, the irrigation water will be supplied by farm ditches through the secondary and tertiary canals with booster pumps. The irrigation water will be supplied by a 4-day rotation system. In the sandy terrain where sprinkler or drip irrigation method is applied, the irrigation water will be distributed by pipes with booster pump directly from the branch canal. The irrigation water will be applied more frequently with intervals of 2 - 6 days. The typical on-farm irrigation systems for the

both areas are shown below:

Typical On-Farm Irrigation System (Sand Terrain)  
(Without field drainage)



Typical On-Farm Irrigation System (Tina Plain)



Maximum hours of the field irrigation per day are planned to be 20 hours, while the operation of the El Salam Canal will be 24 hours continuously. Accordingly, the water surplus caused by the gap between supply and application will be stored in the branch canals.

### 13. Drainage Plan

Cultivable areas which require field drainage system are located at clay flats in the north of Balouza and at sand flats around Sabkha near Rabaa, covering 9,720 feddan, equivalent to 23.4 percent of the total net cultivable area. Water drained from clay flats is to be evacuated through the Balouza main drainage system, while drainage water from the sand flats is to be drained through the Rabaa/Qatia main drainage system. These areas require a field drainage system that controls groundwater levels to prevent waterlogging and salinity.

A pipe drain system will be adopted to minimize the loss of cropping area and the maintenance costs. The pipes will be buried at the minimum depth of 1.5 m and at intervals of 50 m for clay flats, but 100 m for low-lying sand flats.

Two pumping stations for drainage will be constructed in the F/S Area as below:

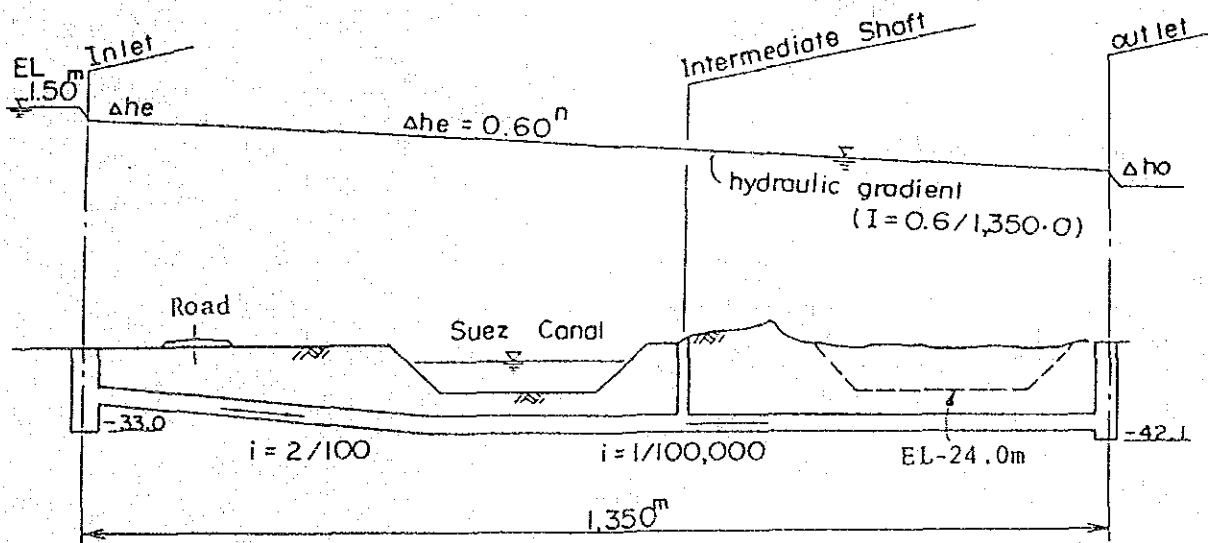
<u>Pumping Station</u>	<u>Location</u>	<u>Discharge</u> (cu.m/sec)	<u>Head</u> (m)
Balouza Drain St.	Balouza Main Drain. Canal	0.39	3.0
Rabaa Drain. St.	Rabaa Main Drain. Canal	0.51	3.0

The bed slope of main drainage canal was designed on the scale of 1/10,000. No special lining will be made for the drainage canals.

#### 14. Water Conveyance Plan

The El Salam Canal has reached up to 300 m west from the Suez Canal and is to be extended towards the east of the Suez Canal in order to supply enough irrigation water for total land reclamation area of 254,700 feddan up to El Midan proposed in the M/P Study.

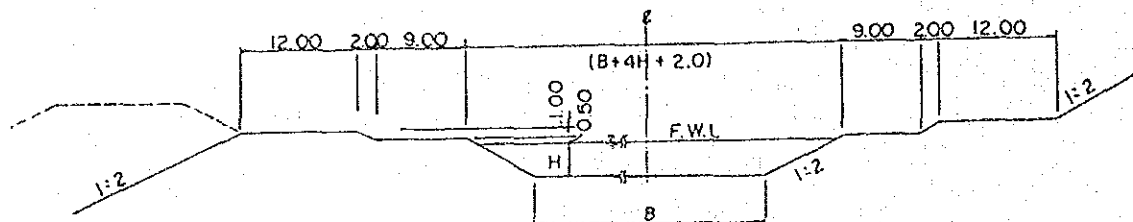
To cross the Suez Canal, a siphon will be constructed under the Suez Canal by shield-driven method. The siphon has total length of 1,350 m, taking into consideration a future widening of the Suez Canal. Two rows of siphon of which diameter is 5.3 m was chosen from the economic viewpoint.



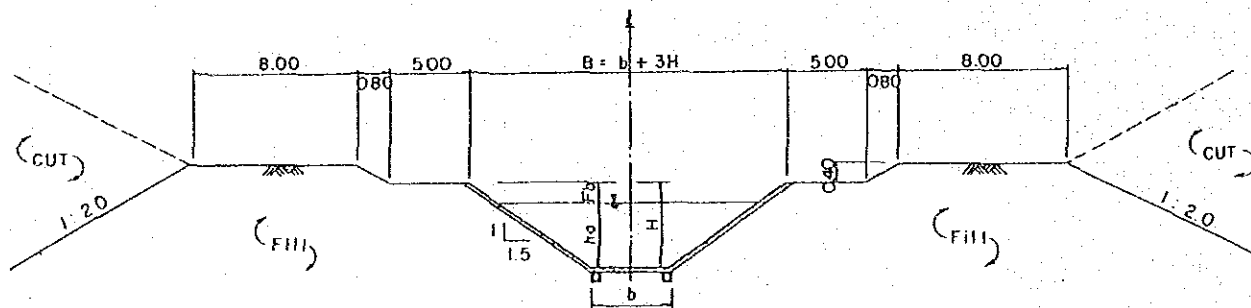
The canal alignment was determined so that the El Salam Canal will be free from the influence of mobile sand dunes. The El Salam Canal is separated into two sections, i.e., 24 km long canal section in the Tina Plain and 37 km long section in the sandy terrain. The canal section in the Tina Plain is to be lifted by Tina Pumping Station located at 2.0 km east of the siphon outlet and crosses the next 22 km by gravity flow up to Balouza Pumping Station. Design of the canal section in the Tina Plain was made based on the same criteria adopted to the west bank of Suez Canal because of the similar geographical and soil conditions, i.e., a part of the Nile Delta and silt or clayey soils. The canal in this section will not be lined and has a bed slope of 5/100,000.

The canal section in the sandy area runs from Balouza Pumping Station to the eastern boundary of the F/S Area. The canal in this section will be constructed with concrete lining and has a bed slope of 1/8,000.

Cross Section of El Salam Canal (Tina Plain)



Cross Section of El Salam Canal (Sandy Area)



Three pumping stations for water conveyance will be constructed as below:

<u>Pumping Station</u>	<u>Location</u>	<u>Discharge</u> (cu.m/sec)	<u>Head</u> (m)
Tina Station	2.0 km on El Salam Canal	88.7	2.6
Balouza Station	23.8 km on El Salam Canal	38.6	11.0
Hod Abu Samara St.	5.3 km on Rabaa/Qatia B.C.	4.4	15.0

In the F/S Area, ten branch canals will be constructed to distribute the irrigation water from the El Salam Canal. Branch irrigation canals in the sandy area will be constructed similarly to the El Salam Canal in this section with concrete lining and have the canal bed slope of 1/8,000. On the other hand, no special lining will be made for a branch canal in the Tina Plain.

For efficient and safe operation of the El Salam Canal, a remote control system to regulate the canal flows at the siphon, pumping stations and diversions will be installed. A control center is planned to be located at Balouza.

#### 15. Agro-Industries and Marketing Plan

An oil-extraction plant and a slaughterhouse with cut meat plant will be established to produce value-added products using materials obtained from the Area. About 140 persons will be employed in these two industries (60 persons for oil-extraction and 80 persons for slaughterhouse/cut meat plant).

<u>Products</u>	<u>Production</u> (ton)	<u>Value</u> (1,000 LE)
Olive oil	2,256	10,829
Edible oil (sunflower, safflower)	1,673	5,076
Flax oil	323	736
Beef cut meat	1,490	13,410
Goat/Mutton cut meat	3,100	23,250

Export-oriented crops, i.e., fruits and vegetables will be introduced and a group marketing facility is planned to enable the efficient marketing of fruits and vegetables.

#### 16. New-Community Development Plan

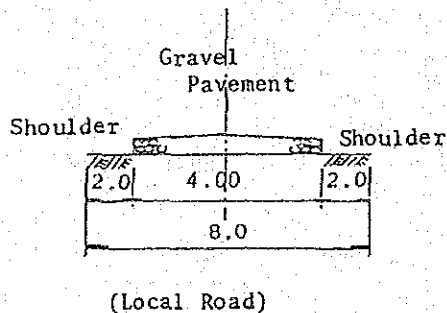
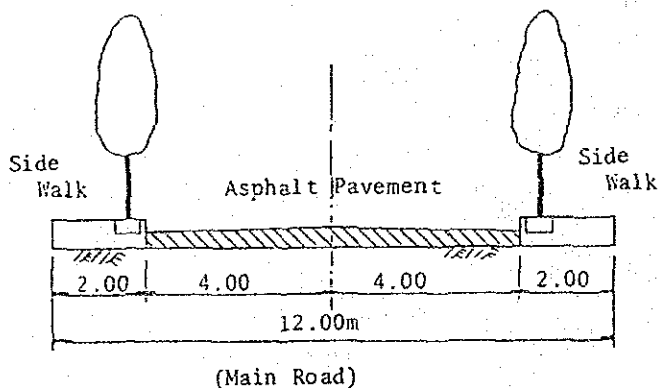
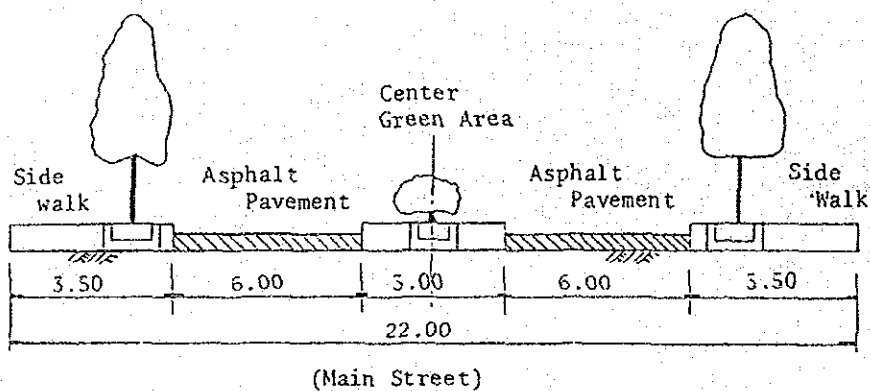
Community development is planned to consist of three levels, i.e., central village, service village, and settlement village. A central village will be fully provided with public facilities, marketing and commercial facilities. A settlement village serves as the smallest village unit made up of farmers' settlement, and will be equipped with the basic public utilities for daily prerequisites.



In the F/S Area, 12 settlement villages will be newly established and one central village (Rabaa) and 3 service villages (Balouza, Qatia and Nigila) will be rehabilitated and improved by strengthening their infrastructure.

### 17. Infrastructure and Social Services Plan

There will be three types of village roads provided, i.e., main street, main road and local road. These roads will be paved.



Additional potable water supply systems are planned only for the settlement villages and investors' complexes, since the central and service villages are already equipped with the water supply systems.

A sewage treatment plant by simple oxidation pond method will be installed to prevent groundwater from pollution. The treated effluent will be reused for irrigation of windbreaks, roadside trees etc. A refuse treatment plant will be established at the southeastern edge of Rabaa to treat all kinds of solid waste collected from villages in the Area. Combustible refuse will be treated with a small-scale incinerator, while incombustible one will be disposed in Sabkha near the plant.

Electricity will be supplied to all households in the settlement villages, and the present electricity service will be extended to the central as well as service villages. A new power line will be installed for the settlement villages and the investor's complex, which will branch off from a transformer installed near the Balouza Pumping Station. Telephone circuits will be installed in the settlement villages and investor's complex, since there are existing and under-construction circuits in the central and service villages.

