CHAPTER 1

INTRODUCTION

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1-1 Background of the Study

In accordance with the Scope of Works agreed upon between the Ministry of Public Works and Water Resources (MPWWR), the Government of Arab Republic of Egypt, and Japan International Cooperation Agency (JICA), the official agency responsible for the implementation of technical cooperation programs of the Government of Japan, dated December 12, 1995, JICA sent the Study Team organized by Sanyu Consultants Inc. and Pacific Consultants International on April, 1996 to Egypt to carry out the feasibility study on the North Sinai Integrated Rural Development Project - Phase II (the Study). The objective of the Study is to formulate an integrated rural development plan for newly reclaimed 135,000 feddan area in North Sinai with agricultural purposes.

The Study was conducted in two stages through 1996 to 1997 in close cooperation with North Sinai Development Organization (NSDO) in MPWWR as follows:

Stage I in 1996
- Preparatory work in Japan
- First field investigation in Egypt
- First home work in Japan

Stage II in 1996/97
- Second field investigation in Egypt
- Second home work in Japan

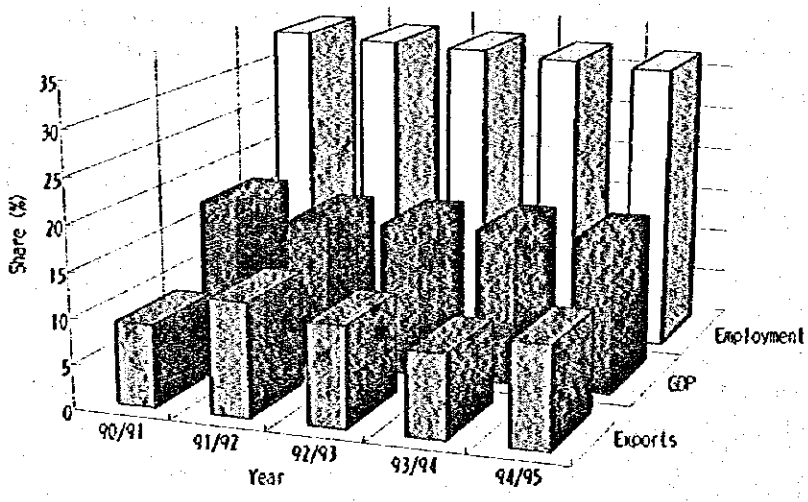
NSDO has been established in 1992 to take charge of planning and implementation of rural development projects in North Sinai covering the land of 400,000 feddans with other agencies involved in completing other infrastructures such as electricity, water supply and so on. The responsibility of NSDO includes the works in the fields of land reclamation, settlement and social infrastructures, irrigation and drainage infrastructures and on-farm works. The 400,000 feddan land is under holding of NSDO as granted by the Presidential decrees and Law Number 7 of 1991.

Four (4) reports have been issued since the start of this Study; Progress Report (I), Interim Report, Progress Report (II) and Draft Final Report. The contents of the reports were subsequently discussed in a series of meetings with the participation of representatives of NSDO and the steering committee of MPWWR. Based on the results of meetings this Final Report has been prepared with the emphasis on early implementation of proposed projects for integrated rural development in North Sinai.

1-2 Agricultural Sector

Egyptian agricultural sector's growth was initiated by 1952 revolution and boosted significantly by the completion of the High Aswan Dam in 1968. The agricultural sector still contributes greatly to the socio-economic development of the country; its share in GDP formation was close to 17% in 1995, exports of agro-products accounted for around 11% of the total merchandise exports and the proportion of employment was about 32%.

Share of Agriculture Sector in GDP, Employment and Exports



Arable land in Egypt is limited to total 7.5 million feddans, which is equal to only 4.0% of the national territory. As a result, agricultural holdings in Egypt average less than two (2) feddans, one of the lowest in the world. Being situated within an arid zone, irrigation is a critical factor in farming and almost the all of the arable land throughout the country is irrigated.

Natural pasture is hardly grown in the country, and in 1994 berseem (Egyptian clover) was the leading crop, covering more than 20% of the total cultivated area. Its share had decreased to 17.7% in 1995 and it was outstripped by wheat which had cultivated area exceeding 18% of the total area. This change of the leading position may be explained as an outcome of the government policy to encourage cultivation of crops for substituting imports. Other major crops which attained a higher share in terms of cultivated area are: maize (16%), rice (10%) and cotton (6%). Perishable crops represented by vegetables and fruits are less dominant, the total sum of their cultivated area occupying as little as 15% of the total area.

Egypt's limited arable land coupled with large and burgeoning population has forced the country to rely on food imports to satisfy domestic food demands. Most of the leading foodstuffs for the diet of the Egyptians (wheat, maize, broad beans, meats, sugar and edible oil) have failed to attain a 100% self-sufficiency ratio for decades; although the ratio for wheat had improved from below 40% in 1989/90 to over 50% in 1992/93, it later dropped off to 46% in 1993/94, meanwhile the ratio for

edible oil has remained extremely low level because the output of relevant crops has not been expanded to catch up with population growth.

To offset deficiency in domestic supply, the country has imported food commodities, apart from their aids, from foreign countries. Import of food commodities has included wheat which accounted for 18% of the total value of food imports in 1993. Meat, dairy products, maize and edible oil are other major imports. On the other hand, as far as agricultural exports is concerned, cotton has been the leading agricultural export, but its share within total agricultural exports has decreased drastically in recent years, dropping from more than 60% in the 1970s to 11.7% in 1993. Rice, potato, orange and onion are identified as the principal agricultural exports, apart from cotton.

Until the mid 1980s, the agricultural policy in Egypt was characterized by heavy government intervention in production, pricing, trade and marketing of crops and inputs. In line with this policy, crop area allotments with delivery quotas at fixed procurement prices were applied to such major crops as cotton, wheat, rice, sugarcane and maize; fertilizers and agro-chemicals were provided to farmers at subsidized prices; and exports and imports were controlled. Nevertheless since the initiation of the structural reform program which was put into force in compliance with IMF's recommendations, the Egyptian Government has embarked on a reform program of the agricultural sector, which aimed at, among others, (1) removal of crop area allotment, delivery quotas, and producer prices with exception of cotton and sugarcane, (2) elimination of subsidies for feed, fertilizers and agro-chemicals, (3) privatization of marketing of agro-products and inputs, and (4) liberalization of trade of most agricultural commodities.

With implementation of afore-mentioned measures the agricultural sector in Egypt is now in a transition period from a Government's highly intervened and centrally planned economy to a decentralized and market oriented one and it is anticipated that the sector would be largely liberalized and major distortions will be removed.

1-3 Settlement Program and Land Reclamation

The arable land in Egypt is about 7.5 million feddans which equates only 4% of the national land, resulting in high population density in the scarce arable land. With an annual population growth rate of about 2.2%, the population living in rural areas has continuously migrated into urban areas. This migration has further resulted in high population density in urban area, as is evident by changes in urban population from 38% in 1960 to 45% in 1988, thus leading to disproportional distribution over the country.

Due to this situation, the government of Egypt has given priority to evenly distribute the population into various governorates as well as between rural and urban areas. The policy concerning the distribution of the population is shown in the Third Five Year Plan covering 1992/93 to 1996/97. The sectors regarding construction, housing and the new town, states the policy as mentioned below:

- to increase the size and activities in the new area in Sinai, north west coast, Red Sea and the New Valley
- to attract citizens to settle in new areas and particularly to implement the project for reclaiming 400 thousand feddans in Sinai.
- to increase the contribution of the private sector in implementing the development projects in new areas.
- to give priority to infrastructure projects in new areas and new cities, and
- to construct 1,150 thousand housing units in the Urban areas and 100,000 units in newly reclaimed areas.

The Land Master Plan was prepared in 1986 by the General Authority for Rehabilitation Projects and Agricultural Development (GARPAD) with the assistance of consultants. A gross area of 2.88 million feddans has been identified as potential irrigable lands with Nile water, at pumping lifts not exceeding 150m, of which 283,000 feddans of lands are located in Sinai.

In 1994, the Ministry of Planning set forth the National Project for the Development of Sinai, in the light of urgent need of land resources development and its results concerning principal economic implications. Based on the results of investigations and studies made by various agencies and organizations concerned, top priority of land reclamation has been given to a 400,000 feddans area in North Sinai. Irrigation water will be supplied through the extension of the El Salam Canal.

1-4 Water Resources

Water resources in Egypt are limited to the country's share of Nile water plus minor amounts of rainwater, groundwater and others. From Aswan to the Mediterranean the Nile is almost fully regulated by the High Aswan Dam. The construction of the dam began in 1960, and the dam was inaugurated in 1971. It is a rock-fill dam, 110.70 m high above the river bed, 980 m wide at the base, and with a total length of 3,820 m. The Lake Nasser has a total storage capacity of 160 billion m^3, of which 90 billion m^3 is the live capacity at a reservoir water level of 175 m above the mean sea level.

