

4.4. Fishery Development Plan

4.4.1. Bardawil Lake

1) General

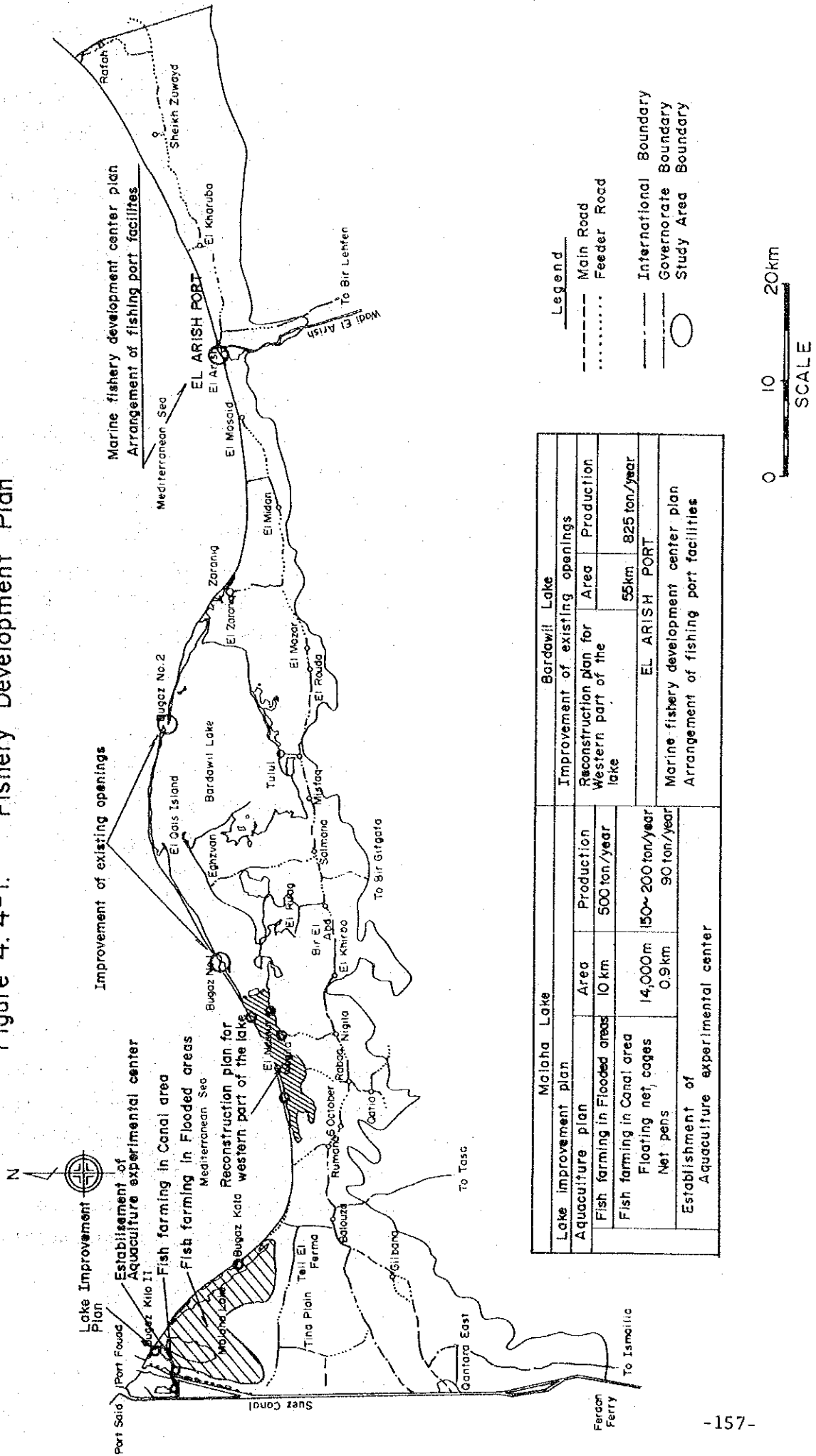
The Bardawil Lake exists in natural conditions that there is no inflow of rivers nor drains. The salinity levels of the lake water must be kept down by an exchange of water between the lake and the sea for fishery in the lake. Fish fry migration into the lake through the openings (Bughaz I and II) must be carefully maintained (Figure 4.4-1). Sands and particles are deposited in the openings by tidal currents and waves and they will soon silt up at the openings if left unmaintained. This would cause rapid increases in salinity levels and deterioration of the lake's ecological conditions. Under this condition, fish fry migration to the lake will be disturbed and fish would escape to the open sea from the lake. Consequently, the catch would be drastically decreased.