Other facilities to meet settlers' daily needs such as primary and preparatory schools, health units, public offices and mosque etc. will be provided in the settlement villages. Service facilities in the central and service villages will be strengthened through improvement, repair, and extension of existing ones as well as the installation of new ones.

#### 18. Institutional Plan

Water user's association which is responsible for the maintenance of terminal irrigation facilities will be organized, while the existing cooperatives will be strengthened and expanded in their functions for farmer's advantages in group bargaining of agricultural inputs and outputs.

The North Sinai agricultural extension office under the MOA will be strengthened by keeping a closer link with activities in the proposed Agricultural Development Center.

19. Agricultural Development Center Plan

The Agricultural Development Center will be established to train the farmers and extension staff, so that they will get accustomed to irrigation farming. The Center also functions in experimental works on promising crops and livestock etc.

PROJECT IMPLEMENTATION PLAN

20. Project Organization

The following executing agencies will be in charge of these subprojects in line with the field of each subproject.

<u>Subproject</u>	<u>Executing Agency</u>
° Arrangement of infrastructure	MOD (SDA)
° Extension of the El Salam Canal	MPWWR
° Construction of large-scale irrigation and pumping stations	
° Siphon under the Suez Canal	
° Construction of branch irrigation facilities	
° Construction of drainage pumping stations	
° Land reclamation	MOA (GARPAD)
° Consolidation of on-farm facilities	
° Construction of terminal irrigation and drainage facilities	
° Construction of new-community	
° Marketing facilities	
° Agricultural Development Center	

As the whole project will be mainly implemented by the MOD, it is important to organize a Coordinating Committee under MOD. It will be organized to coordinate with the above three executing agencies for the construction procedure and adjustment of implementation schedules for the project.

## 21. Operation and Maintenance Plan

The executing agencies to undertake the operation and maintenance of the facilities will be MPWWR, MOA (GARPAD) and MOD (SDA).

MPWWR will be responsible for the El Salam Canal and the branch canals and main drainage canals, pumping stations as well as the check gates to be installed. MOA (GARPAD) will be the key agency after the new farmers settle in the reclamation area and begin farming their new farmland. The most essential factors leading to settlement success are the extension and supporting services to be given by the MOA in various ways such as operation of marketing center and the Agricultural Development Center etc. The MOD (SDA) will be responsible for the operation and maintenance of infrastructure such as roads, water supply and sewage facilities etc. North Sinai Governorate will coordinate the other operations with support from the Ministry concerned.

The operation and maintenance costs consist of electricity and fuel costs for pumping stations, machinery and vehicles; salaries and wages for engineers, operators, labourers and administrative staff; repair costs for the facilities; and administrative costs for offices. The estimated annual costs for the total operation and maintenance amounts to 6,450,000 LE. In this connection, the operation and maintenance costs of on-farm facilities will be borne by farmers.

## 22. Project Cost

The current unit prices for construction work and materials, as of November 1988, were utilized for estimating project costs. The total

project cost was estimated at 859,140,000 LE including the foreign currency portion of 447,394,000 LE (or 52 percent of the total project cost), and the local currency portion of 411,746,000 LE.

(Unit: '000 LE)

Item	Total	F.C.	L.C.
1. Civil Works			
1.1. Siphon under Suez Canal	175,695	137,896	37,799
1.2. El Salan Canal <u>1/</u>	76,361	44,340	32,021
1.3. Pumping Stations	54,607	41,626	12,981
1.4. Branch Canal	33,042	17,553	15,489
1.5. Drainage Canal	6,796	3,662	3,134
1.6. Land Reclamation	54,822	32,644	22,178
1.7. On-farm Facilities	118,362	88,771	29,591
2. New-Community/Social Infrastructure			
2.1. Buildings	130,822	-	130,822
2.2. Village Roads	17,553	-	17,553
2.3. Water Supply & Sewage	25,100	8,465	16,635
2.4. Electricity & Telephone	21,525	12,335	9,190
3. Agro-Industry/Marketing Facilities			
3.1. Oil-Extraction Plant	12,265	5,880	6,385
3.2. Slaughterhouse & Cut-Meat Plant	20,687	14,841	5,846
3.3. Marketing Center etc.	10,168	6,304	3,864
4. Agricultural Development Center			
4.1. Buildings & Equipment	16,696	7,333	9,363
4.2. Experimental Field <u>2/</u>	3,304	1,244	2,060
5. Engineering Fee	46,500	24,500	22,000
<u>Sub-Total</u>	<u>824,305</u>	<u>447,394</u>	<u>376,911</u>
6. Price Escalation	34,835	-	34,835
<u>Grand Total</u>	<u>859,140</u>	<u>447,394</u>	<u>411,746</u>

1/ ... Including a remote control system

2/ ... Including water resource development

### 23. Project Justification

Financial and economic analyses from the viewpoints of private and public sector were carried out in calculating the project cost, operation and maintenance cost together with benefits.

The economic project cost as well as operation and maintenance cost, economy, excluding cost of social infrastructure required for agricultural development, to be used in the project evaluation are as follows:

	<u>Financial</u> -----('000 LE)-----	<u>Economic</u> -----('000 LE)-----
Project Costs	402,063	385,384
O & M Costs	5,852	5,132

The evaluation was made based on 50 years' project life and 1988's prices. Meanwhile, the project costs and annual operation and maintenance costs including social infrastructure and agro-industries, are estimated below:

	<u>Financial</u> -----('000 LE)-----	<u>Economic</u> -----('000 LE)-----
Project Costs	597,063	558,957
O & M Costs/Year	6,452	5,658

It is expected that the cropping acreage and crop yield will increase with the implementation of the project. The incremental crop benefit of the Project is as follows:

	<u>Net Production Value (NPV)</u> ( '000 LE)
Without Project	3,823
With Project	57,894
<u>Incremental Benefit</u>	<u>54,071</u>

Based on the above facts, the internal economic rate of return (EIRR) of the whole Project is estimated at 9 percent. Whilst the EIRR, which includes social infrastructure and agro-industries, is estimated at 6 percent.

The results do not give high economic indices. However, the implementation of this project is significant in line with the national purpose such as increase in agricultural production and redistribution of population through mobilizing the limited land and water resources. And the project will contribute to the increase of the employment opportunities, correcting the regional disparity in income and regional development etc., which are the indirect and intangible benefits.

Sensitivity analysis has been made on the basis of the four alternative assumptions, the results of which are as follows:

<u>Alternatives</u>	<u>EIRR</u>	<u>EIRR in case of 10% increase in capital cost</u>
1. Proto-type	8.9	8.1
2. 10% increase in benefit	9.7	8.9
3. 10% reduction in benefit	7.9	7.3
4. Five-year delay in benefits	8.1	7.5
5. Combination of 3 and 4 above	7.3	6.7
6. Including social infrastructures	6.3	5.7

## CHAPTER 1. INTRODUCTION





## 1.1. General

This is the report for the Feasibility Study on the priority subprojects which was selected in the course of Master Plan Study of North Sinai Integrated Rural Development in the Arab Republic of Egypt.

Technical cooperation on this Project was requested from the Government of Egypt to the Government of Japan in 1986. This report was prepared in accordance with the Scope of Works which was agreed between the Ministry of Development, New Communities, Housing and Utilities (MOD) and the Japan International Cooperation Agency (JICA) on November 2, 1987.

The Interim Report on the Master Plan Study for North Sinai Integrated Rural Development was prepared by the Study Team and submitted to the Government of Egypt on October 13, 1988. In the Interim Report, the Study Team proposed the development plans with the following five components;

- (1) Agricultural development
  - El Salam Canal extension including a siphon crossing the Suez Canal
  - Land reclamation and settlement
- (2) Agro-industry and supporting services
- (3) New-community development
- (4) Inland fishery development
- (5) Tourism development

Among the above-components, the Study Team selected a package of priority subprojects for agricultural development consisting of the following components to be studied on the technical and economic feasibility after discussion with the steering committee.

- El Salam Canal extension up to El Khirba including a siphon crossing the Suez Canal
- Land reclamation of the Rabba/Qatia area, which includes new-community development, agro-industry and supporting services.

In Japan, the Study Team prepared this Report after an analysis of the data collected during the field investigation.

1) Steering Committee

Name	Present Post
Prof. Dr. Osman Badran	Chairman of the Steering Committee, MOD
Eng. M. Abdel Fatah Mohsen	Advisor and member in the Advisory Committee for Reconstruction (ACR), MOD
Eng. Mohei El Naggar	First Undersecretary, MOD
Dr. Salah El Zarka	Fishery Consultant, MOD
Mr. Ibrahim Nagib	Advisor of the Steering Committee, MOD
Eng. M. Tag El Sahley	Chairman of the Studies and Researches Organization, MOD
Eng. Salah Abou El Ezz	General Director of Central Organization for Development, MOD
Eng. Amina Maher	Chairman of the General Organization of Physical Planning (GOPP), MOD
Dr. Fathy Sakr	Economic Consultant, GOPP, MOD
Eng. Helmy Ibrahim	First Undersecretary of Ministry of Public Works and Water Resources (MPWWR)
Dr. Samir Nagmouh	First Undersecretary of General Authority for Rehabilitation Project and Agricultural Development (GARPAD), Ministry of Agriculture and Land Reclamation
Eng. Tawfik El Mahruky	Undersecretary of Central Agency for Mobilization and Statistics (CAPMAS)
Eng. M. Abdel Monem El Kotoury	Chairman of Sinai Development Authority (SDA)
Eng. Roshdy Fahim	Undersecretary of Sinai Development Authority (SDA)
Eng. Taher Yossef	Chairman of General Organization of Fisheries
Eng. Medhat Seif	Undersecretary of Ministry of Tourism (MOT)
Mr. Anwar Salama	Egyptian General Petroleum Corporation
Prof. Dr. M. Khairy Moursy	Prof. Food Technology, Faculty of Agriculture, Cairo University
Mr. M. El Hafer Karim	North Sinai Governorate (NSG)
Mr. Fouad Zatun	Port Said Governorate (PSG)
Eng. Hanan Akel	Rapporteur

## 2) Field Counterparts

The field survey was completed owing to the efforts of the field counterparts from the agencies concerned as below;

- Topographical survey:  
Eng. Magid Mostafa Ahmed (HELWAN Surveying Office)
- Irrigation and drainage survey:  
Eng. Abdul Rezak M. El Yassaky (FAO project, Ismailia Agricultural Office)
- Soil survey:  
Mr. Shoukry Morcos Ibrahim (Soil surveyor, GARPAD)
- Farm economic survey:  
Mr. Salah El Din Hassan (Director of Ismailia Agricultural Office)  
Mr. Farhan Abdel El Wadod (General Manager of North Sinai Agricultural Office)
- Agronomy survey:  
Mr. Hamed Sharhapil (SDA)
- Survey coordination:  
Mr. Hassan Mohamed Khalifa (SDA)

## 3) JICA Study Team

<u>Name</u>	<u>Field</u>
Mr. Kazunori Tamaki	Leader
Mr. Kazuo Nakabayashi	Soil & Land Use (Deputy Leader)
Mr. Hiroshi Moriyama	Irrigation & Drainage
Mr. Shun-ichi Hosono	Irrigation & Drainage/Social Infrastructure
Mr. Minoru Yahata	Land Reclamation
Mr. Kensuke Iriya	Agro-Economy/Project Evaluation
Mr. Toshihide Shibata	Agronomy
Mr. Masamichi Watanabe	Facility Design
Mr. Yutaka Nakada	Survey Supervise

## 1.2. Feasibility Study Procedure

The field survey was carried out during the period from October 24, 1988 to December 12, 1988. During the field survey period, the Study Team received cooperation from the Sinai Development Authority (SDA) and other relevant agencies. The field office was established in Ismailia and a field camp was set up at Rumana in the F/S Area.

The field survey began with a field reconnaissance. Topographical maps scaled 1:5,000, 1:10,000, 1:25,000 and 1:100,000 were used as base maps. The main components of the field survey were as follows;

### (1) Water conveyance

- El Salam Canal alignment from the Suez Canal to El Khirba
- Survey for the center line of El Salam Canal crossing the Suez Canal and topographical survey of both sides of Suez Canal at the crossing point.
- Topographical survey of the proposed site of pumping stations.
- Water conveyance planning.

### (2) Irrigation and drainage

- Infiltration test, hydraulic conductivity measurement and leaching test.
- Irrigation and drainage planning.

### (3) Land reclamation

- Soil survey for land reclaimability classification.
- On-farm development planning including windbreaks and sand dune fixing.

### (4) Agriculture and agro-economy.

- Farm economic survey.
- Cropping and livestock production planning.

(5) Agro-industry and supporting services

- Marketing survey.
- Agro-industry and marketing planning.
- Site selection and planning of the Agricultural Development Center.

(6) Land settlement and new-community development

- Study on the past experiences in land settlement and *new-community development projects*.
- Land settlement planning.
- New-community development planning.
- Social infrastructure planning.