The Nile Waters Agreement of 1959 proposed the following water allocations to Egypt and the Sudan of water they share:

Average Nile flow in Aswan:		84	billion m^3
Evaporation losses from Lake Nasser:		10	billion m^3
Available water:		74	billion m^3
Water allocation	- Egypt:	55.5	billion m^3
	- Sudan:	18.5	billion m^3

The current water balance (1994/95) indicates that additional 4.3, 4.1, and 0.4 billion m^3 are being used from drainage water, groundwater, and treated sewerage, respectively. Agriculture is currently using 53.3 billion m^3 of water. It is projected by year 2000 that agriculture demands will increase to be 57.6 billion m^3 in order to irrigate an extra 1.2 million feddans of reclaimed lands. This will be met by increasing drainage water reuse to 6.3 billion m^3 and increasing groundwater extraction to 6.0 billion m^3 in addition to 0.6 billion m^3 increase in treated sewerage water. The total potential drainage water reuse and groundwater extraction is determined to be 7.0 billion m^3 and 7.0 billion m^3 as suggested by various studies of the water and salt balances of the Nile Delta done mainly by Drainage and Groundwater Research Institutes. It is planned that these limits will be reached by 2010 (MPWWR, 1996).

1-5 El Salam Canal and Shikh Gaber El Sabah Canal

Construction of the El Salam canal was initiated in 1979. The intake facilities are located about three (3) km upstream of the Faraskour Barrage on the Damietta branch of the Nile River. The El Salam canal project will be implemented in two (2) stages; construction of the first stage, from the intake to the Suez Canal, was completed in 1990; the second stage includes construction of a siphon underneath the Suez Canal and extension of El Salam canal. After crossing the Suez Canal, the canal is named El Shikh Gaber El Sabah canal. Construction of the second stage works is underway. Suez siphon has a conveyance capacity of 160 m^3/sec with four (4) tunnels of 5.1 m diameter. Its total length is 820 m, of which tunnel length is 750 m. Construction of the siphon is scheduled to be completed by the middle of 1997.

The total command area of the El Salam canal project is 620,000 feddans; 220,000 feddans for the west of the Suez Canal (first stage project); 400,000 feddans for the east of the Canal (second stage project). The command areas of Shikh Gaber El Sabah canal are composed of the following five (5) zones including El Sir & El Kawareer (the Study area):

Name	Land Area (feddan gross)
Tina Plain	50,000
South Eastern Kantara	75,000
Rabaa	70,000
Bir El Abd	70,000
El Sir & El Kawareer	135,000
Total	400,000

The El Salam Canal is to convey a required water of 4.45 milliard m^3 per year, which is equivalent to 30.5 m^3/day/feddan gross. Monthly water discharge fluctuates between 160 million m^3 in October and 570 million m^3 in June.

Out of annual supply water of 4.45 milliard m^3, 2.11 milliard m^3 will constitute fresh water supplied from Nile water and the remainder from Hadous and Serw drains. Mixing of drainage water was planned in 1977. The long-term monitoring of both drains revealed that drainage water estimated

would not be available (DRI, 1993). Meanwhile, the drainage water salinity has increased more than was anticipated. To cope with this situation, the Ministry of Public Works and Water Resources (MPWWR) envisages to use drainage water from Faraskour pumping station and/or other sources. The salinity of the drainage water is about 1,300 ppm, and after mixing with fresh water of salinity of 300 ppm at a ration of 1:1, the salinity of the mixture will be of range 800~1,000 ppm (DRI, 1993).

1-6 Previous Studies

Regarding land reclamation projects in North Sinai, various studies have been carried out so far by different agencies and organizations, among which the following study reports related to the El Salam Canal project present useful data and information for the Study :

1. Feasibility Study, Tina Plain Development Project, June 1988
   - Draft final report (Final report is not available with NSDO)
   - GARPAD/Atkins Land & Water Management

2. Feasibility Study, North Sinai Integrated Development Project, Aug. 1989
   - GARPAD/JICA
   - 254,700 feddans gross

3. Report, Northern Sinai Agricultural Development Project, December 1989
   - FAO/World Bank, Investment Centre
   - 250,000 feddans gross

4. Preliminary Feasibility Study, Provision of Fundamental Structures for Reclaiming 400,000 Feddans in Sinai, February 1990
   - MPWWR
   - 400,000 feddans

5. Feasibility Study, North Sinai Agricultural Development Project, Apr. 1991
   - Draft final report (Final report is not available with NSDO)
   - GARPAD/Atkins Land & Water Management
   - 400,000 feddans

6. Preliminary Feasibility Study, An Area of 135,000 Feddans in El Sir and El Kawareer Region of El Arish Valley, December 1994
   - Draft report in Arabic
   - MPWWR/Ministry of Agriculture and Land Reclamation
   - 135,000 feddans covering the Study area

7. Feasibility Study, Updating for 400,000 Feddans Reclamation in North Sinai, December 1995
   - Draft report in Arabic
   - MPWWR
   - 400,000 feddans including the Study area

CHAPTER 2

GENERAL DESCRIPTION OF THE STUDY AREA

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2-1 Location

The Study area is located in El Sir and El Kawareer within North Sinai governorate, 400 km north-east of Cairo. It is about 30 km from El Arish, the biggest city on Sinai Peninsula, to the center of the Study area. The Study area includes five (5) existing villages and has a population of around 5,000, predominantly Bedouins.

The Study area lies between latitude 30° 45'N and 31° 00'N, and longitude 33° 30'E and 34° 05'E. The area has an irregular shape, being bounded in the north by the foot hills of Mt. Risan Aneiza (363 m), in the south by the foot hills of Mt. Lobna (464 m) and in the east by Wadi El Arish. The catchment area of Wadi El Arish occupies about one third of the total area of Sinai Peninsula.

The Study area, which is also called El Sir and El Kawareer zone, has boundaries that were determined by the MPWWR and the Ministry of Agriculture and Land Reclamation (MALR) based on the results of soil surveys carried out in 1994. The land area is estimated at 155,500 feddans, of which 135,000 feddans of land has been selected for agricultural development.

2-2 General Geology

Sinai was geologically formed as a result of tectonic movement during Cretaceous and is a portion of the northward overlap of the Nubian Arabian Massif. Through tectonic movements, geological domes with numerous folds have developed in the form of hills and rocky ridges such as Gebels Maghara, Halal and Yellaq, those of which are located at about 30 to 40 km inland in a zone parallel to Mediterranean Sea. The hill tops belong to the Jurassic and Lower Cretaceous rocks.

There are three (3) physiographic zones in Sinai; namely, the northern plains, the middle plateau and the southern mountains. The western part along the Gulf of Suez consists of a rift valley, characterized by many faults. In central and northern Sinai, thick marine Eocene limestone rocks can be found. The Study area is located in the northern plains bordering Mediterranean Sea, which is characterized by sand dunes, sand sheets, salt flats and low coastal plains.

The geological structure of northern part of Sinai is divided into three (3) units; namely, the central Sinai stable foreland, the north Sinai strongly folded belt and the north Sinai foreshore area (Shata, 1956). The Study area lies in the northern edge of the north Sinai strongly folded belt which borders on the north Sinai foreshore area in the north.

The structural unit of the belt is well known as Syrian Arc which is characterized by double plunging folds, thrusts and reverse faults. One of the typical folds can be observed at Gebel Maghara about 20 km away toward south-west from the peripheral of the Study area. The predominating directions of the lineaments are ENE-WSW and WNW-ESE, those of which can be observed at hills encompassing the Study area such as Risan Aneiza, G. Maghara and G. Haral.

Quaternary formation, composed of mainly sand dunes, covers most of the Study area. Flooded deposits featured by outcropping gravel/cobbles are observed in south-western parts of the Study area, while an alluvial plain extends along Wadi El Arish which lies almost in parallel with the north-eastern peripheral of the Study area.

During the Groundwater Management Study in the Arish-Rafah Plain area it was observed that the Quaternary formation was 12m in thickness. This study was carried out by JICA in 1988 in the Study area upstream of Wadi El Arish, the upper eight (8) meters are composed of silty sand, medium sand with granule, fine sand, clay, fine sand with granule clay, medium and fine sand, and sand stone from the surface. The lower part of the Quaternary consists of calcareous sandstone and calcareous conglomerate which are of different grain size. The Quaternary is underlain by silt-shale belonging to Tertiary.

2-3 Soils and Lands

2-3-1 Soils

The detailed soil survey was carried out in 1994 by General Authority for Reclamation Projects and Agricultural Development (GARPAD) of MALR, which covered about 154,000 feddans of land, to identify suitable land for agricultural development. According to the said survey, soil types prevailing in the Study area are silty/silty clay and sandy soils, sharing 52.3% and 47.7% respectively (for details, refer to Table 2-1 and Figure 2-1). The soil types are summarized below:

Summary of Soil Types

Soil Type	Area (feddans)
Silty / Silty Clay Soil	
1. Silty clay soil	3,520
2. Deep section of silty clay	46,540
3. Middle section of silty lime soil	30,358
Sub-total	80,418
Sandy Soil	
1. Rough sandy soil of deep section, flat surface	12,450
2. Free sandy soil mixed with small ratio of silty sand	58,204
3. Definitely deep section of sandy soil, more than 100cm in depth	2,784
Sub-total	73,438
Total	153,856

2-3-2 Soil Properties

Soil surveys were carried out by the Study team during the course of the Study in order to supplement the previous soil surveys and obtain first-hand information on soil properties, based on which farming, irrigation and drainage practices are to be planned. At 100 sites soil pits were dug to a depth of 1.5 m. Information on the pits and the characteristics of soil profiles are described according to "The Guideline for Soil Profile Description" of FAO/UNESCO.