Production of the lake (20 kg/feddan/year) is very low, compared to those of other lakes or coastal lagoons in the country (40 - 160 kg/feddan/year). This is probably due to the high salinity inhibiting normal growth of common fish and planktons. The lake has no supply of nutrients from land to initiate a rich food chain.

As reported by the previous studies, the decline of catch per unit of fishing effort and the decrease in size of fish caught indicated that the lake had already been over-exploited. Since the lake's capacity is limited under its natural conditions, a great increase of catch cannot be expected even if fishing efforts are intensified.

Priority should be given to the preservation of the natural environment, because the Bardawil Lake is the country's sole lake without pollution. It has an ecosystem attracting fish fry, though

Figure 4. 4-1. Fishery Development Plan



Malaha Lake		Bardawil Lake	
Lake improvement plan		Improvement of existing openings	
Aquaculture plan		Reconstruction plan for Western part of the lake	
Fish farming in Flooded areas	Area 10 km	Area 55km	Production 825 ton/year
Fish farming in Canal area	14,000m	EL ARISH PORT	
Floating net cages	0.9km	Marine fishery development center plan	
Net pens		Arrangement of fishing port facilities	
Establishment of Aquaculture experimental center			

the production is comparatively low, so long as good water exchange is maintained. The production is quantitatively not so high, but the lake produces high value fishes which are now exported. It is desirable not to lead drained water into the whole lake. Therefore, the introducing drainage water into the lake to raise the primary production should be taken on a limited basis.

To strengthen the fishery regulations and management of preservation of resources, GAFRD has instructed the purse seiners to stop their operations in the lake, considering their harmful influence, and move to the Mediterranean Sea. Such instructions and fishery regulations should be enforced and the surplus fishing effort should be transferred out of the lake, i.e., to the Mediterranean Sea. Because of the closed season in the lake, which is indispensable for maintenance of the lake's fishery resources, fishermen cannot work all the year round. Thus, their fishing activities are periodic so that it is difficult to improve their living conditions.

Therefore, it is essential to promote the fisheries including those in the Mediterranean Sea, aiming to transfer the surplus fishing effort from the lake, and creating employment opportunities throughout the year for fishermen in order to stabilize and improve their livelihood. Present conditions and development plan of marine fisheries are presented in APPENDIX-E.2.

2) Improvement of the Lake Openings Bughaz I and II

The Bardawil Lake is the only clean hypersaline lake in Egypt which is not polluted either by domestic or agricultural effluents. The artificially dug openings, Bughaz I and II which connect the lake with the Mediterranean Sea have enabled the people dwelling around the lake to live on fishing. Fishing in the lake has contributed to the people's welfare and development of the area through creating the employment opportunity and supplying additional food (animal protein).

The General Authority for Fishery Resources Development (GAFRD) has placed a high priority on the preservation of the fishing grounds in the Bardawil Lake through improvement of the openings to sustain the fisheries production. Salinity has increased to 70,000 ppm (more than 120,000 ppm in some places) and caused a decrease in fish production in the lake during closure of the openings in 1970 and 1979. The continuous maintenance of the openings is, therefore, essential to preserve the environment of the lake and maintain the fishery production.

GAFRD is burdened by the large amounts of funding to maintain the openings. The construction of a breakwater and embankment in front of the openings will decrease the sand deposits at the openings, resulting reduction of the expenses of GAFRD, and will preserve the fishing environment of the lake.

To obtain the basic data for designing the permanent protection structures of the openings Bughaz I and II, the Coastal Research Institute of the Water Research Center conducted the following survey and research in Bardawil Lake from 1985 to 1987 (refer to APPENDIX-E):

- General reconnaissance of the whole coastal area
- Survey of the hydrographic profiles
- Measurements of surface sediments
- Littoral current and wave measurements
- Meteorological observation (wind direction and velocity)
- Water level observation in the lake
- Salinity and temperature measurements
- Simulation of a mathematical model and application to the actual measured values.