During the home office work period, the collected data and the survey results were analysed and the development plan was formulated. Finally, the project costs and benefits were estimated and the project was evaluated.

### 1.3. Existing Development Plans Concerned

Many data and information were collected and reviewed during the F/S Study. The existing development plans and study reports prepared by various agencies concerned are listed below:

#### General

- Sinai Development Study (Phase I), Dames & Moore, ACR/MOD, 1985
- Sinai Development Plan, DRTPC/Cairo Univ. & MIT, 1982

#### Water Resources

- Water Master Plan, MOI (MPWWR)
- El Salam Canal Project, F/S Report, MOI (MPWWR)
- North Sinai Water Resources Study Report, RIWR/MPWWR, 1986

#### Land Resources

- Land Master Plan, Euroconsult-Pacer/GARPAD, 1986
- Reconnaissance Soil Survey of North Sinai, REGWA/GARPAD, 1981
- Semi-Detailed Soil Survey of North Sinai, REGWA/GARPAD, 1984

#### Agriculture

- Preliminary Feasibility Study for Reclamation, Cultivation and Reconstruction of Land in North Sinai, REGWA/GARPAD, 1984
- Tina Plain Development Project Feasibility Study, PPU/GARPAD, 1988





## CHAPTER 2. THE PROJECT AREA



## 2.1. Outline of the Project Area

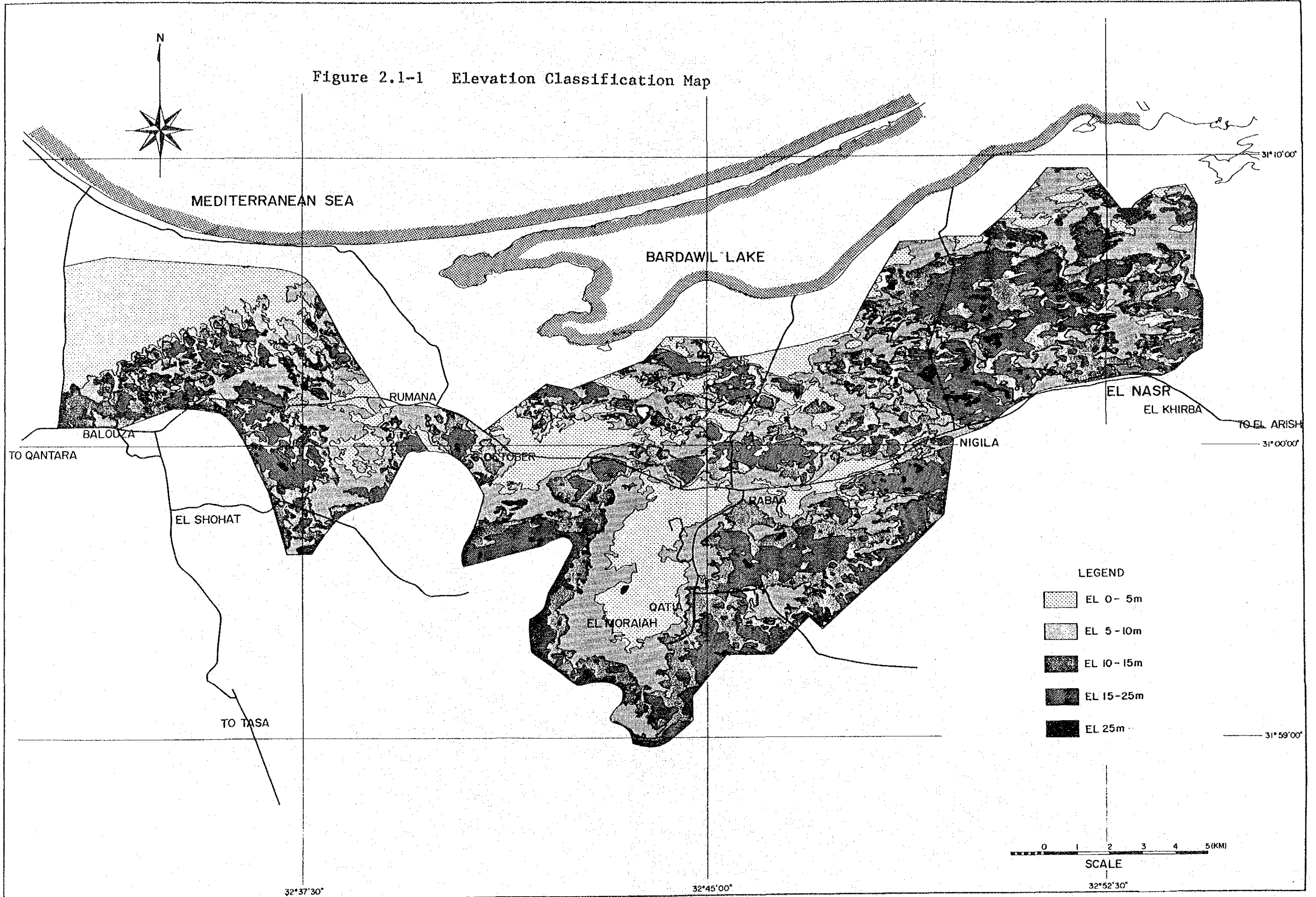
### 2.1.1. Location and Topography

The land reclamation area drawn up by the Master Plan Study comprises the low-lying Mediterranean foreshore strip between the Suez Canal and El Arish in North Sinai and the area lying along the eastern bank of the Suez Canal situated north of the Ferdan ferry which is located about 66 km south from Port Said. The reclamation area extends over three governorates of Ismailia, Port Said, and North Sinai, and its gross area is 254,700 feddan.

The Feasibility Study Area occupies the center of the M/P land reclamation area and has a gross area of 53,400 feddan. It lies between 30°55' and 31°04'N and 32°33' and 32°55'E, and belongs to the Bir El Abd Markaz of the North Sinai Governorate. In this area, there are eight villages, that is, Balouza, Rumana, Six October, El Moraiah, Rabaa, Qatia, Nigila, and El Nasr.

The F/S Area is bounded by the Mediterranean Sea and the Bardawil Lake to the north and the Tina Plain to the west. The southern and eastern boundary adjoins the area of mobile sand dunes. The greater part of the F/S Area is covered with undulating sand terrain of aeolian origin, and clay flats are only found in the northwest corner of the F/S Area. Gently undulating sand terrain cover the areas of El Moraiah, Rabba, Qatia and the north of El Nasr, while rolling sand terrain covers the area located at the north of Balouza and Six October. Many Sabkha are found in the F/S Area and wide areas of Sabkha exist near Rumana, Six October and Rabaa/Qatia. The altitude of the land in the F/S Area is less than 25 m above mean sea level except for some small portions (Figure 2.1-1).

Figure 2.1-1 Elevation Classification Map



LEGEND

- EL 0- 5m
- EL 5-10m
- EL 10-15m
- EL 15-25m
- EL 25m

0 1 2 3 4 5 (KM)  
SCALE



### 2.1.2. Regional Economy

Economic activities in the F/S Area have been mainly based on agricultural production. Other than agriculture, some small-scale shops and gasoline stations are found along the highway which crosses the F/S Area from east to west.

Agricultural activities in the F/S Area are relatively new. According to the results of a farm economic survey which was conducted by the Study Team, farming experience after settlement is six years, on an average. Existing cultivated area was estimated at 1,300 feddan which corresponds to only 2.5 percent of the total F/S Area, therefore, other economic activities accompanied with agriculture have been confined to a small-scale.

#### 1) Agricultural Products and Materials

Agricultural products are marketed through dealers from Cairo and Ismailia, etc. or by the farmers themselves. Successful farmers transport their products by rented car to the market where they can sell their products at good prices. In cases of marketing through middlemen, the farmers' share is estimated at 30 to 40 percent of retail price because of high profit margins.

Agricultural materials such as seed and fertilizer are supplied to farmers through the village bank. However, farmers have been compelled to buy manure and animal feeds at higher prices, which are transported from the west side of the Suez Canal. Cooperatives already exist in the F/S Area, but group marketing activity has so far not been carried out.

#### 2) Farm Labour Force

The labour force for harvesting of tomatoes and olives, are mainly female and their daily wage has been increased annually. At

present, wage rates for men are 5 to 7 LE/day and 3 to 5 LE/day for women, and higher rate is applied during the harvest season (refer to Table 2.1-1).

### 3) Farm Household Economy

According to the farm economic survey conducted, average gross farm household income is estimated at 7,600 LE/year consisting of 6,400 LE of gross farm income and 1,200 LE of off-farm income. Meanwhile, averaged household expenditure is 3,400 LE/year (not including production costs) and about 60 percent of it are spent on food.

In the F/S Area, 1,950 Bedouin households are living, whose annual income is about 500 LE, which is lower than ordinary farmers. The Bedouin's main income sources are dates, sheep and goats. Livestock are raised on wildgrass.

Results of farm economic survey and questionnaire for Bedouin are shown in APPENDIX-G.

Table 2.1-1. Daily Labour Wage for Agricultural Work

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1983	<u>Man</u>	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.0
	<u>Woman</u>	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.5	2.5	2.5	2.0
1984	<u>Man</u>	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4.0	4.0	4.0	4.5
	<u>Woman</u>	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.5	2.5	2.5	2.0
1985	<u>Man</u>	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0	5.0	5.0	4.0
	<u>Woman</u>	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.0	3.0	3.0	2.5
1986	<u>Man</u>	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0	5.0	5.0	3.5
	<u>Woman</u>	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.0	3.0	3.0	2.0
1987	<u>Man</u>	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	6.0	6.0	6.0	4.0
	<u>Woman</u>	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	3.0
1988	<u>Man</u>	5.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0	7.0	7.0	6.0	5.0
	<u>Woman</u>	4.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	5.0	5.0	4.0	3.0

Source: Agricultural office, MOA, El Arish



## 2.2. Population and Landholding

There are eight villages in the F/S Area. According to the statistical data of the Agricultural Office in El Arish, population and number of households in 1988 are about 27,000 and 2,680, respectively. Bedouin occupy 73 percent of the total number of households (refer to Table 2.2-1). In some villages, such as Rumana and Six October, etc., fisheries households are observed and some are subsidiary farmers.

The existing cultivated area amounts to 1,300 feddan and average farm size is estimated at 2.1 feddan per farm household (refer to Table 2.2.-2). However, it must be noted that more than 90 percent are squatters. Beside the aforesaid eight villages, many Bedouins' houses are found along the highway. According to the survey, 45 percent of Bedouin are settled, 30 percent semi-nomadic and 25 percent nomadic. In response to informal questions, the chiefs of Bedouin replied that those nomadic and semi-nomadic Bedouin will settle if the El Salam Canal is extended in the near future.

Table 2.2-1. Population and Household (1988)

Village Name	Population (persons)	No. of Household	No. of Bedouin Household	No. of Farm Household	No. of Fishery Household
Balouza	7,000	500	(500)	200	-
Rumana	5,600	225	(225)	75	150
El Moraiah Village	1,150	120	(25)	25	-
6 October Village	3,100	300	(180)	30	50
Rabaa	2,500	350	(255)	60	35
Qatia Village	4,000	650	(250)	220	-
Nigila	3,129	450	(450)	7	-
El Nasr Village	500	85	(60)	-	30
Total	26,979	2,680	1,950	617	265

Note : Numbers in parenthesis are included in the No. of Household.