Properties of soils in the Study area are summarized as follows:

- Being located in Wadi El Arish valley, soils are derived from calcareous sand stone. Soil acidity varies from 7.3 to 9.4, namely alkaline soil. Soil fertility is very low.

- With respect to soil particle size distribution, most soils are composed of coarse sand fraction, including calcium carbonate concretions and/or nodules.

- Clay content is very low in all surface layers. On the contrary, sand content is high. This may suggest that fine particles moved into underlayers.

- Soils are characterized by poor physical and chemical conditions which are not ideal for agricultural use, due to the low fertility and low water holding capacities, unless water and soil management is applied.

Some chemical and physical properties of soils are given below:

Some Properties of Soils

Particulars	Surface Soil	Subsurface Soil
Horizon Depth (cm)	15~80	15~150
pH (H_2O)	7.3~9.3	7.6~9.4
Electrical Conductivity (ms/cm)	0.13~23.5	0.13~18.2
Organic Carbon (%)	0.03~0.96	0.03~0.96
Total Nitrogen (%)	0.01~0.05	0.01~0.04
Total Calcium Carbonate (%)	1.30~38.0	1.00~40.5
Cation Exchangeable Capacity (meq)	0.55~21.57	2.56~23.9
Field Dry Bulk Density	1.51~1.92	1.50~1.86
Real Density	2.56~2.68	2.58~2.74
Pore Space (%)	28.4~42.1	29.6~44.2
Particle Size Distribution (%)		
- Clay	1.0~24.0	2.0~50.0
- Silt	0.0~33.0	0.0~42.0
- Sand	43.0~98.0	16.0~98.0
Intake Rate (cm/hr)		
- Initial Intake Rate	4.94~158	-
- Final Intake Rate	0.62~54.5	-

2-3-3 Land Forms

The ground elevations of the Study area gradually increase toward the south. The ground elevation at Lehfen on the road of El Arish to El Hasana, is 60 m above the sea level, whereas the ground elevation at Mashashel Inbru village, the southmost village, reaches to 110 m above the sea level. The relationship of ground elevations to land area was calculated using the topographic maps with a scale of 1 to 50,000 as summarized in the following table:

Ground Elevation and Land Area

Elevation (EL.m)	Area (feddan)	Percentage (%)
Lower than 90	66,000	48.9
90~100	54,400	40.3
100~110	14,600	10.8
Total	135,000	100.0

Land form is a major factor in land use planning and irrigation and drainage design. Costs of land development, size and shape of farm fields, range of possible crops and methods of irrigation and drainage are determined with consideration of the land form. The lands in the Study area may be broadly classified into four (4) land forms (GARPAD, 1994).

Flat Land: Loose sandy soils with some gravel at surface; slightly to very calcareous; imperfect to good drainage; sparse vegetation. Suitable for growing and irrigating fruit trees and vegetables; also suitable for rainfed wheat and fodder crop cultivation.

Almost Flat/ Gently Sloping Land: Largely light to heavy corrugated mobile sand formed by wind; slightly to very calcareous; moderate to good drainage; susceptible to wind erosion; little to dense vegetation. Suitable for growing some fruit trees and vegetables using irrigation.

Slightly Undulating/ Undulating Land: Loose sandy soils with silt in surface layers; moderate to very calcareous; poor to good drainage; susceptible to wind erosion; little vegetation; suitable for desert reclamation with irrigation. Legumes, oil crops, fruit trees and vegetables can be grown.

Hilly Land: Very limited area; slightly to very calcareous; moderate to good drainage; little to average vegetation; not suitable for cultivation because of shallowness, high gravel content and steep slopes.

2-4 Climate and Hydrology

2-4-1 Climate

The whole Sinai area is characterized by an arid desert climate with exception of a narrow strip along the coastal line. The coastal strip has a Mediterranean climate, which is more moderate and characterized by a cool winter with some rainfall and a hot summer with little rainfall. Rafah has a maximum annual rainfall of about 300 mm. The rainfall over the Sinai decreases quickly going inland in south-west direction, and finally reduces to 20 mm or less along the Gulf of Suez.

The Study area is located south of El Arish about 20 km from the coastal line, thus the climate can expected to be slightly more moderate when compared with the inland of Sinai. El Arish city has a meteorological station, which is the closest station to the Study area. The station measures such meteorological and agro-meteorological data as rainfall, humidity, temperature, sunshine hours, evaporation and wind velocity. This data was referred to in calculating the crop water requirements.

Annual rainfall ranges between 31 mm in 1995 and 226 mm in 1989 with a mean annual rainfall of 129 mm. The rainfall is known to fall in about 20 days per year only during the winter season with a maximum monthly rainfall of about 44 mm in January. The summer season from June to September, has negligible or almost zero rainfall. Thus, the rainfall in the Study area is not considered significant further more it is also known to fall very localized.

Mean monthly temperature ranges between 13℃ in January and 26℃ in July, and the annual mean is about 19℃. Mean monthly maximum temperature ranges between 19℃ and 32℃ with an annual mean of 26℃, while the mean monthly minimum is between 8℃ and 21℃ with its annual mean of 14℃. Mean monthly relative humidity falls within a relatively small range of between 67% and 75% with its annual average of 71%. The most humid month is August, while the driest one is April. Mean maximum and minimum humidities range between 80% and 90% for August and between 50% and 57% for April.

The mean monthly wind speed ranges between 6 km/hour in August and 10 km/hour in February with the annual average of 8 km/hour. The winds blow mostly from such directions as north, north-west and north-east towards the inland of Sinai. It is also well known that a strong and hot wind, called Khamsin, blows during the spring season from south-east direction, raising the temperature above 40℃. The total number of sunshine-hours is about 12 hours per day during summer and 7 hours per day during winter. The annual average is 9.5 hours per day, thus assuring long sunshine hours necessary for crop growth. Mean daily evaporation reaches to more than 10 mm/day in summer due to long sunshine hours and hot weather, and it becomes about 4 mm/day during winter season. Annual evaporation is worked out to be about 2,600 mm.

2-4-2 Hydrology

Wadi El Arish, running along the north-eastern peripheral of the Study area, has a distance of about 250 km and large catchment area of about 20,000 km^2 which occupies about one-third of whole Sinai peninsula. When the rainfall amounts to more than 10 mm, runoff will occur and the wadi will begin to carry water. With rainfall below 10 mm, most of the rainfall evaporates or infiltrates into the ground.

Topographic maps of central and north-central Sinai denote that the wadi is characterized by relatively gentle slope with the average slope of about 4 m/km. The drainage density, estimated by identifiable streams on maps, is about 0.18 km/km^2, which is significantly lower than that of most other basins. The average for the basins draining to Gulf of Suez and Gulf of Aqabah is about 0.29 km/km^2. Considering the gentle slope and low drainage density, Wadi El Arish may have lower runoff compared to other basins in Sinai.

Rawafaa dam was constructed in 1946 with a capacity of 1.96 million cubic meter (MCM).It is located about 10km upstream from the boundary of the Study area and has a purpose supplying irrigation water to the farms along the downstream wadi. The dam was raised a further two (2) m in 1986 not only for the purpose of securing more irrigation water but also to protect El Arish city from probable floods. The dam now has a capacity of 5.3 MCM at the full water level of 132 m.

The dam has rarely stored water because of little rainfall, and no flood has overtopped the dam since the dam was raised. With reference to the records dating back to 1984, 1.5 MCM was the maximum amount of water ever stored in the dam, this occurred in 1994 and the water level reached 128.55m, which is far below the full capacity of the dam.

Although scarcity of hydrological data prevails over Sinai, Sinai Water Resources Study (Commission of the European Community, 1993) tried to estimate the total flood quantities which have occurred at Rawafaa dam. The floods were identified with the information from Government officials. The study lists the following floods without elaborating the methodology of estimating the floods' quantities:

Estimation of Flood Quantities

Year	Magnitude
1945	7 days continuous flow
1948	21 MCM
1950	18 MCM
1951	3 MCM
1953	0.8 MCM
1954-1964	Information missing
1965	> 1 MCM
1966	> 1 MCM
1967-1974	Information missing
1975	Large flood at El Arish
1976-1979	Information missing
1980	Large flood at El Arish

Note: 1.5 MCM is the biggest since 1984 to date.

A site survey was carried out by the Study team, during which it was confirmed that there were times that floods reached to El Arish city before the dam was elevated. It was also confirmed by the local population that those floods had rarely affected the El Arish city, although reliable flood data is absent. According to the villagers of Macdava, a village located just beside the wadi in the Study area, in the last 40 to 50 years, the biggest flood occurred in the early 1980's (probably in 1980). However, even that flood had not given any damage to the village along the wadi.

Resulting from the above, the maximum flood in the past may have had a magnitude of about 20 MCM or just above, and no noticeable flooding is to be expected with the existing dam storing floods in the reservoir.

2-5 Agriculture

2-5-1 The Study Area

The Study area with the gross area of 135,000 feddans is located about 30 km south of El Arish. The existing farm lands in the eastern part of the Study area extend from the two (2) villages of El Koreah and El Magdaba along the left bank of Wadi El Arish. The total farm land area is 4,064 feddans, or three (3) percent of the total land of the Study area. There are 374 farm households in the Study area. The average area of farm land per farm household is 10.9 feddans.