As the results, the study has clarified the following points:

(1) Littoral Current

- The predominant littoral current was from west to east.
- The average velocity of current was 0.25-0.30 m/sec towards east. The maximum velocity in the stretch west of opening Bughaz I was 0.54-0.83 m/sec towards east.

(2) Wave

- The predominant wave direction was coming from northwest.
- The wave period fluctuated between 3 and 10.7 sec. The predominant wave period was 7 sec.
- The maximum wave height observed was 7.5 cm coming from northwest.
- As a conclusion, the following table can be taken into consideration for the design work necessary for construction of breakwater etc.

Wave height (cm)	0.75	1.5	2.5	3.5
Wave period (sec)	5	6	7	8

(3) Water Level Variation

- The maximum water level, average water level and average water level variation recorded at the sea side of opening Bughaz I was 55-65 cm, 36-37 cm and 24-26 cm, respectively. While at Tulul they were 26 cm, 11 cm and 8 cm, respectively.
- This means that the water entering the lake during high tide does not reach the lake end because of the long distance from the opening, huge area of the lake, and little tidal variation.

(4) Discharge through the Openings

- The maximum discharge through opening Bughaz I was 958 cu.m/sec for inflow and 910 cu.m/sec for outflow. Those through the opening Bughaz II were 1,240 cu.m/sec for inflow and 1,040 cu.m/sec for outflow.

(5) Accretion/Erosion Patterns

- The stretch from the wave breaker zone to the west of opening Bughaz I is an eroded area. The eroded material was deposited on the western jetty which became full, while the eastern bank of the opening was washed off by the current so that the eastern jetty became isolated in the sea.
- The stretch from east of opening Bughaz II to El Zaraniq was an accretion area.

This study succeeded in collecting many data. However, the data represent the conditions during the study period, when unfortunately, a large-scale dredging operation took place at the openings. The study concluded that it was impossible to predict the evolution of the coast or opening conditions from the data collected, and recommended a continuous monitoring of the openings. As reviewed above, the Water Research Center conducted different kinds of studies, but they have not yet drawn up an effective design for the permanent protection structures.

The final objective is to maintain fishery production and to support further fishery development in the Bardawil Lake, by the improvement of the openings making water exchange between the sea and the lake more efficiently. For the improvement of the openings of the lake, it is proposed to carry out the measures with civil engineering such as embankments and breakwaters to protect the openings from silting and erosion.

In order to grasp coastal and tidal situation at the openings, tidal data and water level fluctuation data in the lake should be collected and simulation analysis shall be carried out by computer for designing proper facilities for openings.

To establish efficiently functioning permanent protection structures of openings, the detailed study should be commenced as early as possible. An example of the Scope of Works of the study is shown in APPENDIX-E.1. The study shall comprise two phases. In the first phase, the circumstances and natural conditions of the openings and coast of the lake are to be elucidated through analyses of existing data and field survey. Based on the data analysis, basic design of the structures for improvement of the openings will be made. Economic and financial feasibility analyses are to be made during the second phase.

3) Reconstruction of the Western Part of the Lake

Although the lake is currently maintained in good condition by means of the large-scale dredging of the openings conducted in 1986, efficient water exchange is made in only the main part of the lake between the openings Bughaz I and II, where the salinity is restricted to 40,000 - 55,000 ppm and an optimum ecosystem is formulated to attract and grow fish such as seabream, mullet and seabass. In the east, south and western peripheries of the lake, the water circulation is inadequate. Accordingly, those areas have a higher salinity and make less contribution to the fishery production than the main body of the lake.

If the salinity could be diluted and some nutrients supplied in those areas, for example, by leading drains, the productivity of those areas could be expected to rise. It is suggested to carry out the abovementioned measure, i.e., leading the drainage water containing nutrients but poison, in a particular area with poor availability of fishing ground, in order to increase the fish catch, while the main body of the lake remains its clean natural environment.

The plan is to raise the fish production by leading drainage water into an area separated from the main body of the lake and introducing the aquaculture techniques.

The proposed area is situated west of the islands off El Nasr because the area can be easily partitioned and is adjacent to the irrigated agriculture development area. The proposed areas is approximately 55 sq.km (Figure 4.4-2).

The plan is composed of the followings:

(1) Excavation of Openings

To excavate openings in the sand bar to connect the area with the Mediterranean Sea for exchange of seawater and introduction of fish resources including natural fry from the sea. Two openings are to be made. The locations of the openings shall be selected so as to obtain effective water exchange and circulation in the area.