Source: Agricultural office, MOA, El Arish

Table 2.2-2. Cultivated Area and Livestock, (1988)

Village Name	Cultivated Area (feddan)	Averaged Farm Size (feddan/farm household)	Number of Livestock				Number of Tractors		
			Buffalo	Cow	Camel	Sheep		Goat	Chicken
Balouza	500	2.5	-	-	5	100	800	10,800	-
Rumana	75	1.0	1	2	6	46	500	1,900	2
El Moraiah Village	55	2.2	-	-	35	493	1,000	2,500	-
6 October Village	12	0.4	-	-	20	1,840	-	-	-
Rabaa	120	2.0	-	-	10	300	1,600	-	1
Qatia Village	300	1.4	-	-	30	593	2,000	10,200	4
Nigila	258	36.9	-	-	3	1,343	2,568	2,500	1
El Nasr Village	1/	1/	-	-	8	326	1,055	-	-
Total	1,320	2.1	1	2	117	5,041	9,523	27,900	8

Source: Agricultural Office MOA, El Arish

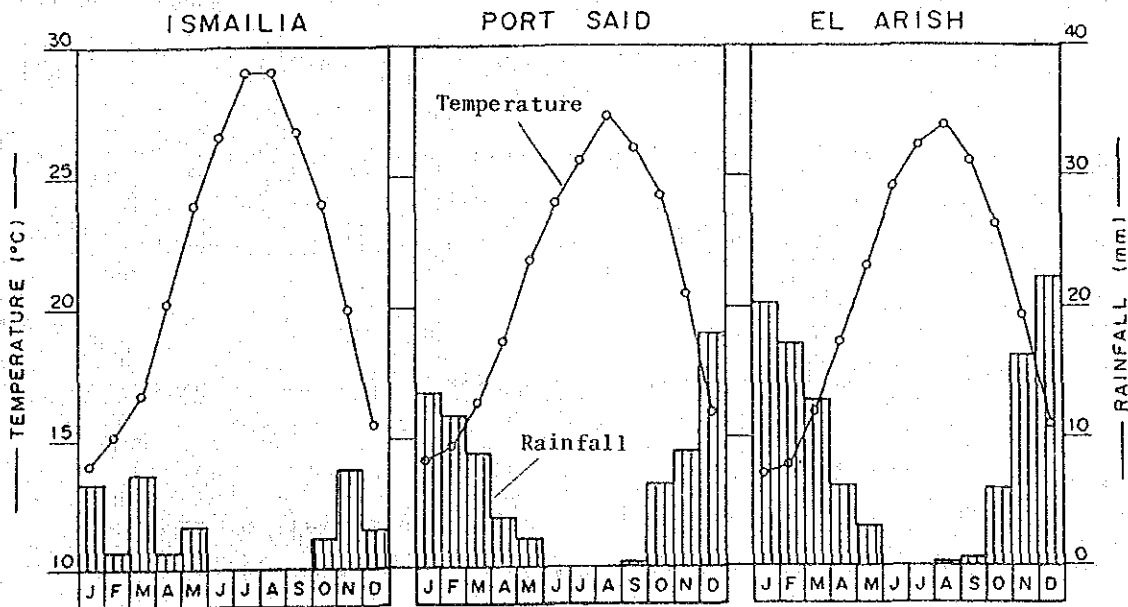
## 2.3. Meteorology and Hydrology

### 2.3.1. Meteorology

The climate in the F/S Area is generally known as the Mediterranean type which is characterized by a relatively wet winter with cool temperatures and a dry hot summer. In spring, hot and dusty winds, known locally as "Khamseen", blow occasionally from the south or southeast.

There is no meteorological station in the F/S Area. The climate in the F/S Area was estimated based on available mean monthly climatic data of three stations, at Port Said, El Arish and Ismailia as below (refer to APPENDIX-B):

Figure 2.3-1 Mean Monthly Temperature and Rainfall



The lowest temperature occurs in January when the minimum average temperature is 8°C and the maximum average temperature is 20°C. In August, the maximum and minimum average temperatures are 31°C and 22°C, respectively.

Relative humidity is 70 percent on an average. The annual average windspeed is around 14 km/hr and the prevailing directions of wind are north, northeast and northwest. Topography of the northern portion of the F/S Area is formed by wind blowing from the north, northeast and northwest, while that of the southern portion is strongly affected by "Khamseen". Therefore, the provision of windbreaks is essential in the F/S Area.

The average annual rainfall is about 80 mm. Rainfall occurs mainly during the winter and occasional rainfall occurs during the transitional seasons of spring and autumn. No rainfall is expected during the summer, that is, four months of June, July, August and September.

### 2.3.2. Water Resources

There are no rivers due to the scarcity of rainfall. The sole water resource available in the F/S Area is the groundwater which has been used in the areas of El Moraiah, Rabaa and Qatia. The groundwater information obtained from the Research Institute of Water Resources (RIWR) under the Water Research Center of MPWWR is as follows:

<u>Acquifer</u>	<u>No. of Wells</u>	<u>Ave. Recharge</u>	<u>Withdrawal</u>
Pleistocene	290	38,000 cu.m/day	14,000 cu.m/day

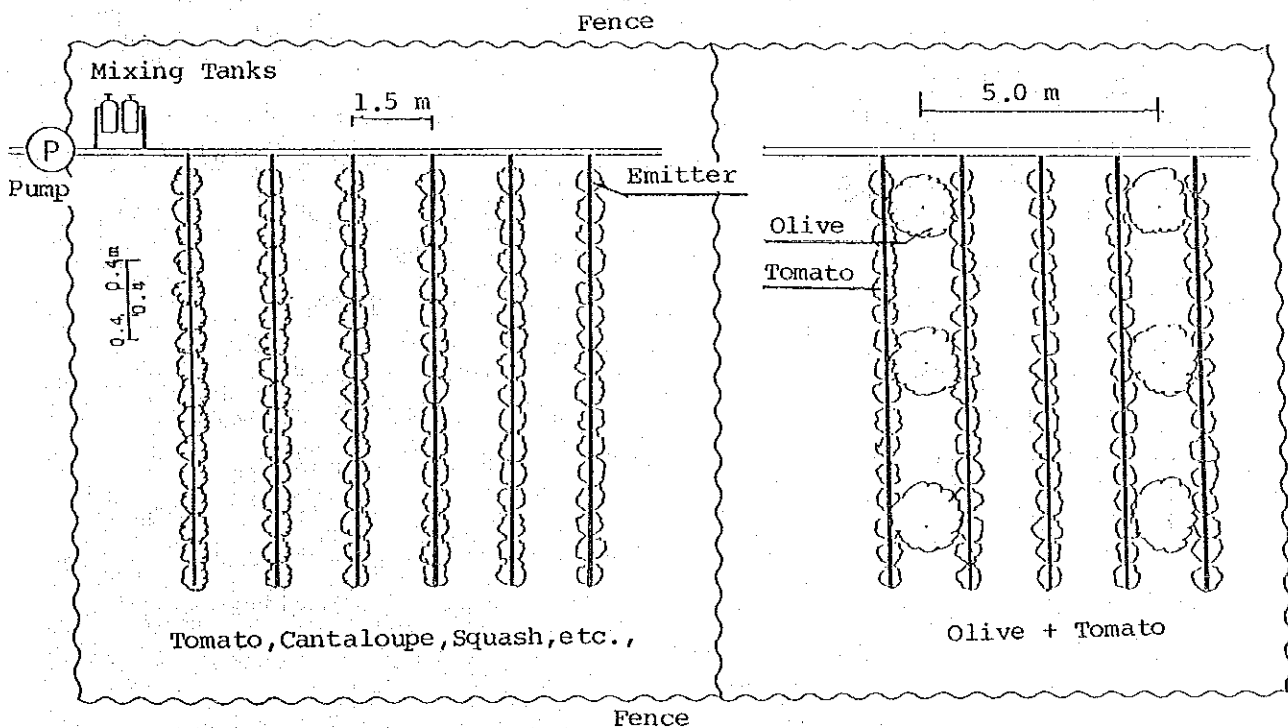
It seems that the F/S Area has a high potential for groundwater development. However, detailed analysis of the groundwater conditions should be required before the implementation of the groundwater exploitation because the average groundwater recharge is estimated on the basis of the water balance study carried out using incomplete rainfall and evapotranspiration data.

### 2.3.3. Present Water Use

The groundwater is used for irrigation of the cultivated areas of about 750 feddan located mostly in the areas of El Moraiah, Rabaa, and Qatia. The farmers in the F/S Area have irrigated land of one to 2 feddan where crops such as olives, guava, tomatoes, cantaloupes, cucumbers, etc. are planted under drip irrigation (Figure 2.3-2). The irrigation water is supplied at the rate of 15 to 20 cu.m/day/feddan.

The working hours of the pump are usually 6 hours a day and the irrigation is made once every two days. Groundwater in a large part of the areas indicates a relatively high salinity of 1,000 to 4,000 ppm.

Figure 2.3-2 Typical Irrigation Methods



## 2.4. Soil and Land Use

### 2.4.1. General

Soils of the F/S Area had been studied by REGWA/GARPAD and a reconnaissance soil map (Scale 1 : 100,000) and a semi-detailed soil map (scale 1 : 50,000) were prepared. These maps were used for the Land Master Plan (LMP) as base map; however, the reliability was not high.

Accordingly, the soil survey for the F/S Area was made through soil profile investigations by digging test pits (3 m deep) and by auger borings (2 m deep) at the grid of one kilometer (one per 250 feddan, approximately). The topographical maps of 1:25,000 scale were used as the base maps of the survey. In addition, chemical and physical analyses were made for 100 soil samples taken from the representative profiles.

The results of soil surveys are shown in APPENDIX-C. The land classification map was prepared for land reclamation planning, based on the results of these soil surveys.

### 2.4.2. Landform and Soil

#### 1) Landform

The F/S Area consists of two major physiographical units, i.e., the fringe of the Tina Plain and the sandy terrain. The fringe of the Tina Plain is low-lying flat land derived from the fluvio-lacustrine deposits of the River Nile, that have a shallow, saline water table and called wet or dry Sabkha. The sandy terrain of aeolian deposits is subdivided into level terrain, undulating terrain, and active dunes according to the REGWA/GARPAD study.

### Landforms in the F/S Area

Tina Plain	- Wet & dry Sabkha	(Clay Flat)
	- Level lowland	(Clay Flat)
Sand Terrain	- Level sand terrain	(Sand Flat)
	- Undulating sand terrain	(Sand Undulating)
	- Complex of level terrain and undulating sand terrain	(Sand Undulating)
	- Inland Sabkha	
	- Mobile sand dune	

The pattern of landforms of the F/S Area is shown in Figure 2.4-1. There is a close relationship between landforms and soil distribution and land use (or natural vegetation) as shown in Figure 2.4-2.

#### 2) Soil

The predominant soil in the F/S Area is the deep sandy soil with a deep water table. Clayey-loamy soils are found in the Tina Plain. Non-uniform texture soils with alternately stratified sand and clay layers occupy a transitional area between the Tina Plain and the sandy terrain. Sandy soils with shallow water table are found at further inland Sabkha between sand dunes.

These soils are classified into four Great Groups according to the USDA Soil Taxonomy as below;

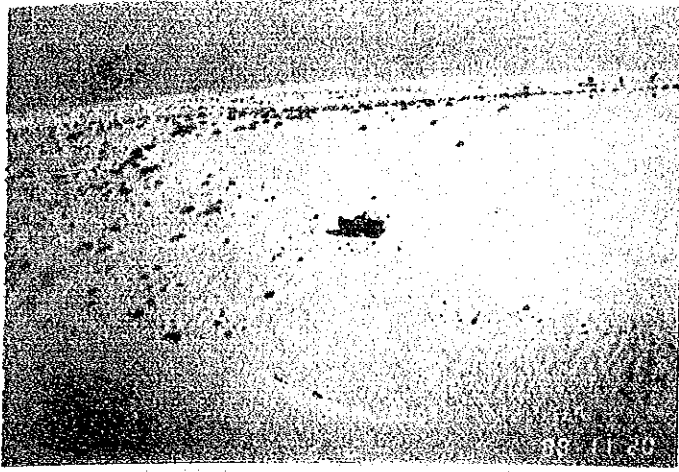
- Typic Torripsamments (See page 25)
- Typic Psammaquents (See page 26)
- Typic Salorthids (See pages 27-28)
- Typic Hydraquents (See page 29)

The typical soil profiles for respective soils are shown in the following pages mentioned above.

The soil salinity is generally low in the sandy terrain (less than 2 mS/cm); however, the soils in the Tina Plain and those around the Bardawil Lake and inland Sabkha show distinct salinity (more than 16 mS/cm).

The distribution of soils is shown in Figure 2.4-3 and Table 2.4-1. The representative soil profiles are described in the succeeding pages. The relationship between landform, soil and land reclaimability is summarized in Table 2.4-2.