The farmers cultivate only wheat, barely and some olive trees depending on rainfall and/or flood water from the wadi. They also keep camels, sheep and goats on a small scale, no cows or buffaloes are kept by these farmers.

2-5-2 El Arish around the Study Area

Farm surveys were carried out to obtain information on farming profiles and farming activities for three (3) areas; around the Study area in El Arish, the Mubarak's national project and the Ismailia canal project. The survey information was collected by means of directly interviewing to farmers. As for El Arish, during the farm survey interviews were carried out with 16 selected farmers. The farm lands of these farmers are located to the northeastern end of the Study area and consist of irrigated agriculture using groundwater developed by MPWWR. According to the said survey, general information on the present agriculture in El Arish can be summarized as follows:

Land Holding: The average farm size is 19 feddans; 5.5 feddans for small farmers having less than 10 feddans; 37 feddans for large farmers having 10 feddans or more. 58% farmers inherited the farm lands from the previous generation, 24% farmers have procured their farm lands from the government's land reclamation project and 18% farmers reclaimed their owned lands themselves.

Crops and Farming Patterns: Farming patterns prevailing in the area are classified into three (3); vegetable farms, fruit tree farms (olive and peach) and mixed farms of vegetables and olive with a share of 50%, 31% and 19% respectively as shown below:

Cropped Area by Farming Patterns

Unit: feddan

Crops	Small Farmer		Large Farmer			
	Vegetable	Olive	Vegetable	Veg.& Olive	Olive	Peach
Cropped Area						
Vegetables						
- Cantaloupe	3.4	-	11.0	16.6	-	-
- Tomato	2.8	-	3.7	3.1	-	-
- Cucumber	-	-	3.3	-	-	-
- Bell Pepper	-	-	0.7	-	-	-
- Marrow Bean	-	-	-	0.5	-	-
- Water Melon	-	-	-	0.8	-	-
Fruits						
- Olive	-	3.0	-	37.0	17.5	-
- Peach	-	-	-	-	-	10.0
Total	6.2	3.0	18.7	58.0	17.5	10.0
Average Farm Size	5.6	3.7	28.4	59.5	24.0	10.0

Supply of Manure and Insecticide/Herbicide : Most farmers purchase manure mixed with chicken droppings from merchants and apply 10 to 20 ton/feddan of manure. They spray insecticide in case of occurrence of pests. Weeds are in general manually controlled, but some farmers control weeds in the fields of vegetables and olive trees through application of herbicides.

Irrigation: Fruit trees and vegetables are irrigated by means of drip irrigation. Irrigation water is supplied for four (4) to eight (8) hours a day at an interval of 10 days, or seven (7) hours at an internal of 15 days. The average irrigation hour per feddan is three (3).

Farming Labor: Farming labor mostly depends on manpower. Large farmers use farm tractors for land preparation, plowing and control of insects and diseases. It was only recently that small farmers have started to use hired farm tractors.

Problems regarding the present agriculture around the Study area are replant failure, relatively high costs of manure and low cropping intensities.

2-5-3 North Sinai

(1) Crop Production

Peach and Almond are predominately grown in North Sinai, taking account of almost all of Egypt's national production. The average yields of the 10 major crops in terms of cultivated area are presented in the following table based on statistical agricultural information of the North Sinai

governorate (1190 - 1994). The average yields of three (3) crops, namely wheat, green pepper and fig are very low when compared with that of the national average as given below:

Production and Average Yields of Main Crops

Crops	Planted Area (feddan)	Production (ton)	Yield (ton/feddan)	
			North Sinai	National
Wheat	58,522	89,280	1.53	2.15
Peach	51,399	114,980	2.24	NA
Barley	30,355	50,080	1.65	0.91
Almond	11,592	7,530	0.65	NA
Olive	6,845	11,260	1.64	1.66
Tomato	2,389	24,490	10.25	12.68
Fig	1,712	2,820	1.65	3.20
Orange	954	6,640	6.96	6.66
Green Pepper	931	3,220	3.46	6.38
Lentil	819	1,150	1.40	0.75

(2) Livestock

The current situation of livestock keeping could not be clearly grasped through the farm survey; however, the agricultural statistics of the Governorate (1994) gives the number of livestock in El Arish district as 50,268 heads of goats, 18,335 heads of sheep, 11,180 heads of camels and 297 heads of beef cattle. The livestock keeping in Sinai is largely depending on nomadic grazing due to the dry climate and the lack of pasture land. The number of livestock slaughtered in 1994 in El Arish was 1,163 heads for beef cattle, 403 heads for goats, 234 heads for buffaloes, 206 heads for sheep and 37 heads for camels.

2-6 Irrigation and Drainage

2-6-1 Irrigation and Drainage in the Study Area

Agricultural activity is very limited in the Study area because of scarce rainfall ranging from 30 to 230 mm annually over the last 10 years as recorded by El Arish station. At present, there are about 4,000 feddans of agricultural land under cultivation in the Study area. Among them are a few farms cultivating olives with drip irrigation, for which the irrigation water is being delivered by water tank trucks. Delivering irrigation water by trucks is unlikely to be economical.

Although some farms are equipped with drip irrigation, the majority of the farms in the Study area are not provided with any means of irrigation and drainage, depending totally upon rainfed agriculture or flood water from Wadi El Arish. Those farms are predominantly growing wheat and barley.

2-6-2 El Salam Canal Related Projects

Most of the command area in Sinai is to have up-land irrigation systems such as sprinkler and drip except for the Tina Plain zone. Since Tina Plain zone is composed of heavy clay soil, a basin irrigation scheme is to be applied similar to the case on the western side of the Suez Canal. On the western side of the Suez Canal, the irrigation water has been designed to be pumped up from distributary (tertiary) canals to the farms by the farmers themselves; so each farmer has to install their own individual pumps just beside the canal.

On the other hand, the Tina Plain zone will have a new system at the Mesqa level in order to ensure equity of water delivery between head and tail of a Mesqa, to provide individual farmers with greater direct control over water use, and to reduce operation and maintenance costs. The system is so designed that single point lifting at a head of a Mesqa, using a pumpset owned by a group of farmers, will be introduced. With this system, farmers will not need to install their own individual pumps but have to operate/manage a pumpset by the group.

The up-land irrigation system to be utilized in South Eastern Kantara, Rabaa and Bir El Abd zones has not been finalized. The farms in the zones will be divided into three (3) categories, of which small scale and graduate farmers will be given a service unit (irrigation block), in which they have to practice farming cooperatively. With reference to a government policy, each 10 number of farmers will be given one service unit and they have to manage and operate a pumpset commanding the unit.

Leaching has been planned for El Salam related projects and has already started in some part on the west side of the Suez Canal. Leaching in up-land farming areas will be done by using similar irrigation systems such as sprinkler and drip. A drainage system will also be included to avoid water logging and to enhance the effect of the leaching.

Canals are to be operated to deliver the required water for 24 hours a day, while on-farm irrigation practice is typical limited in Egypt to less than 24 hours a day, say 16 hours a day, even in peak periods. Therefore, the difference must be regulated by supplementary storing water in the main and distribution canals in the project areas of west of the Suez Canal as previously practiced.

2-6-3 El Arish Area

Many farms are located along approximately the last 15 km of Wadi El Arish. These farms are irrigated by groundwater which aquifers are composed of Quaternary sedimentation and are within 60 m from the ground level. The yield of the wells varies depending upon the location but are usually 30 to 40 m^3 per hour covering irrigation area of about 20 to 80 feddans.

The farms are supplied with irrigation water either from the wells directly or through booster pumps placed beside small farm ponds with a capacity of about 10 to 30 m^3, to which the water is firstly

pumped up from the well. Drip irrigation is used in most cases with exception of a few plots in which furrow irrigation is practiced for barley.

Olive is the predominant plant in the area, the irrigation water contains salinity of more than 3000 ppm. Such crops as melon, famous in this area, tomato and courgette are also planted on the farms which can be supplied with irrigation water of less than 3000 ppm salinity (refer to APPENDIX C-1).

Although the salinity of the groundwater is high, often more than 3000 ppm, neither leaching has intentionally been practiced nor has any drainage system been introduced. Rainfall as much as 100 mm yearly may have contributed to leaching the salinity or farmers have probably applied more water than was actually needed. This was the case, as observed in an olive farm, where the salt had accumulated on the soil surface. Also, expected high permeability of the soil, resulting from river sediments, could have contributed to the draining of the irrigation water reducing the salt accumulation in the soil, and thus the soil itself probably worked as a natural drain.

2-6-4 Other Project Areas

In Egypt, up-land irrigation was started with a relatively large scale system. The Tahhadi project area, developed in 1960's as one of the oldest sprinkler irrigated area, has service units as large as 900 feddans, to which irrigation water is supplied by one set of booster pumps. The length of the pipeline between the booster pump and the terminal point reaches about 3 km, causing chronic water shortage at the nearby terminal area. The service unit probably consists of more than 150 farms, making rotational irrigation difficult.

There are two (2) irrigation systems in the Bustan project areas I and II; namely, a centralized pressurized fixed sprinkler system and an individual pressurized half-fixed sprinkler system. The farmer's service unit ranges between 240 and 480 feddans, and the latter has 20 feddans service unit each. The operation of the relatively large pressurized irrigation system needs strict management and cooperation of the farmers. On the other hand, the individual system requires purchasing of a set of booster pumps, distribution pipes and sprinklers for each system which is likely to be more expensive.