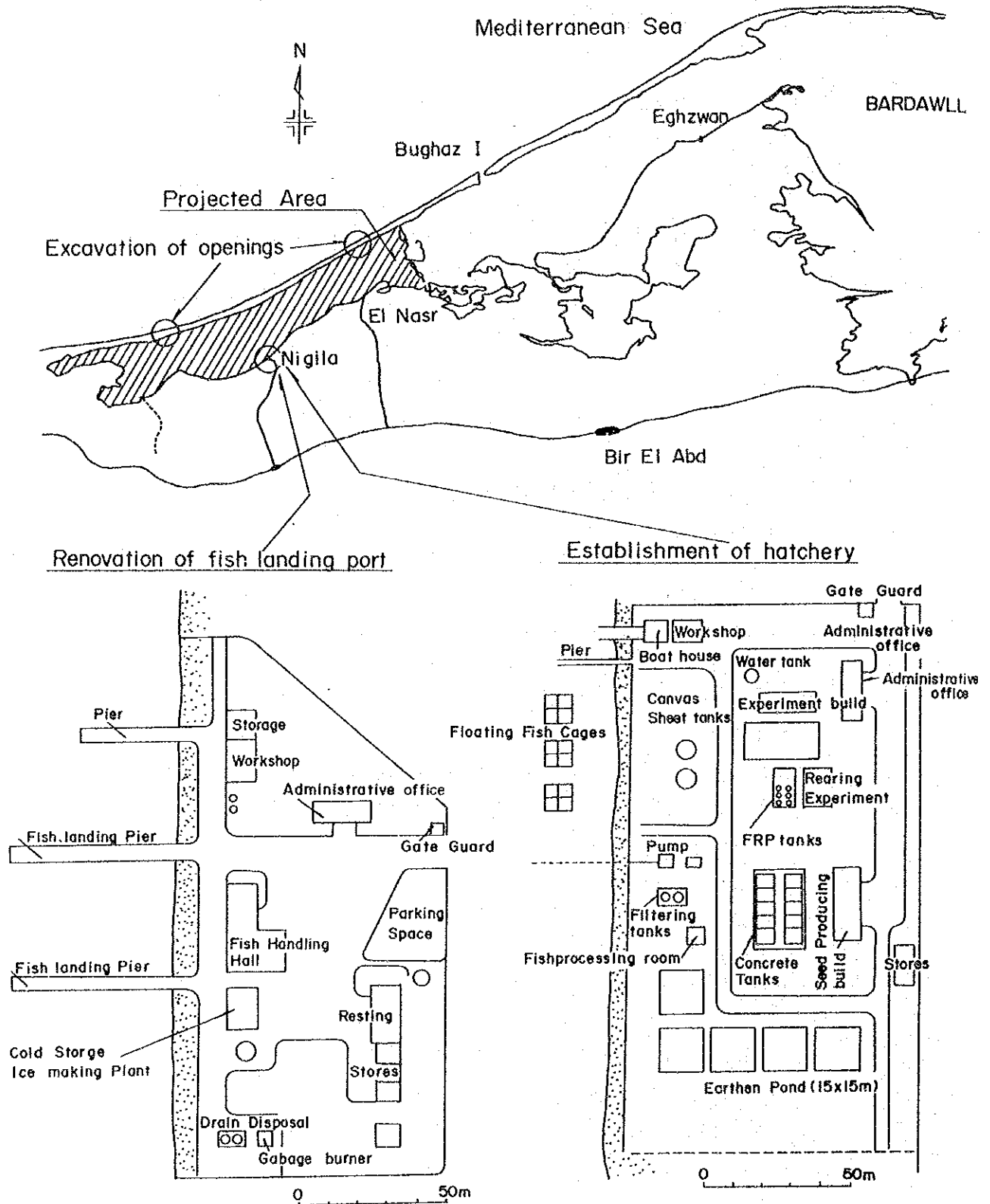
(2) Introduction of Breeding and Restocking

A hatchery is to be established and breeding techniques will be introduced. Fry are to be produced on a large-scale in the hatchery for restocking in the area. Thus, the stock in the area will increase in addition to the natural seeds. Techniques of fish farming should also be experimented with, in order to promote aquaculture in the area. The species for breeding are mainly mullet and tilapia. Seabream, seabass and shrimp (Peneidae) are possibly included.