Soil survey in sand dune area



Soil profile investigation by test pit digging



Soil survey in Tina Plain



Intake rate measurement

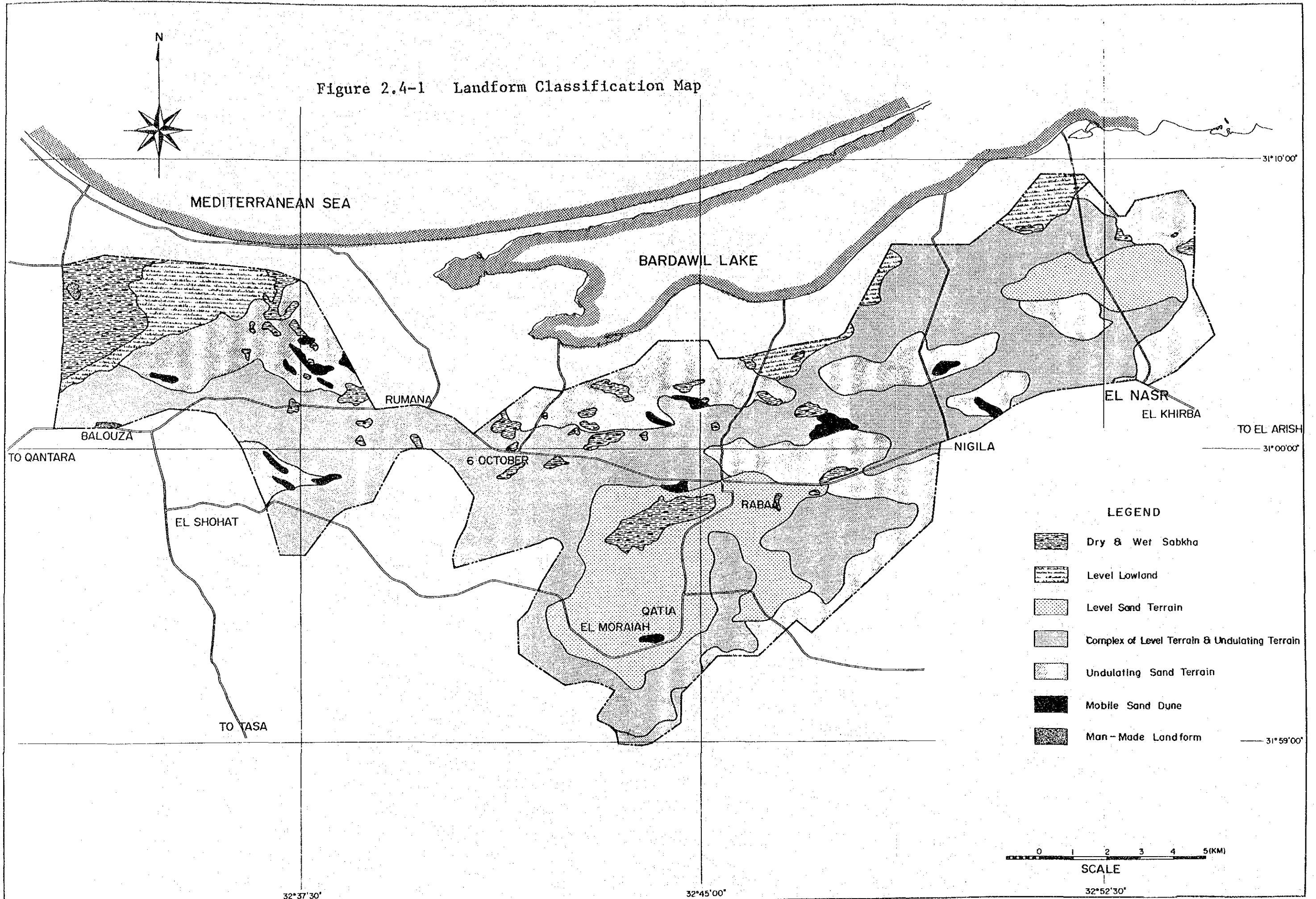


Hydraulic conductivity measurement by Auger-hole method










Leaching test

Figure 2.4-1 Landform Classification Map



LEGEND

-  Dry & Wet Sabkha
-  Level Lowland
-  Level Sand Terrain
-  Complex of Level Terrain & Undulating Terrain
-  Undulating Sand Terrain
-  Mobile Sand Dune
-  Man-Made Land form

0 1 2 3 4 5 (KM)  
SCALE

32°37'30"

32°45'00"

32°52'30"

31°10'00"

31°00'00"

31°59'00"



Figure 2-4-2 Relationship between Landform - Soil - Land Use (Vegetation)

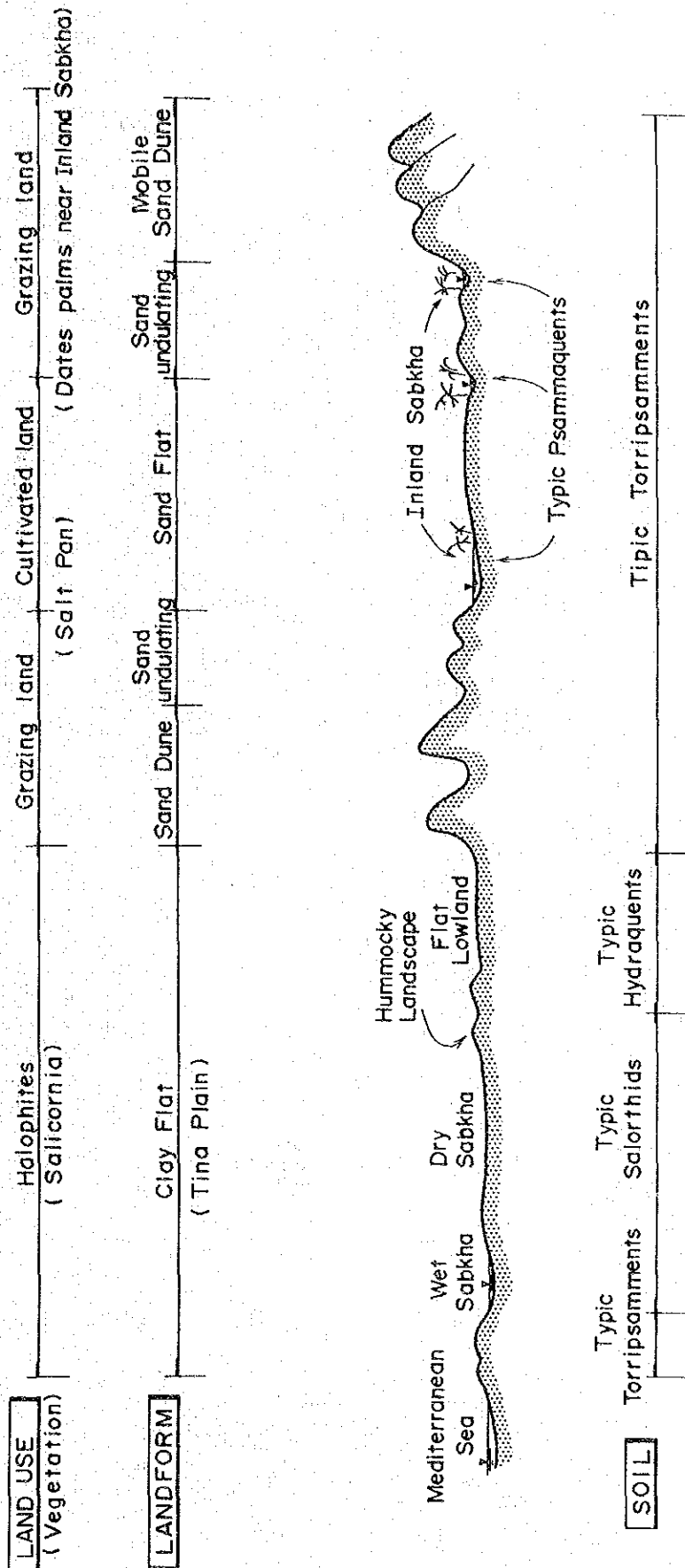
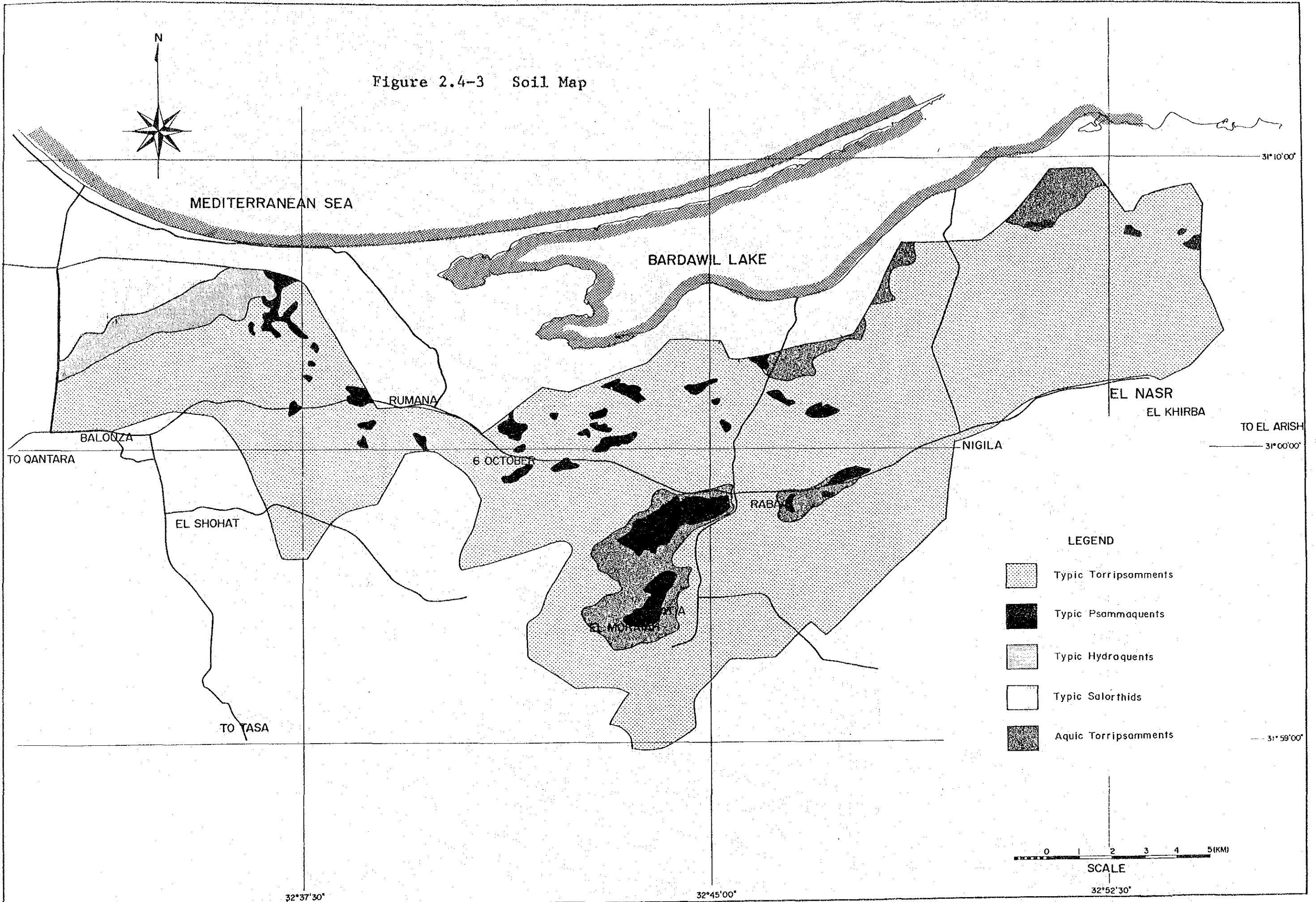







Figure 2.4-3 Soil Map



**LEGEND**

-  Typic Torripsomments
-  Typic Psammaquents
-  Typic Hydroquents
-  Typic Salorthids
-  Aquic Torripsomments

0 1 2 3 4 5 (KM)

SCALE

31° 10' 00"

31° 00' 00"

31° 59' 00"

32° 37' 30"

32° 45' 00"

32° 52' 30"



Table 2.4-1. Soil Distribution in F/S Area

Great Group	Area	
	(feddan)	(%)
Typic Torripsamments	43,500	81.5
Typic Psammaquents	2,200	4.1
Typic Hydraquents	1,600	3.0
Typic Salorthids	1,800	3.4
Aquic Torripsamments	4,300	8.0
<b>Total</b>	<b>53,400</b>	<b>100.0</b>

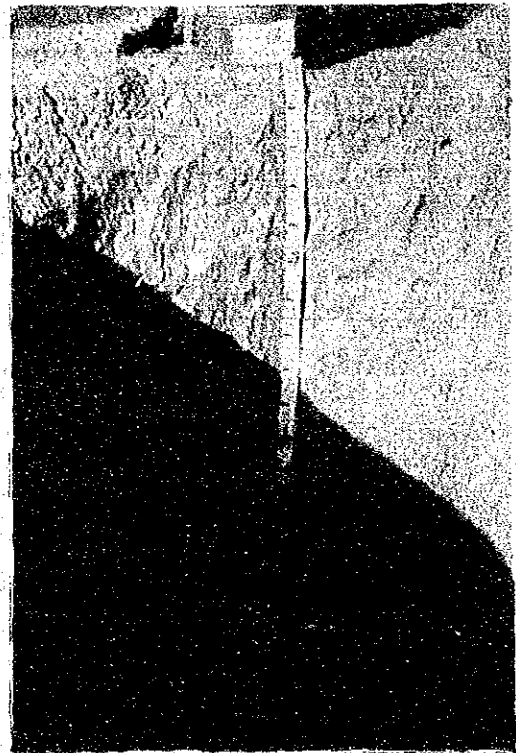
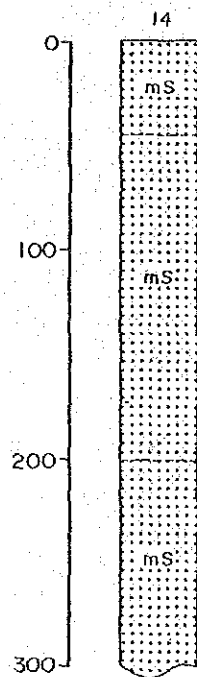
Table 2.4-2. Relationship between Landform, Soil and Land Reclaimability

Landform	Soil	Land Reclaimability
Coastal Sand Dune	Typic Torripsamments (Typic Psammaquents)	4st, 6st
Clay Flat (Tina Plain)		
Wet & dry Sabkha	Typic Salorthids	4sd, 6sd
Flat Lowland	Typic Hydraquents	3sd
Sand Flat	Typic Torripsamments	2s, 3st, 3sd
Sand Undulating	"	3st, 4st
Inland Sabkha	Typic Psammaquents	4sd, 6sd
Mobile Sand Dune	Typic Torripsamments	6 st