There are such sprinkler systems introduced in Egypt as hand-moved sprinkler called half-fixed sprinkler, hose-pull sprinkler, side roll, center pivot and liner move. Of them, the hand-moved and center pivot are the most popular in Egypt. In addition to these, drip irrigation systems are recently getting very popular in Egypt, which can be applied to a wide variety of plants such as tomato, melon, grape, egg plant, maize and orchards. However, drip irrigation systems have potential problems such as clogging of the emitters and accumulation of salt. Clogging of emitters and sometimes conduits requires well designed filter systems. The salt accumulated on soil must be leached by using the drip system itself or by other means such as sprinklers which can discharge more water.

No drainage systems were employed during the early stage of up-land irrigation development. An investor's farm, named Elmaghraby farm in Nubariya project area, showed salt accumulation in a farm plot growing barley. The groundwater level which was confirmed in an open drain beside the plot was about only 50 cm below the ground level.

With the example above and Tahhadi project area developing extensive salinity problems, drainage systems were first installed in the form of open drain in the early stage and then later corporating buried pipe systems in the newly reclaimed Nubariya and Bustan project areas. With the drainage systems, no salinity problem has occurred in these project areas. The salinities of the irrigation water and drained water were 200 ppm and 900 ppm respectively, which were tested on May 9, 1996.

An investor's farm in the Suez east project, newly reclaimed in Sinai, showed salinity problem in some places. The 8,300 feddans farm was not provided with a drainage system, of which about 1,000 feddans is said to have developed salinity problem. Salt accumulation appeared even during the first cultivation of barley in lower places, at which groundwater is only 60 cm lower than the surface. The salinity of the irrigation water tested in May 1996 was 200 to 300 ppm, and the drain water showed a salinity of 3,700 ppm salinity. The investor now plans to raise the land to keep the ground level away from the groundwater by placing a 30cm layer of soil in combination with digging an open drainage system.

2-7 Farm Economy and Agricultural Marketing

2-7-1 Farm Budget

According to the farm socio-economic survey made by the Study team covering a total of 50 farmers comprising both independent farmers and beneficiaries of government land settlement project, the average size of land holding was 15.2 feddans; the farm with the largest holding was 119 feddans and that of the smallest was one (1) feddan, meanwhile the beneficiaries of the land reform project were distributed equally five (5) feddans of land. It is reported that lands in the Nile delta region are so intensively used that the crop intensity rate reaches almost 200%. In the three survey areas, by contrast, due to immaturity of land settlement project or due to the absence of surface irrigation water, an extensive portion of lands was left fallow, which resulted in a low average crop intensity rate of 136%; in particular, lands around the Study area which were even less intensively used had a rate of 122%.

The farming practices and cropping patterns, which are variable by area and by category of farmers among three survey areas, are summarized in Table 2-2.

The crop budget analysis on crops cited above draws as conclusion that vegetables such as tomato, cantaloupe, cucumber and potato are the most profitable crops among major crops grown around the Study area as well as along both banks of the Suez Canal (Refer to the Appendix II). Relative high profitability of vegetables is also supported by the data which covers principal crops of the country as

a whole and the North Sinai Governorate (see Appendix H). Farmers do not anticipate a high return of wheat, because this cereal is cultivated in most of the cases as a staple foodstuff for their families.

As explained before, because of an immaturity of the land settlement project or an absence of surface irrigation water, the proportion of land use and productivity of crops at the three surveyed areas remains relatively low in comparison with other areas of the country and these factors combined lead to lower net returns of crops and farm income. Approximately 40% of surveyed farmers raise animals to compensate for the low income level from crops. Furthermore, 42% of the surveyed farmers had access to incomes other than farming. An estimate of annual income among interviewed farmers by category of activity is given in the table below (See Appendix H for further information).

	Farming Income			Non-farm	
Area	Crops	Livestock	Sub-total	Income	Total
Around the Study Area	40,942	0	40,942	5,528	46,470
West of the Suez Canal	10,694	1,421	12,115	8,631	20,746
East of the Suez Canal	13,109	1,289	14,398	1,414	15,812
Average	21,582	903	22,486	5,191	27,676

As a result of the production cost survey it was disclosed that the greater majority of the production costs is allocated to fertilizer (chemical fertilizer and/or compost/manure) and labor (hired and family). Because of the peculiar climatological and land conditions, chemicals like pesticides and herbicides are scarcely used on crops with exception of vegetables.

2-7-2 Agricultural Marketing

(1) Marketing Channels

The marketing network from farmers to wholesale markets or retail markets is classified mainly into two (2) categories: one is that financially capable farmers (large investors or entrepreneurs) transport their products by their own vehicles directly to wholesale markets located in Cairo Metropolitan Area, El Arish, Port Said, Ismailia and so on, meanwhile in the other category, middlemen with trucks from Cairo and other large cities of the country receive crops at farms to market them at wholesale markets mentioned before or retail markets. The only wholesale market under the influential zone of the Study area is the one located in El Arish. This is the governorate owned market where wholesalers are given a concession to occupy lots for trading crops in return for monthly payment of LE 300 and trade of crops between farmers and wholesale traders is made through auction system. Thus prices of crops fluctuate even within one day, needless to mention day by day. The wholesale market in El Arish as well as the one in Port Said and Ismailia (two major urban centers located in the vicinity of North Sinai Governorate) is not adequately organized, so most of the cash crops in the area are traded at the renovated wholesale market located at Al Abor, near Cairo.

Marketing of principal crops produced around the Study area as well as at both margin areas of the Suez Canal is conducted as explained hereinafter.

Wheat and Rice :These cereals constitute staple foodstuffs for the diet of the Egyptian people; about half of the output of wheat is consumed by farmers and their family members (most of the

small farmers consume the whole of the production) and the proportion of self-consumption of rice reaches close to three-quarters of the output; the remaining volume of these crops is generally sold at the farm to private middlemen.

Berseem :This fodder crop is cultivated exclusively to feed animals raised by the same farm, so it is totally consumed where it is cultivated.

Maize, Barley & Sorghum :These crops are partly used to feed animals raised by farmers and the remainder is sold for processing and producing animal feed concentrates through private middlemen.

Cotton :Almost the whole production is sold to private merchants at the farm, although the trade through private sector remains around 40% at the national level.

Oil Crops (Groundnuts & Sesame) : These crops are generally traded at the farms and are later processed at private processing plants.

Vegetables (Tomato, Cantaloupe & Water melon) : Tomato is in principal purchased at the farm by middlemen who transport the product to wholesale markets located in El Abor (near Cairo) and in El Arish, meanwhile cantaloupe and water melon are piled up at collecting centers situated alongside the National Roads El Arish-Rafe and El Arish-Ismailia where private middlemen pick up the product to transport them to wholesale markets in El Abor and El Arish.

Olive :Some portion of this fruit is purchased directly by owners of the oil extracting plants existing at the outskirts of El Arish and other portion are transported to wholesale markets in Al Abor and El Arish because the capacity of the said plants is not sufficient enough to process entire output of the area.

(2) Prices

After liberalization for marketing agricultural commodities, the government has phased out controls on their pricing, thus floor prices no longer exist at present except for three crops: cotton, wheat and rice; setting floor price for these three crops does not mean that farmers are obligatory to deliver their produces to government agencies at this floor price, but farmers are allowed at their discretion to sell their crops to anyone who offer higher prices than the floor price.

Trading of vegetables and fruits is conducted in a completely free market and prices are determined by the force of supply and demand. In the absence of adequate market information, an imbalance between supply and demand of agricultural commodities is predominant bringing about a sharp fluctuation of prices. Wholesale prices of major vegetables and fruits surveyed at El Abor Wholesale Market fluctuated as follows:

Crops	Price Range (LE/ton)	Crops	Price Range (LE/ton)	Crops	Price Range (LE/ton)
Cantaloupe	500~700	Cucumber	500~1,000	Grape	600~2,000
Tomato	200~2,000	Water melon	300~800	Mango	1,000~1,800
Onion	200~1,000	Apricot	500~1,000	Orange	500~2,000
Carrot	200~500	Date	500~1,500	Peach	500~3,000
Potato	200~1,000	Fig	500~2,000	Olive	800~1,500

And, according to the wholesale price index prepared by CAPMAS, wholesale prices of agricultural commodities were evolved bimonthly for the last one year (May 1995 - March 1996) as shown in the Table II-12 of Appendix II. This table indicates that the crop which attains the highest rise in 1995/96 since 1986/87 is sesame with an index of 800, which is followed by green pepper (554.5), cotton (547.7), tomato (482.0), potato (434.6) and rice (433.0), meanwhile crops with a lower rise for the same period are: peach (108.8), garlic (151.1), apricot (160.9), mango (161.8), olive (169.0) and grape (169.5). For the last twelve months (April 1995 - March 1996) wholesale prices of cereals, pulses, oil crops and fodder crops has been stable with a rate between the maximum index and the minimum one in the range of 1.01 - 1.14. Wholesale prices of vegetables, on the contrary, fluctuated considerably month by month; the highest maximum/minimum index rate was recorded by tomato with 6.12 and other crops which registers higher rates are green pepper (4.13), potato (3.77) and garlic (3.34).