(3) Renovation of Fish Landing Port

The landing port in Nigila, located at the center of the proposed area will be renovated with construction of necessary facilities for fish landing and marketing so as to handle the increased catch. The following facilities will be provided.

Figure 4.4-2. Reconstruction Plan for Western Part of Bardawil Lake



- Landing Piers:

Piers are to facilitate fish landing jobs for gill net boats (Dabbas) and veranda net boats (Bous).

- Fish Handling Hall:

Fish should be handled (washing, weighting, sorting and packing) in good hygienic conditions. The hall will have a roof and concrete floor and be provided with water supply and sewerage systems.

- Water Supply and Sewerage Systems

For washing the landed catch and equipment etc., water is pumped up from a well to an overhead tank and distributed to each facilities. For drinking, ice-making and fish processing, in addition, fresh water is led to each place after desalinization.

A sewerage network with a drain disposal tank shall be arranged for the facilities.

- Ice Plant and Cold Storage

Fish should be thoroughly stored in ice from the catch to marketing. In order to supply ice for this purpose, an ice plant shall be installed. And small cold-storage is also to be arranged for keeping ice and temporary storing of fish for marketing purposes.

- Electricity Power Supply and Generator

For operation of ice plant/cold storage and other general use, the electric power should be supplied to the landing port. A set of generators shall be provided for emergency purposes.

- Workshop

A workshop shall be established with necessary tools and equipment for repair and maintenance of fishing boats and engines.

- Rest Place and Stores

A rest place with stores selling fishing material and food for fishermen etc. shall be provided.

- Fuel-Oil Station

A fuel-oil station shall be installed to supply fuel oil for the boats.

The suggested plan should lead to an increase in the fish productivity of the area. The unit production can be expected to be at least 60 kg/feddan/year and 825 tons of fish could be predicted from the area.

4.4.2. Malaha Lake

1) General

The Malaha Lake is a hypersaline water body like the Bardawil Lake. It is indispensable to maintain the openings for the lake's fishery, therefore, the development plan should be made taking the following main steps, i.e., i) to preserve fishing ground by efficient water exchange and circulation, ii) to dilute salinity and supply nutrients by directing drain and iii) to introduce aquaculture methods.

2) Improvement of Fishing Ground

There are sand siltations and also erosion in the openings by the force of current and waves. Therefore, the fishing company has spent much labour and expenses to maintain the openings. The openings should be improved so as to reduce these expenses and to increase the efficiency of the water exchange.

To protect the openings from siltation and erosion, breakwaters and protecting embankments should be constructed. Detailed survey should be conducted to determine the conditions (tidal currents, waves, siltation and erosion). Based on the results of the survey, effective breakwaters and protecting embankments shall be designed and constructed.

In addition, the internal canal of the openings should be widened and deepened by dredging to promote effective water circulation in the lake and improve the fishing grounds. An internal canal was planned to connect the North lake and the South lake and is now being excavated. This is an effective measure to increase water circulation.

For designing effective breakwaters and shore protecting embankments, detailed site surveys should be conducted including the following items;

- Observation of winds and waves.
- Observation of tides and tidal currents.
- Survey of depths.
- Movement of water through the canals of the openings.
- Survey of siltation and erosion.
- Simulations with hydrology models.

3) Introduction of Drainage Water

The primary productivity in the lake is low because the lake receives no nutrients supply. Therefore, drainage water, which would be available from agricultural development in the Tina Plain, will be directed into the lake in order to supply nutrients for the lake and dilute the salinity of the lake water. This measure will raise the productivity of the lake and consequently the catch from the lake will increase.

4) Introduction of Aquaculture Techniques

The productivity in the lake should be increased by introducing aquaculture techniques. Aiming at supplying fish for domestic markets, mullet and tilapia will be produced in the areas partitioned by nets (net pens) or earth pond with manure and feeding. Artificial seeds will be restocked in the areas in addition to natural fry.

Extensive fish farming will be introduced in the flooding areas of the lake where is improved by inflow of drain water. Net pens or earth ponds will be made for farming fish in the areas. One unit of net pen or earth will cover an area of about 2 - 12 feddan.