Typic Torripsamments

(Coarse-textured soils with deep water table)

Location: Hagf El Souf (2 km north of Nigila)  
 Physiography: Stable low sand dune (Sand Undulating terrain)  
 Slope: undulating, 3 - 5%  
 Microrelief: Many, about 5 m high  
 Parent Material: aeolian sand, deflated  
 Vegetation: dense desert shrubs  
 Drainage: excessive  
 Water Table: deep, > 3m  
 Water holding capacity: poor



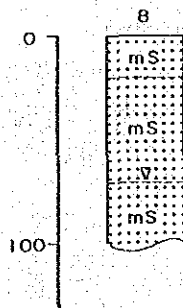
Depth (cm)	Description
0 - 45	Yellow (10YR 7/6), medium sand, single grain, dry, loose, no consistency, low organic matter, diffuse boundary to;
45 - 200	Brownish yellow (10YR 6/6), medium sand, single grain, moist, friable, diffuse boundary to;
200 - 325	Brownish yellow (10YR 6/6), coarse sand, single grain, moist friable



Typic Psammaquents

(Coarse-textured soils with shallow water table)

Location: west of Rabaa  
 Physiology: inland Sabkha, depression  
 Slope: flat, less than 1%  
 Microrelief: many, about 3 m high  
 Parent Material: aeolian sand  
 Vegetation: common halophites (Salicornia)  
 Drainage: poor  
 Water Table: moderately shallow, 70 cm  
 Surface Feature: thin salt crust

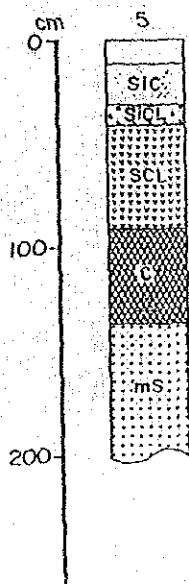


Depth (cm)	Description
0 - 20	Brownish yellow (10YR 6/6) with black colored surface, medium sand, single grain, moist, friable, few roots, diffuse boundary to;
20 - 70	Brownish yellow (10YR 6/6), medium sand, single grain, moist, friable, water table at 70 cm;
70 - 120	Brownish yellow (10YR 6/6), medium sand, single grain, wet

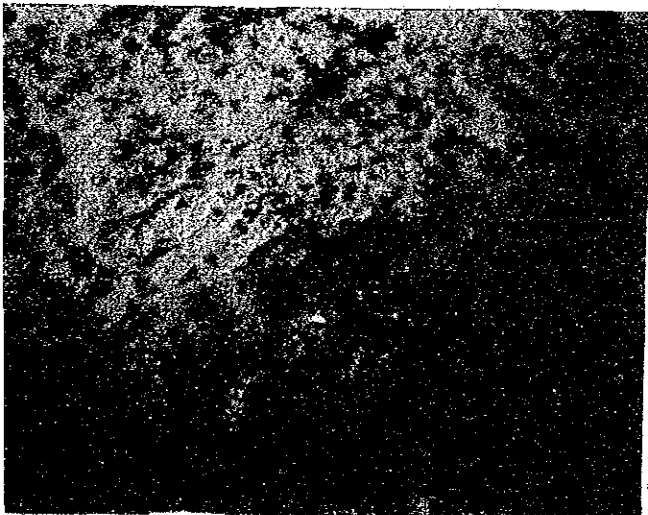
Typic Salorthids

(Fine-textured soils with moderately shallow water table)

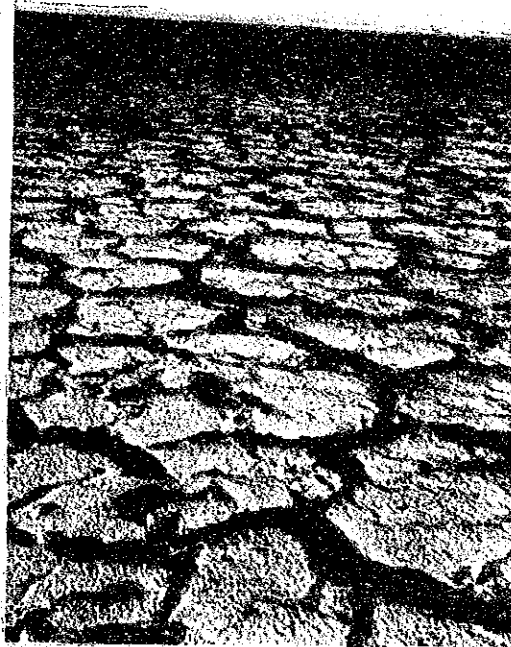
Location: 3 km east of Tell El Farma  
Physiography: Tina Plain, dry Sabkha, (Clay Flat)  
Slope: flat, less than 1%  
Microrelief: few hummocky landscape  
Parent Material: fluvio-lacustrine deposits  
Vegetation: none  
Drainage: poor  
Water Table: moderately shallow, 130 cm  
Surface Feature: scattered shells and gypsum needles



Depth (cm)	Description
0 - 10	Very dark gray (N3), loose fine sand covering salt crust (3 - 5 cm thick), many gypsum needles on the surface, abrupt boundary to;
10 - 30	Dark grayish brown (10YR 4/2), silty clay, blocky structure, moist, friable, sticky and plastic when wet, common small pores, clear smooth boundary to;
30 - 40	Brown yellow (10YR 6/6) and yellowish brown (10YR 5/4) with some black spots, silty clay loam, moist, friable, slightly sticky and plastic when wet, gradual smooth boundary to;
40 - 90	Yellowish brown (10YR 4/2), sandy clay loam, blocky structure, moist, friable, slightly sticky and slightly plastic, common shells, common fine pores, few organic matter, gradual smooth boundary to;
90 - 135	Grayish brown (10YR 5/2), heavy clay, wet, very sticky and very plastic, many small shells, water table at 130 cm, gradual smooth boundary to;
135 - 200	Very pale brown (10YR 7/3), medium sand, loose, non sticky nor plastic, smelling.



Gypsum needles

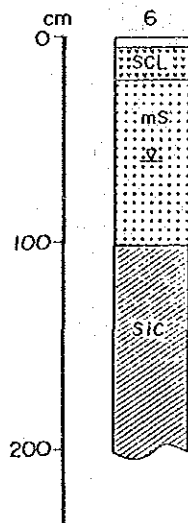


Salt crust

Typic Hydraquents

(Fine-textured soils with shallow water table, sand substratum)

Location: near Tell El Farma  
 Physiography: Tina Plain, dry Sabkha, Clay Flat  
 Slope: flat, less than 1%  
 Parent Material: lacustrine clay, alternately stratified clay and sand layer.  
 Vegetation: none  
 Drainage: poor  
 Water Table: shallow (60 cm), very strongly saline



Depth (cm)	Description
0 - 20	Salt crust on the surface (3cm thick). Dark grayish brown (10YR 1/2), sandy clay loam, blocky structure, moist, friable, sticky and plastic when wet, abrupt boundary to;
20 - 100	Pale brown (10YR 6/3), medium sand, single grain, moist, friable, common black spot of organic matter, water table at 60 cm, gradual smooth boundary to;
100 - 150	Black (2.5 Y 2/1), silty clay, no structure, compact, gley horizon, smelling, wet, very sticky and very plastic.

### 2.4.3. Land Use

Most land in the F/S Area is presently used only for grazing camels, sheep and goats due to lack of water resources. The farmland is concentrated in El Moraiah, Rabaa and Qatia areas where groundwater is available. The existing communities are distributed along the highway connecting El Qantara East and El Arish because the inhabitants can easily get their domestic water from the pipeline running along the highway.

The present major land use patterns by landforms are summarized below (refer to Figure 2.4-2):

<u>Tina Plain</u>	: Barren land covered with salt crust
	: Preserved historical ruins
 <u>Sand Terrain</u>	
Sand Flat	: Irrigated agriculture by drip irrigation (vegetables and olives)
	: Communities and social infrastructure
Sand Undulating	: Grazing camels, sheep and goats
	: Military areas
Inland Sabkha	: Date palm plantation in the hollows between sand dunes
	: Salt pan (Six October and Hod Abu Roda)
Mobile Sand Dunes:	Desert

The present land use in the F/S Area is shown in Figure 2.4-4. The area of agricultural land is about 1,300 feddan, which is 2.5 percent of the total area. About 95 percent of the F/S Area is desert with scarce wild shrubs where Bedouin graze camels, sheep and goats (refer to Table 2.4-3).

Figure 2.4-4 Present Land Use

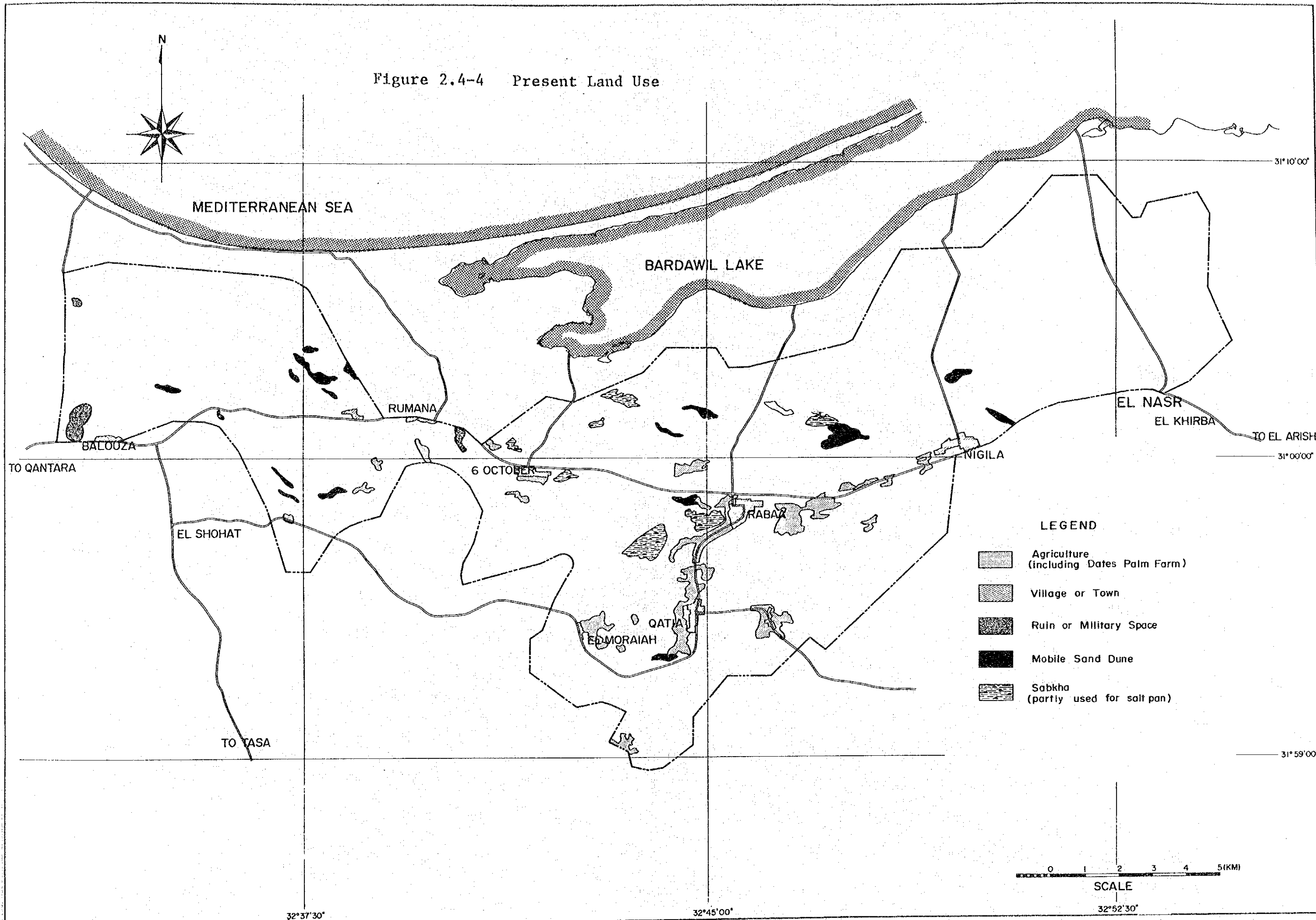
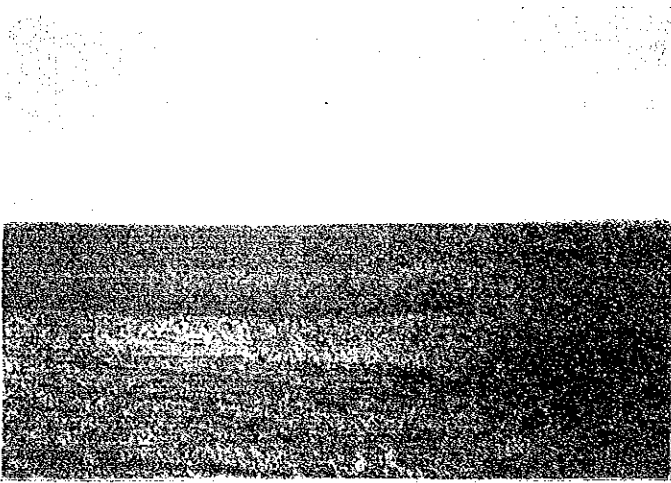