2-8 Socio-economy

The Study area (El Sir and Kawareer zone) belongs to the North Sinai Governorate. The North Sinai Governorate is divided into six (6) districts (El Arish, Rafa, Bir El Abd, El Shekish Zouid, El Hasana and Nakhl) and the greater majority of the Study area is located within El Hasana district; the north-eastern portion of the area constitutes part of El Arish district and a small fragment in the east of the area represents El Sheikish Zouid district. The Study area is sparsely populated area with only five (5) villages named Bir Lehfen, El Koreah, Magdaba, Awlat Ali, El Resan. Almost all the inhabitants in these villages are Bedouin people who have settled there abandoning nomadic lifestyle and their houses including minimum social provisions such as electricity and water are supplied free of charge by the North Sinai Governorate Office.

Population census in the country is carried out every ten years and the latest census results were published in 1986. According to this census, the North Sinai Governorate had a total population of 171,505, which accounted for only 0.4% of the national population. El Arish - the capital city of the governorate - absorbed close to 40% of the governorate's population and El Hanana district, to which the great majority of the Study area belongs, had a population of 13,111 (7.6% of the governorate population) in 1986. According to the information provided by the North Sinai Governorate Office, an estimated population of North Sinai Governorate by respective district in 1995 is as given in the table below:

Population in North Sinai Governorate

Districts	Census in 1986	Estimated Population in 1995				
		Total	Urban	%	Rural	%
El Arish	67,636	92,180	90,251	97.9	1,929	2.1
Rafa	34,331	46,791	27,403	58.6	19,388	41.4
Bir El Abd	27,389	37,331	3,943	10.6	33,388	89.4
El Sheish Zouid	24,382	33,231	11,104	33.4	22,127	66.6
El Hasanal	13,111	17,891	625	3.5	17,266	96.5
Nakhl	4,656	6,343	2,043	32.2	4,300	67.8
Total	171,505	233,767	135,369	57.9	98,398	42.1

Source : Census in 1986 - CAPMAS
Estimated Population - North Sinai Governorate Office

The above estimation indicates that the population of North Sinai Govenorate has grown by 36% over the last 9 years, at a rate of 3.5% per annum, which is far higher than the national average of 2.5%. It is roughly estimated that the number of inhabitants within the Study area is around 3,000.

The economic activity in the region is dominated by agriculture; plantations of olive are located near the urban area of El Arish and peach plantations together with cultivation of fruits and vegetables (cantaloupe, water melon, orange, tomato, cucumber, green pepper, etc.) are found alongside the national road leading from El Arish to Rafa. Meanwhile, fishing activities are flourishing in the El Bardawil Lake (inland fishing) and in the Mediterranean Sea near El Arish City (during non-fishing season - November to March - of the El Bardawil Lake). Fishing in the El Bardawil Lake is carried out by four (4) cooperatives affiliated by a couple of Bedouin tribes and some portion of the captured fish is exported to European countries. Animal husbandry represented by grazing camels, goats and sheep has traditionally been the main activity among Bedouin people, but with the progress of their settlement this practice has been superseded by agricultural activities.

Manufacturing is under-developed in this region; only small-scale olive oil extracting factories are installed in and around El Arish City and one fruit juice production plant is under construction in Rafa City. El Arish City is endowed with beautiful shore and palm lined beaches, so tourism has been developed up to date and is expected to expand in the near future. About 550 beds are available for tourists in El Arish and they were occupied by 56 thousand guests in 1993.

All the desert land in Egypt has been classified as state land, but the lands in North Sinai have been divided among Bedouin tribes under the custom law defining clearly boundaries known to all other tribes. The divided land for each tribe is further divided among tribal clans and then into families. Under the civil law, on the other hand, only legally used or cultivated desert land is considered to be private property. At present, in compliance with the Presidential decrees No.103 (1994) and No.147 (1993) relevant to the Law No.7 of 1991, the whole territory corresponding to the area of the agricultural development project in North Sinai is considered to be the property of NSDO.

2-9 Settlement and Social Infrastructure

2-9-1 Progress of Settlement in Proceeding Projects

The settlement projects related to the El Salam canal project, on the western side of the Suez Canal, and the Shikh Gaber El Sabah canal project, on the eastern side of the Suez Canal, are composed of 11 zones; six (6) zones with the gross area of 220,000 feddans in the western side and five (5) zones with the gross area of 400,000 feddans in the eastern side.

The construction of agricultural infrastructure on the western side of the Canal has been completed, those of which are irrigation and drainage networks, road networks and land reclamation works. On the other hand, the social infrastructure such as public service buildings, schools, hospitals, mosques and the like, are now under construction.

With respect to housing of the six (6) zones, whereas the Berket Om El Reesh zone project has a plan to build houses to accommodate small farmers and graduates, in the other five (5) zones the houses are to be build by the settlers themselves. Under this condition some settlers have already migrated to the settlement areas to create their new life. Detailed data and information were not available so far.

The settlement projects of the five (5) zones on the eastern side of the Suez Canal will be implemented in three (3) phases; phase I consisting of two (2) projects: the Tina Plain zone and the South Eastern Kantara zone, phase II of two (2) projects: the Rabaa zone and the Bir El Abd zone, and phase III will include the El Sir & El Kawareer zone. The construction of Shikh Gaber El Sabah canal is in progress; however, settlement and social infrastructure projects have not yet started. NSDO is revising the previous programs to spped up implementation.

2-9-2 Land Release of Tina Plain Zone

The invitation for land release of the Tina Plain zone was announced to the public and applications were closed on August 31, 1996. The number of applicants for land release was reported to be more than 28,000. This invitation was prepared for three (3) categories namely small farmers/graduates, small scale investors and large scale investors. The outline of this invitation is as follows:

Total Area Released:	35,000 feddans
Number of Farm Lots	
- Small farmers/graduates:	800 lots, less than 10 feddans/lot
- Small scale investors:	50 lots, 10 - 500 feddans/lot
- Large scale investors:	30 lots, more than 500 feddans/lot
Land Prices	
- Small farmers/graduates:	3,000 LE/feddan at a fixed price
- Small scale investors:	10,000 LE/feddan at a fixed price
- Large scale investors:	10,000 LE min./feddan at a public auction (without any restriction to nos. of plots)
Housing Lots (housing to be done by settlers at their cost)	
- Small farmers/graduates:	200 LE/lot, 200 m^2/lot

The settlers of small farmers/graduates will be selected by lottery after consideration of their age, agricultural experiences, family man-power, home town and so on.

2-9-3 Transportation

There are two (2) national road networks to connect the Study area with Cairo; one is the route via El Ismailia, El Kantara, El Arish and Bir Lehfen; the other one is inland route via El Ismailia, Bir Jifjafah and Bagdad or Abu Aweigil. Both national roads are paved with asphalt and are in good condition. An air route is also available between Cairo and El Arish, but it is operated twice a week during summer season only mainly for tourist.

To cross the Suez Canal, five (5) ferry ports, one (1) tunnel and one (1) temporally (seasonal) bridge are used. The location of ferry ports are at Port Fuad, El Kantara Gharb, El Ferdan, El Ismailia (No.6) and El Sarabum. Ferry boats are operated throughout the year during the day time (6:00 a.m. to 12:00 p.m.) except for Port Fuad and El Kantara ports where ferry boats work 24 hours a day. All ferry boats are operated under the control of the Suez Canal Authority free of charge for users.

A temporary bridge of the floating type is available at El Kantara during night time (after operation of Suez Canal) from 6:00 p.m. to 12:00 p.m. for transportation of agricultural products during harvest season from May to July. The tunnel crossing under the Suez Canal was constructed at Ahmad Hamdy near the Suez City.

2-9-4 Electric Power Supply

Current loads in North Sinai Governorate are approximate 36 mega-watts of which 80% is used by El Arish. The total power generating capacity in the Governorate is reported to be about 107 mega-watts. Three (3) power stations are in operation in El Arish with a total installed capacity of 80.6 mega-watts. A new thermal power station with a capacity of 30 mega- watts was constructed in October 1996, and is expected to start supplying soon.

According to the report "National Project for the Development of Sinai", Ministry of Planning, 1994, the electric power demand for the Development of North Sinai is estimated at 300 mega-watts by the year 2007. And the construction of high tension lines from the Abu Sultan Power Station has been started partly for this Project. The details of these facilities are shown as follows:

Electric Power Facilities for 400,000 Feddan

Facilities	Capacity		Quantity	Construction Cost (M. LE)		
				Foreign	Local	Total
Kantara Sub Station 220/66/22 KV	2×125 & 2×25	MVA	1 Unit	84.00	24.00	108.00
Bir El Abd Sub Station 220/66/22 KV	2×125 & 2×25	MVA	1 Unit	84.00	24.00	108.00
Power Line (Kantara to El Arish)	220	KV	210 Km	21.80	81.00	102.80
Power Line (Bir El Abd)	220	KV	12 Km	4.00	2.60	6.60
Romana Sub Station 66/22 KV	4×25	MVA	1 Unit	-	10.00	10.00
Kachia & Baruza Sub Station 66/12 KV	3×25	MVA	2 Unit	-	15.00	15.00
Power Line (Kantara-Romana-Kachia-Baruza)	66	KV	100 Km	-	6.00	6.00
Local Sub Station 22/0.4 KV	500,200,100	KVA	200 Unit	-	2.65	2.65
Switch gear Station	22	KV	4 Unit	-	0.60	0.60
Power Line Network	22	KV	400 Km	-	12.00	12.00
〃	400	Volt	500 Km	-	4.50	4.50
Total				193.80	182.35	376.15

2-9-5 Water Supply

Potable water supplies for North Sinai depend on the Nile River water. This water is conveyed from El Kantara to El Arish by two pipelines along the coastal national highway through several filtration and boost pumping stations. The conveyance capacity of the pipelines is 32,5444 m^3 per day or 353 liters per day per capita for El Arish district having a population of around 92,200 (1995). Many deep wells were constructed by local people to supplement public water supplies. A new pipe line to connect west Kantara with El Arish are under construction having a capacity of 60,000 m^3 per day with 1,000 mm diameter.