Collected natural mullet and tilapia fry are to be restocked in the net pens or earth ponds in addition to natural fry. Artificial seeds will be added for stock after a hatchery center commenced the breeding. Manures and feeds should be given as much as practicable.

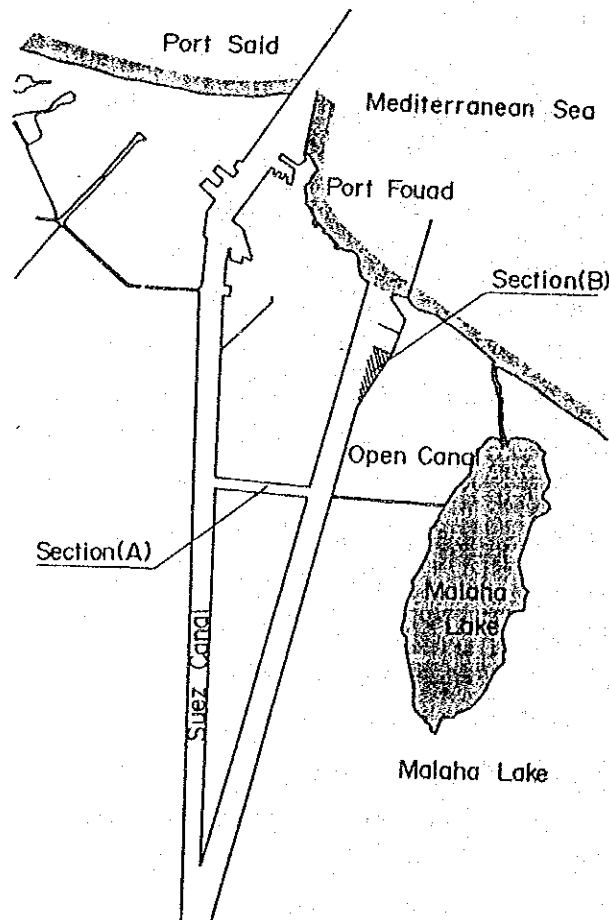
The total area of net pens and earth ponds will be approximately 2,400 feddan. The unit production would be approximately 210 kg/feddan and total production would be expected at approximately 500 tons annually.

In order to control the temperature rising and salinity of the water, small pumps shall be installed to direct water into the ponds from internal canals. Solar batteries shall be used for the power source of the pumps.

In the areas with enough depth, fish farming in floating net cages could be introduced to produce marine fish such as seabass and seabream for overseas markets.

5) Fish Production in the Suez Canal Area

Some areas of the Suez Canal are allocated to be utilized for fish production.



Section (A) covers an area of 33 feddan with a depth of from 5 to 17 m and Section (B) is 300 feddan and 0.7 to 1.5 m in depth. Species should be those of exportable marine fish such as seabream and seabass.

Section (A): The area can be utilized for fish farming in net cages owing to no waves and deep water. Natural fry should be collected for stocking in net cages. Artificial fry should also be stocked after the hatchery center commences production. Feeds should be made utilizing i) trash fish landed by trawlers at Port Said fishing port, ii) trash fish and clams caught around the area, and iii) agricultural byproducts such as rice bran and wheat bran. The net cages, composed of iron pipe frames with floats and nets are installed by anchors and ropes.

Size of net cage:

Nursery net cage	2 m x 2 m x 2 m
Production net cage	5 m x 5 m x 3 m

Total area of net cages: Approximately 3.3 feddan

Number of Production net cages: 500 units.

With sufficient feeding, the production from one cage could be expected to be at least 300 to 400 kg per year. Therefore, it could be predicted that from 150 to 200 tons of fish are produced annually.

Section (B): The area can be utilized for extensive fish farming in net pens. Since the Section (B) is open to the Suez Canal, it is necessary to shelter the area by making breakwaters at the western edge of the area for protecting from waves made by vessels passing the Canal. In order to maintain water exchange, the breakwaters should be divided into several blocks, the total length of which should be limited to about 60 percent of the length of the western edges.

The area for the net pens shall be approximately 200 feddan. One unit of the net pen has an area of approximately 5 to 25 feddan.

The main fish to be stocked is mullet. Collected natural fry are stocked in the pens and artificial fry shall be added. Shrimp (Peneidae) shall be one of the main species after establishment of the artificial seeds production. With manuring and feeding, the average production could be expected to reach about 420 kg/feddan/year and total production would be 90 tons per year.