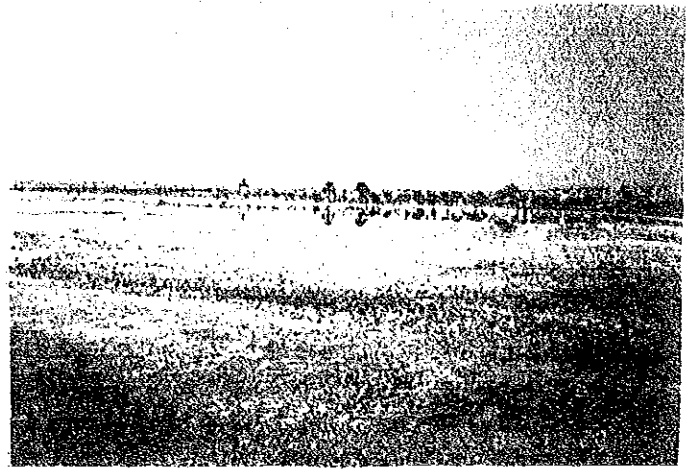
Table 2.4-3. Present Land Use in F/S Area

Land Use	Area	
	(feddan)	(%)
Agriculture (including dates plum farm)	1,300	2.5
Town and village	400	0.7
Ruin and military space	150	0.3
Mobile sand dune	550	1.0
Wet Sabkha (partly used for salt pan)	550	1.0
Desert	50,450	94.5
<b>Total</b>	<b>53,400</b>	<b>100.0</b>





Tina Plain



Salt pan



Desert Shrubs



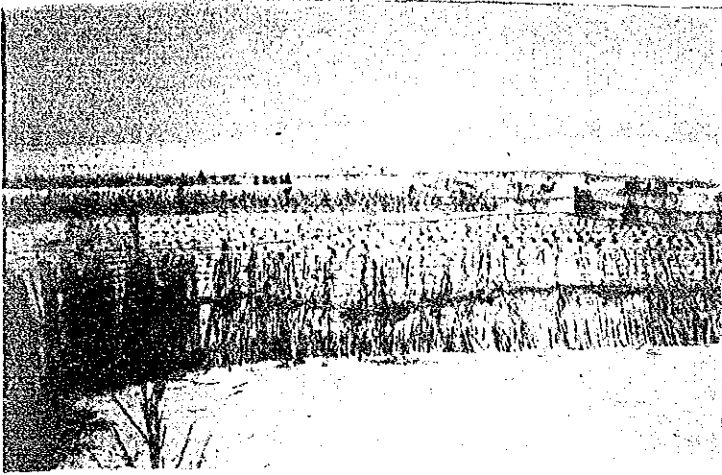
Mobile Sand Dune



Date palm plantation attacked by mobile sand dune



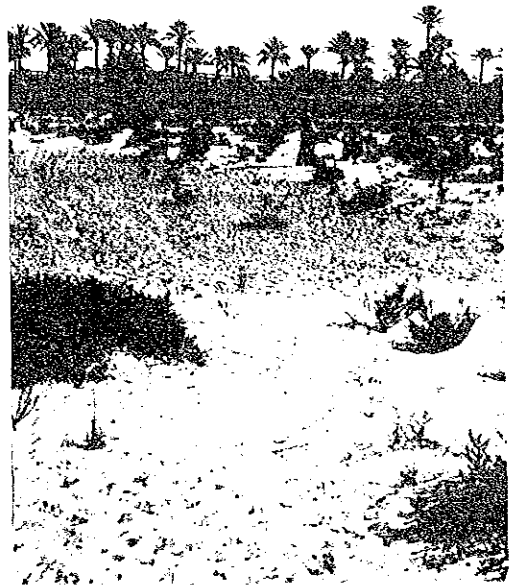
Sand fixation using castor bean planting



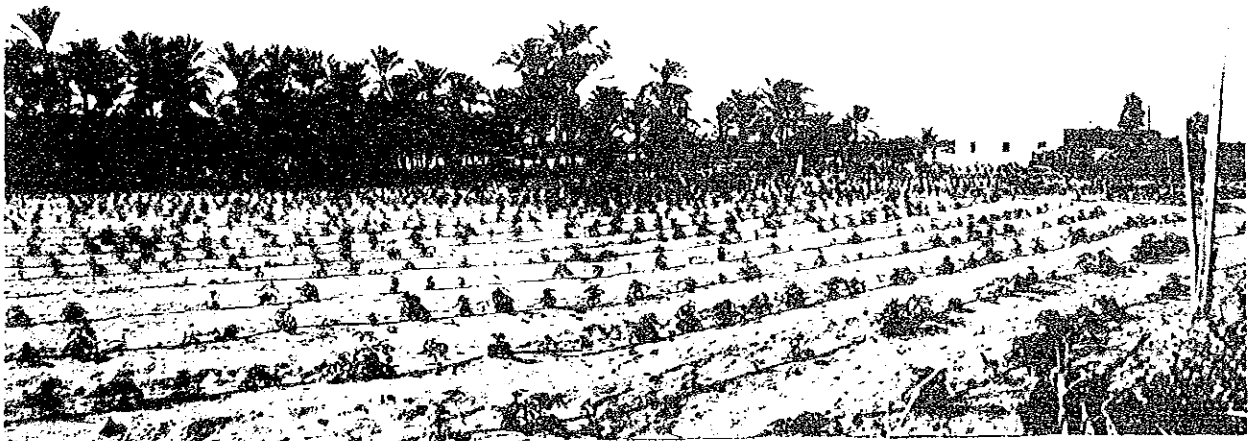
Irrigated field in undulating sand terrain



Olive plantation in Qatia village



Dates palms near inland Sabkha



Tomato Cultivation under drip irrigation (Qatia village)

## 2.5. Crop and Livestock Production

### 2.5.1. Current Crop Production

Presently, farming activities in the F/S Area are practiced on 750 feddan of irrigated land, representing 57 percent of the total cultivated area of 1,300 feddan. Irrigated farms are concentrated in the areas of El Moraiah, Rabaa and Qatia while no farmland is found on the northern side of the highway.

Formerly, farming activities were confined to occasional spring cropping of barley or watermelon after rainfall. In recent years, agricultural development has been concentrated in this area and rapidly accelerated by the following factors which seem to have played a catalytic role in this progress.

- (1) World Food Program (WFP) has assisted the inhabitants with food aid and with drilling of many shallow wells.
- (2) Sinai Development Authority (SDA) has constructed two water collection ditches in these villages and instructed inhabitants on their use.
- (3) Bedouin began to settle before the war; moreover, road networks have been consolidated after the war, providing suitable environments for cashcrop production.

Average farm size is 2.1 feddan, and most farmers manage one to 2 feddan of irrigated plot, with rare exceptions of large-size farm households managing more than 30 feddan.

Irrigation water is supplied by small pumps with kerosene engines through tube-wells or water collection ditches which reach shallow aquifers. Pumped up water is then distributed through a drip irrigation system.

As shown in the cropping pattern (Figure 2.5-1), cantaloupes and cucumbers cropped in summer are dominant. Winter fallow is prevalent, but sometimes squash or winter tomato are also cropped without tunnel coverings. Most orchard plots planted with mixed species are still at the premature stage. The current production and the typical farm management are shown in Tables 2.5-1 and 2.5-2.

A major difference from the farming features of the horticultural areas in El Arish and farther east is the dependence on summer crops. In other words, winter crops, particularly those which require greenhouses or plastic covering, have low shares in the F/S Area.

Farmers have already adopted basic techniques to produce vegetables, using nurseries for tomatoes and cucumbers or direct sowing for cantaloupes and squash. They purchase poultry manure from Ismailia or farther west to improve nutrient levels and physical properties of soils. Expensive seed and foreign chemicals are often used. However, greenhouse or walk-in tunnel cropping is not as popular among farmers as is observed in El Arish. The use of agricultural machinery is virtually non-existent apart from spraying practices from knapsak sprayers. A small number of farmers have pick-up vans or tractors as means of transport. Labour requirement for farming falls under the range of the family labour. Family labour is sufficient even during the peak period in summer.

The following issues are technically observed in current production.

- (1) Scientific understanding among farmers is inadequate to efficiently put advice from extension staff into practice. Exhausting the soil fertility through heavy cash-cropping is an example of this problem.
- (2) Heavier concentration on a few profitable crops induces continuous single-cropping hazards such as outbreaks of pests, i.e., white fly attacks on tomatoes causing prevalence of virus disease. It is difficult to control by spraying, and along with bird attacks has a detrimental effect on yields and quality of products.
- (3) Inefficient filtering cause choking of emitters, whilst salts are accumulated at the periphery of water seepage zone by saline irrigation water.
- (4) Currently prevailing techniques are merely transposed from El Arish and farther east, and are as yet not adapted to the conditions found in the F/S Area. Various measures are needed to cope with the difference in natural conditions.
- (5) Even though the Bedouin have native skills to tend their livestock herds, they have not yet been introduced to nutritious forage crop due to the lack of irrigation water.

#### 2.5.2. Livestock Situation

Settling of Bedouin in the F/S Area has accelerated since the end of the war. As the Bedouin acquires irrigation farming through permanent settlement, nomadism becomes less important and actually difficult for them to maintain. Moreover, as paved roads are developed around their villages, there is less need to keep camels. Some have already sold their camels as a means of transportation and switched to pick-up vans or motorcycles. The rangeland for nomads has become restricted due to the recent expansion of cultivation

area and settlement area. As a rule, coastal areas with higher annual precipitation have higher carrying capacity whereas these areas are subject to recent land development. Therefore, the settled Bedouin farmers cannot afford to sustain goats and sheep herds on the same scale as they kept in the past, especially in the northern part of the F/S Area.

The semi-nomadism which the settled Bedouin farmers adopt here means utilization of wildgrass around their living quarters within the reach of daily grazing and of crop leftovers after the harvest. It follows that herd sizes will become more limited according to the availability of feed and natural carrying capacity.

Current status of herd size appears to indicate a rising trend, but the average live weights have fallen as a result of lower rations. Actually, most goats which are sacrificed for casual events in villages are lean and have lower dressing rations than those in the Delta areas. Some Bedouin families attempt to introduce such improved goat varieties as damascus, but they have reportedly been unsuccessful so far, due mainly to feed insufficiency. Goats grazed in the desert have very low daily gain, and are traded or slaughtered for domestic consumption with a live weight of around 25 kg. The proportion of sheep in mixed herds has been declining recently relatively to goats because of decreasing availability of wildgrasses or diminishing demand for wool processing material.

Cattles are seldom found in the F/S Area, partly because Bedouin is unaccustomed to rearing them, and partly owing to heavy feed requirement. With a view to alleviating feed shortage stress, the Government recently introduced a subsidized concentrate feed supply programme, under which Bedouin families can receive 2 kg of concentrate feed per month at reduced price.

As to animal health services, every village has a veterinary office providing services for livestock owners. As far as animal diseases are concerned, no epidemic disease has been reported.

Figure 2.5-1 Current Cropping Pattern

Area	1st year						2nd year				
	Feb	Apr	Jun	Aug	Oct	Dec	Feb	Apr	Jun	Aug	Oct
80%	Rainfed Watermelon						Rainfed Watermelon				
60%	Tomato						Cucumber				
40%	Cantaloupe						Tomato				
20%	Orchard						Orchard				

Table 2.5-1 Current Production

Crop	Area (feddan)	Production (tons)
Rainfed water melon	765 <sup>*/</sup>	612
Winter squash	44	110
" tomato	266	1,064
Summer cantaloupe	505	2,020
" cucumber	66	178
Immature Orchard		
olive	132	66
fig	61	37
citrus	68	68
guava	85	43
grape	14	11
date palm	702 <sup>*/</sup>	2,808
<b>total</b>	<b>2,708</b>	<b>-</b>

Table 2.5-2 Typical Farm Management

Item	Unit	Quantity (Per household)
Household Size	persons	8
Econ. Active	persons	3
Size of Farmland	feddan	2.1
Irrigated	feddan	1.2
<u>Livestock Held</u>		
Goats	heads	15.4
Sheep	heads	8.2
Camel	heads	0.2
Chicken	fowls	45
<u>Machinery Held</u>		
Irrigation Pumps	set	0.6
Pick Up-van	car	0.05
Tractors	set	0.01

Livestock Production

Livestock	Head	Production (Tons)
Goats	3,200	63
Sheep	1,700	42
Chicken	27,900	28
<b>Total</b>	<b>-</b>	<b>133</b>

\* These are not counted for cultivated area.