A new domestic water supply plan is being implemented presently for North Sinai Development. According to the plan, the water is taken form Port Said canal at El Kantara West and after crossing the Suez Canal water treatment facilities will be constructed. The water is carried by new pipelines only for North Sinai Development Area and El Arish. The water demand is estimated as 200 litter par capita including drinking water, public use, cattle use and small scale industrial water.

2-9-6 Education, Health and Other Public Services

There are no public service facilities in the Study area at the present. Current public services in El Arish related to the development of the Study area are summarized as follows:

Public Services in El Arish

Services	No. of Facilities	Remarks
Education		
College	3	Students : 1,372
Institutes	1	
Kindergarten	18	
Elementary School	48	Class : 1,105
Junior High School	21	Students :30,207
Technical School	15	Teachers :2,988
Health		
Public Hospital	1	Beds : 203
Health Center	5	
Branch of Health Center	8	Services :1 day/week
Others		
Telephone Office	4	Line : 16,000
Police Station	4	
Mosque	112	

Source : Governorate Office

2-9-7 Existing Villages in the Study Area

In the Study Area, there are five (5) villages. Their location and profile are shown in Appendix E.

Electric networks were already provided by the Governorate for all villages. Only Koreah village has a 24 hour public power supply by aerial lines from El Arish. The other villages have generators in each village and electricity is supplied only six (6) to seven (7) hours a day.

Drinking water pipe lines are connected from El Arish to El Koeah and El Magdaba village, but these facilities are not used due to shortage of water of El Arish (These pipe lines were constructed only 6 months ago). Their drinking water is carried by water tank truck from El Arish every day or every other day.

Access roads from the main road to most villages are paved with asphalt except for El Awlad Ali village which is just close to main road.

Bedouin Villages in the Study Area

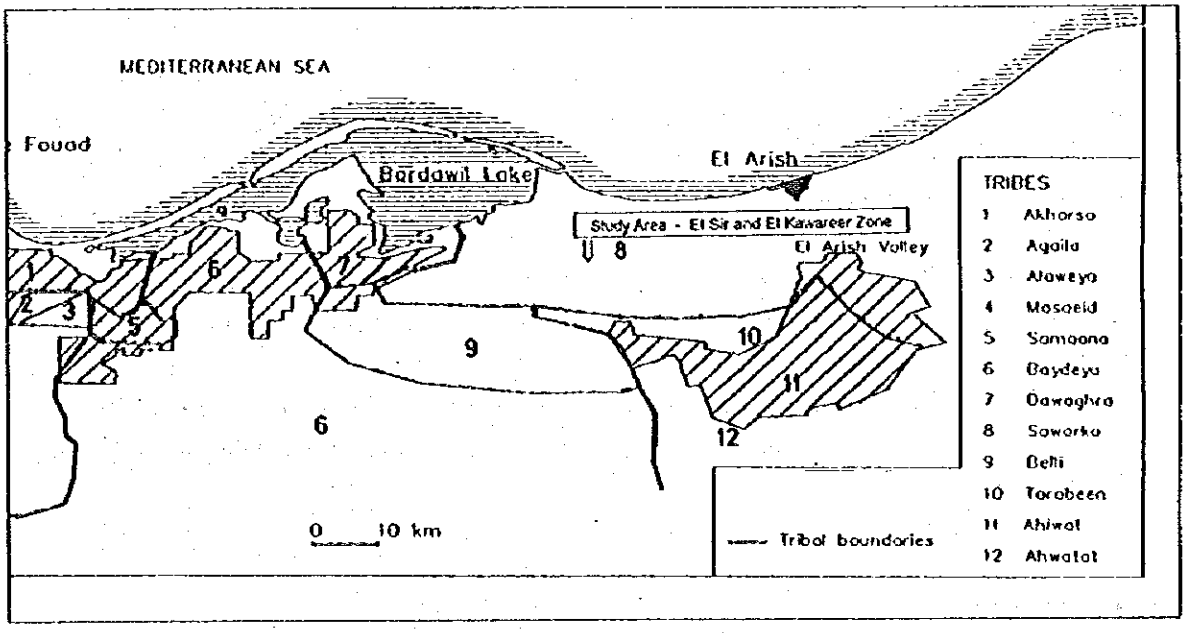
Name of Village	Bir Lefen	El Koreah	El Makdaba	El Awlad Ali	El Resan	Remarks
Population	-	1,334	921	-	583	
(houses)	[40]	[75]	[100]	[20]	[9]	*1)
Agricultural Land	-	1,920	2,144	-	Non	Feddans
Road Network	A/P	A/P	A/P	Non	A/P	*2)
Electric Network	G	P/L	G	G	G	*3)
Water Supply System	-	1,850	1,000	Non	Non	Pipe Line (m)
Quantity	-	66 (50)	46 (50)	-	17 (30)	m^3/day (l/Cap.)
School	-	2	2	-	1	
Health Center	-	1	1	-	Non	Every Day
(")	-	1	Non	-	2	1 day/week
Post Office	-	Non	1	-	Non	
Mosque	-	6	1	-	Non	

Note *1) : There is no statistic data. These figure is by our research.
*2) : "A/P" Asphalt Paved Road
*3) : "G" generated in their villages, "P/L" Public Lined Electricity from El Arish.
*4) : "-" Statistic data are not available.

2-10 Bedouin Society

2-10-1 Tribes

The land in North Sinai is divided amongst various Bedouin tribes. The tribal areas of five Bedouin tribes are affected by the North Sinai Integrated Rural Development Project. These are the Sawarka, Belli, Tarabeen, Ahiwat and the Ahwatat tribe (See following figure). Of these, the Tarabeen and the Ahiwat tribes are likely to be more affected since the project area covers predominately their tribal land. The land is used for grazing of goats and camels, and has clearly divided boundaries, marked by trees, stones or metal posts. These boundaries are known to all tribes, and grazing land is open to all tribe members within the boundaries.



Boundaries of Tribal Areas

2-10-2 Social Grouping

The Bedouin tribes consist of a number of clans which include a family up to the 5th generation. The tribal sheikhs or heads make all important decisions regarding tribal affairs. Marriage occurs within the clan tribe, and women rarely marry outside the tribe because this would mean forfeit of grazing rights. Inheritance rights especially to the land are usually settled through customary law. Bedouins live in tents or temporary shelters made from date palm leaves, however some have been settling in more permanent concrete block structures. The layout of these structures is of significance since it reflects their traditional tent layout.

2-10-3 Livestock

Goats and sheep are kept by the Bedouin tribes for their wool, while camels are used for transport. Camels also represent a source of wealth, status and income. Grazing of camels is practiced by the male members of the tribes and often requires many days out in remote grazing area. The number of camels has however been reducing due to the increasing trend for Bedouin to settle and replace the camel by motor vehicles as the mode of transport.

The grazing and herding of goats and sheep is the role of women, mostly the younger, unmarried girls or the elder women. As agriculture is intensifying, livestock are being kept in enclosures in order to stop them destroying the crops. This results in an increasing reliance on fodder which are expensive. The overall cost and inconvenience, as well as the decreasing demand for wool products is a major factor in the reduction of herds in the region.

2-10-4 Customary Law

Customary law is an unwritten law which has been developed over many years by the tribes. It is highly developed and has a complex structure, being based around the meeting of the tribal and clan heads. Each tribe specializes in an area of customary law and the tribal elders are considered to be objective and of high moral integrity and wisdom.

Rules also exist for the use of water because of its scarce nature. These rules do not apply to access to wells by individuals All drinking wells are open to anyone in genuine need of drinking water. However, the use of the water for animals, cultivation or domestic use needs to be approved by the owner of the well. The owner usually charges a fee for the use of his well due to the high cost of extraction and the general water scarcity in the region. Disputes over water rights are judged under customary law.

2-10-5 Civil Law

Under Law Number 148 all desert land is the property of the Egyptian government and approval needs to be obtained for development of this land. The law relates to land and water rights and recognizes original ownership. It also provides for compensation under certain conditions. Conditions that apply to ownership of desert land are:

- A legal title of land exists as per Law Number 124, 1958.
- The reclaimed or cultivated land has been cultivated for at least one year before issue of the Law Number 124 of 1958. Land reclaimed under rainfed irrigation will not be considered.
- The reclaimed or cultivated desert land has been effectively and continuously farmed, is provided with a permanent water source, and falls within the state plans of reclamation.