## 2.6. Agro-Industry and Marketing

### 2.6.1. Agro-industrial Situation

No significant agro-industrial activity is found in the F/S Area. In the area between El Arish and Rafah, however, activities such as oil extraction in the outskirts of El Arish, and a slaughterhouse together with a milk processing in the suburbs of Rafah, are taking place under the management of the North Sinai Governorate Public Enterprise Commission.

The latter is now suffering from low demand for dairy produce in the urban quarters and also from the high expense of collecting raw milk. This situation prompted the former private enterprise to hand it over to the aforementioned Commission. At present, only cottage cheese processing has been continued, with all other products using pasteurized milk or yoghurt left idle due to the short supply of raw materials.

Olive oil extraction plants have been installed by hydraulic presses made in Italy and are used to extract olive oil from fruit for farmers who bring under a processing fee payment system.

### 2.6.2. Current Marketing Structures

Current scale of production in the F/S Area remains too small to establish any public marketing facility. Two major marketing routes for agricultural produce are identified in the F/S Area. One represents marketing by farmers themselves in El Arish, Ismailia, Suez and Cairo. This type of marketing is only carried out by a few capable farmers who can afford to use their own vehicles or hired ones to transport their produce to the consumers.

The other route is adopted by common smallholders. They usually trade at the farmgate with middlemen or merchants who offer



short-term credits to farmers for their input purchase. These traders frequently visit farms, especially during harvesting seasons to collect products from them. They often offer the same prices as the ordinary level even though attractive levels are prevailing in the urban markets. They may also restrain farmers from free trading with other merchants with precropping loans.

Local retail markets near the F/S Area are limited to the recently established retail stall corners in Bir El Abd and the shopping quarters in El Qantara East, along with roadside vendors and stores scattered along the highway.

## 2.7. Infrastructure and Social Services

### 2.7.1. Road Network

The existing road system in the F/S Area is categorized into three classes, firstly the highway running from El Qantara East to Rafah, secondly the seashore road stretching towards north from the highway up to the Mediterranean Sea coast and the Bardawil Lake, and thirdly the interior roads connecting villages in the south of the highway. In addition, the road construction work is ongoing at the northern Tina Plain, which will connect the F/S Area with Port Fouad.

#### 1) Highway

Widening and rehabilitation works for the highway have been completed by 1986 except some portions. The road is embanked above 2 to 4 m from the original ground level to be free from the blown sand deposition on its surface. Maximum height of embankment is 8 m. The road has been improved to reach the international highway standard of 14 m road width and 7.5m asphalt pavement width comprising three layers, that is, 5 cm thick of asphalt, 6 cm thick of asphalt binder and 35 cm thick of gravel filter.

#### 2) Seashore Road

Six roads have been developed to the coast from the highway at Balouza, Rumana, Six October, Rabaa, Nigila and El Nasr. Two roads, i.e., from Six October and El nasr were completed in 1985. Each road is of 5 to 8 km in length and 13 m width of embankment with 6 m width of asphalt pavement.

#### 3) Interior Road

To the south of the highway, there are two paved interior roads. One is from Balouza to El Tasa and the other is from El Shohatt to Rabaa via El Moraiah villages. A gravel road is also located between Hod Abu Samara and El Moraiah villages.

#### 4) North of Tina Plan (surroundings of the Malaha Lake)

A new road surrounding the Malaha Lake, 50 km in length, from the beginning point of the seashore road between Tell El Ferma and Balouza is being constructed by the SDA. At present, the road embankment extends for a distance of 15 km from the beginning point. When the road construction completes further 8 km, it will reach the Suez Canal. Then, it will be extended about 15 km northwards. Furthermore, it will be extended 11 km along the sea to the mouth of the Malaha Lake. It is consolidated at the same standards as an international highway, i.e., 14 m width embankment and 7.5 m pavement width.

#### 2.7.2. Electricity Supply

Electricity supply for the F/S Area branches out from the national power grid at the El Qantara West substation. The voltage is reduced from 66 to 11 KV for crossing the Suez Canal and then increased to 22 KV using the transformer located at El Qantara East. The trunk power line is placed along the highway and branches out to each village. At Six October, a diesel power station equipped with 3 units of generator (530 KVA) and 3 units of transformers (380V - 22 KV) is under operation. The existing power supply is only for the present demand of village households, in the absence of any extra for industries.

#### 2.7.3. Water Supply

Domestic water is supplied from two existing pipelines of 300 mm and 700 mm diameter with the capacity of 4,000 and 20,000 cu.m/day, respectively. These two pipelines are placed along the highway and distributed to each village. Yet, the supply network in the village is not sufficient to meet each household's demand, therefore, water lorries are used to supply the domestic water in the remote settlement far from the pipelines.

The supply capacity of these two pipelines has almost no allowance for the new demand, so that the SDA scheduled to install a new pipeline of 1,100 mm diameter in addition to the existing two pipelines.

#### 2.7.4. Telephone Service

A telephone line is in place along the highway as far as Rafah. In the F/S Area, the utility improvement has recently been completed in Balouza and Rumana installing 50 and 200 circuit in respective villages. Extension work is also proceeding in other villages such as Rabaa, Qatia, Kottaia, Nigila and El Nasr with the installation of 50 branches usage. The lines in those villages are handled by an operator.

#### 2.7.5. Public Facilities

The existing public facilities in the villages within the F/S Area are summarized in Table 2.7-1.

Table 2.7-1 Existing Public Facilities in F/S Area

Name of Facilities	Rabaa	Belouza	Qatia	Nigila	Rumana	Six October	El Moraiah	Kotaia	El Nasr
Primary School	3	1	3	1	1	1	-	1	-
Preparatory School	1	2	1	1	1	1	-	-	-
Secondary School	1	-	-	-	-	-	-	-	-
Vocational School	1	-	-	-	-	-	-	-	-
Rural Health Unit	1	1	1	1	1	1	-	-	-
Post Office	1	-	-	1	1	-	-	-	-
Telephone Office	U.C.	1	U.C.	U.C.	1	-	-	U.C.	U.C.
Village Council Bldg	1	1	1	1	1	-	-	-	-
Mosque	1	1	1	1	1	1	1	1	1
Cemetery	1	1	1	1	1	1	1	1	1
Social Sports Club	1	-	-	-	-	-	-	-	-
Potable Water Network System	1	1	1	1	1	-	-	-	-
Sewage Network System	1	1	-	1	1	-	-	-	-

Note: U.C.: Under construction

## 2.8. Farmer's Organizations and Agricultural Supporting Services

### 2.8.1. Farmer's Organizations

North Sinai Cooperative Organization has a network covering the whole governorate, with the Central Cooperative in El Arish. There are currently six cooperatives in the F/S Area as shown in Table 2.8-1, distributing inputs and loans among their members. Farmers who want to be enrolled at the cooperative should pay their membership fee at a rate of 2 LE per feddan of their own holding. Village Bank type cooperatives can deal with credits for irrigation facilities, agricultural machinery and stock animals.

Table 2.8-1. Cooperatives and Membership in the F/S Area (1986)

<u>Name of Cooperative</u>	<u>Type of Cooperative</u>	<u>Membership</u>	<u>Remarks</u>
Rabaa Coop.	Development Bank	100	Village bank located
Qatia Coop.	"	227	
El Moraiah Coop.	"	52	
Balouza Coop.	"	260	
Kottaia Coop.	Desert Type	42	Newly built
Nigila Coop.	"	51	
<b>Total</b>	<b>6 cooperatives</b>	<b>732</b>	

North Sinai Agricultural Credit Bank (under PBDAC) has its headquarter in El Arish and a branch office in Bir El Abd, and they perform their activities in close relation with cooperatives. Each cooperative manages an input store, and supplies farmers with various inputs such as feeds, fertilizers, and irrigation equipment, etc.

Apart from these public organizations, there is a consultative network traditionally maintained within the Bedouin population, which still contributes to keeping the whole community in good order.

## 2.8.2. Agricultural Supporting Services

### 1) Agricultural Extension Services

Agricultural extension services in the North Sinai Governorate are offered by more than 400 extension staff under the instruction of the agricultural office in the governorate. An office was established in Bir El Abd with about 20 extension staff members. However, their services are still inefficient due to lack of a means of transport at their disposal.

Coordination between extension and cooperative activities is so imperative that an officer who takes charge of coordinating both agencies is staffed at the branch office. The overall network is illustrated in Figure 2.8-1.

### (2) Agricultural Credit

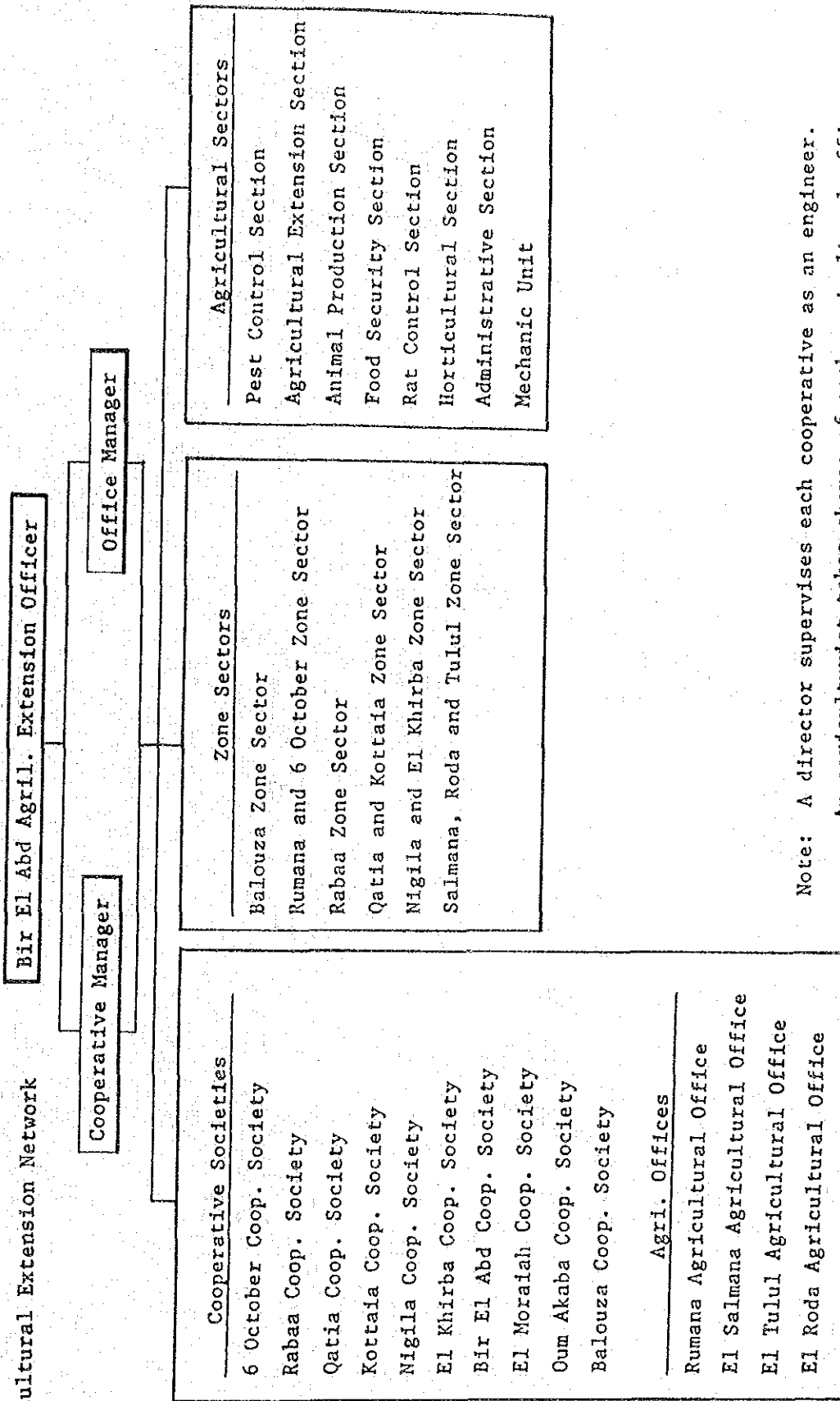
The Principal Bank for Development and Agricultural Credit (PBDAC) deals with agricultural credit service. The organization of the PBDAC is shown in Figure 2.8-2. Totally 4,307 Village Banks have been established in the country but there is none in the F/S Area. Farmers can utilize the following 4 types of credit.

<u>Credit</u>	<u>Objectives</u>	<u>Repayment Period</u>
Short Term	Livestock, poultry	below 12 months
Medium Term	Livestock shed and facilities Agro-industry facilities Agricultural machineries Irrigation facilities	1 - 5 years
Long Term	Land reclamation Horticulture	5 - 15 years
Seasonal	Production loan for summer and winter fruits	After harvesting

Source: Village Bank of NSG

Figure 2.8-1

Agricultural Extension Network



Note: A director supervises each cooperative as an engineer.

An agriculturist takes charge of each agricultural office.



Figure 2.8-2 Farmers Credit