In 1987 the North Sinai Governorate issued a decree offering land title to anybody in the region who has cultivated the land for three years. Many tribe members however did not register their land as in their opinion customary law covers landownership. Some attempts were made to integrate customary law and civil law and the North Sinai Governorate even gave recognition and power to customary law committees under law 569 of 1980.

Presidential decrees 147 of 1993 and 103 of 1994 to Law Number 7 of 1991 state that all the land that forms part of the 400,000 feddans to be reclaimed in North Sinai is under holding of the North Sinai Development Organization. The resettlement policy of the Government for this project allows for 25% of the settlers to be small scale farmers and graduates, of which 20% will be allocated to the Bedouins. Although compensation will be given to those Bedouins presently cultivating land in the study area, these decrees seem to contradict the North Sinai Governorate's attempts to integrate civil and customary law, and ignore the fact that Bedouins have used these land for grazing their livestock and camels for many decades.

Table 2-1 Soil Types and Characteristics of Different Lands

(Unit: Feddans)

Land Type	Total Area
A. Nearly leveled sedimentary land	**33,472**
1. A1 (Silty sand to silty clay sand soil) This is nearly leveled land, wide strip covered with desert plants. Color changes from light brown to yellowish brown. There are many weak lime and gypsum accumulation. Soil texture changes from silty sand to silty clay sand with different ratio of calcium.	29,952
2. A2 (Silty clay soil) It covers submerged area in EL-Arish valley, almost flat with gentle slope to North. Color differ from light brown to yellowish brown. Calcium carbonate ratio vary from 7.9 to 11.3 %. pH vary from 7.5 to 8.2. EC vary from 1.4 to 7.8. It is contained few organic matter.	3,520
TC. Simple corrugated lime land of surface covered with gravel	**54,142**
1. TC1 (Silty clay soil with deep section) Simple corrugated land is undulating. Soil surface covers with large ratio of gravel. Color differ from light brown to yellowish brown. This section has medium ratio of weak lime accumulation. Contistutes differ from silty sand to silt in surface layer, and sandy clay in layers under soil has a high ratio of calcium carbonate vary from 25 to 45 %. pH vary from 7.9 to 8.3. EC vary from 4.2 to 11.7.	16,588
2. TC2 (Silty sand in surface soil layer) Sandy gravel soil in subsurface layer. Surface covered with gravel. Color changes from light brown to yellowish brown. There are weak lime accumulation at depth of 80-120 cm. It is consist of sandy silt to sandy silt clay. Calcium carbonate vary from 18 to 29 %. pH vary from 8.2 to 8.7. EC vary from 4.2 to 9.6.	18,462
3. TC3 (Silty soil in surface soil layer) Sandy gravel soil in surface layer. Color changes from light brown to yellowish brown. There are weak lime accumulation at depth of 50-80 cm. It is consist of sandy gravel layer. Morphology and analysis properties like TC2.	6,642
4. TC4 (sandy soil) Color changes from light brown to yellowish brown. There are some roots, and lime accumulation. The land are not lime soil. The ratio of bicarbonate is not more than 2 %.	12,450
TG. Gypsum land	**8,038**
1. TG1 (Silty to sandy silt soil) Gypsum land are of medium depth consist of silty to sandy silt at depth from 80 to 120 cm above gypsum accumulation where there are silty soil. There is some lime accumulation. Color vary from light brown to yellowish brown.	5,254
2. TG2 (Silty to sandy soil) Like TG1, except surface layer depth from 50 to 80 cm.	1,176
3. TG3 (Silty to sandy soil) Like TG1, except surface layer depth from 30 to 50 cm.	1,608
W. Light to heavy corrugated movable sand formed because of wind	**58,204**
1. W1 (Loose sandy soil) Loose sandy soil, sometimes there are sandy silt to silty sand soil in the surface layer or subsoil layer, which represent about 20 % from the total area of this land. The sandy hill land is not high with shallow depth more than 150 cm fine sand in surface soil layer and medium to coarse sand in layer under soil surface. Calcium carbonate ratio in surface layer is 9.4 to 11.6 % and this ratio decreases at depth of more than 100 cm, to less than 6 %.	58,204
Total Area (Feddans)	**153,856**

Table 2-2 Summary of Farm Survey

Area	Category of Farmers	Main Crops			Livestock
		Winter Season	Summer Season	Permanent Crops	
Around the Study Area	Independent Big Farmer	Vegetables (Cantaloupe, tomato, etc.)	Greater portion is left in fallow; some vegetables (tomato and water melon)	Fruits consist of olive and peach cover approx. 42% of total crop area.	Rarely carried out (sheep is the only animal raised)
	Indep. Small Farmer	Similar with Big Farmer but in smaller scale			
West Bank of the Suez Canal	Indep. Big Farmer	Fodder crops (Berseem, etc.)	Cotton and paddy	None	Cattle raising is predominant
	Indep. Small Farmer	Wheat and berseem	Cotton, maize and paddy	None	ditto
	Settler	Barley and without crop (some settlers)	Fallow	None	Poultry is carried out by one settler
East Bank of the Suez Canal	Indep. Big Farmer	Vegetables (Tomato and cucumber, etc.) and berseem	Oil crops (Sesame and groundnuts)	Mango	Cattle raising is predominant
	Indep. Small Farmer	Wheat, broad bean and berseem	Maize and oil crops (Sesame and groundnut)	None	Cattle and sheep raising and poultry
	Settler	Wheat and vegetables (Tomato, potato, etc.)	Water melon and oil crops (Sesame and groundnuts)	Olive	Rarely carried out, some settlers raise cattle.

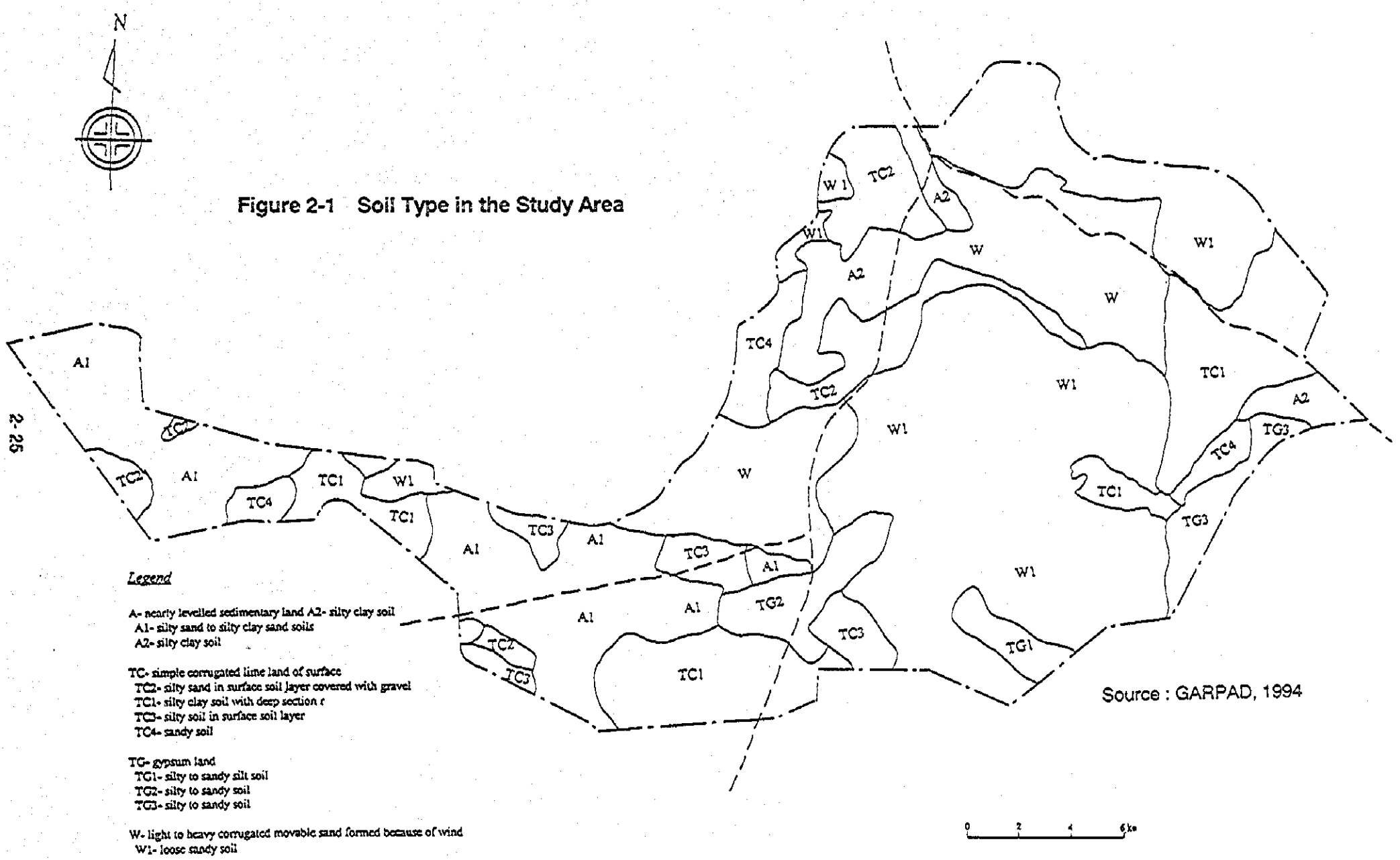


Figure 2-1 Soil Type in the Study Area