6) Experimental Aquaculture and Hatchery Center

An experimental aquaculture and hatchery center is to be established to promote fish farming in the region. The center shall have the following functions.

Technical development:

- To conduct technical development for breeding and fish farming through various experiments of raising in the experimental ponds.
- To utilize species principally living in the region.

Tilapia and mullets
Seabream, seabass and sole
shrimp(Peneidae)

Technical instruction and extension services:

- To conduct technical demonstrations in the experimental ponds for fish farmers.

Production of fry:

- To produce artificial fry for restocking in the lake and for distribution for fish farming.

The following facilities will be built for the center.

Experimental and research building:

For biological research and experiment (area: 140 sq.m).

Rearing experiment building:

To be provided with breeding tanks for experiment of spawning, hatching, fish-raising techniques (area: 140 sq.m).

Seed production building:

To be provided with hatching, fish-raising tank rooms and food organism culture rooms for seeds production.

Feed plant:

To be provided with feed processing equipment, small cold room, storages for feed processing (area: 30 sq.m).

Pump room:

Experimental fish-raising tanks and ponds:

FRP tank	1 cu.m x 40 pcs.
	2 cu.m x 15 pcs.
Concrete tank	25 cu.m x 10 pcs.
Canvas sheet tank	50 cu.m x 2 pcs.
Earth pond	300 cu.m x 5 pcs.

Major equipment: Pumps for obtaining water

Filtering tanks

Air pumps

Small cold storage

Generator for emergency

4.5. Agro-Industry and Marketing Plan

4.5.1. Processing of Agricultural and Fishery Products

1) General

Agro-industry is planned to process locally what is produced within the Study Area, thereby providing more value-added products and ultimately improving overall levels of economic productivity. Agro-industrial facilities enable to collect marketable goods and to create sizable labour demands which can absorb surplus labour supply from smallholders.

Since this sector requires water and electricity supplies as well as an efficient transport system, the processing plants will be established at locations along the highway, and near the production area of raw materials. Similarly, the site for fisheries processing will be found at the principal landing port.

Water, electricity and manpower will be readily supplied with the implementation of the integrated rural development plan. Processing materials are procured from contracted farms at predetermined prices. Cropping arrangements and techniques are taught and suitable quality control is exercised by technical staff who give entrusted farmers necessary advice on varieties, farming practices etc., so as to secure a stabilized supply of materials of good quality during the extended span of collecting period. The capacities of processing plants are planned and operating days (hours) are calculated according to the materials collection schedule.

Effective demand of existing and potential consumers is of major concern whenever agro-industrial activities are programmed in the Egypt, where these with a higher processing cost would be unacceptable except for those for exports. For example, most processed foods packed or bottled in metal containers or glass bottles have higher prices and hence are less marketable.

Another essential factor is higher byproduct value and lower costs for waste treatment. Olive oil cakes as byproducts from oil extraction plants can be returned to farmers for supplementary animal feeds. Raw hide material is salt-treated and sent to tanneries outside the Governorate. Such a complex of related industries is also applicable to the combination of fisheries processing and ice-making.

2) Plants and Products to be Introduced

The processing system based on the above strategy will be established with a combination of oil extraction and refining facility (Figure 4.5-1), slaughterhouse with a cut meat processing facility (Figure 4.5-2), and an ice plant for fish preservation alongside a fish processing facility. The production plan for raw material and products under each sector is shown in Table 4.5-1. The annual budget of agro-industrial and marketing facilities is estimated as shown in Table 4.5-2.

4.5.2. Marketing Plan

1) Domestic Demand for Agricultural Products and Supply from Sinai

The food demand/supply structure of Egypt has been typically characterized by the fact that self-supply rations for cereals, e.g. wheat and maize, meats and vegetable oils remain at low levels. There will be no problem of demand for these items, but cash crops such as vegetables and fruits, for which demand projection will be needed.

Vegetables are considered as one of the crops for which future demand expansion will be sustained. No outstanding competition is anticipated for Nily and winter vegetables (except for leaf vegetables) among supplying areas, nor serious risk of over-production.

This is the background why cash crop production in El Arish area has been oriented - to the formation of a specialized winter

Figure 4.5-1

Oil Extraction and Refinery Process

for Sunflower Flax and Safflower

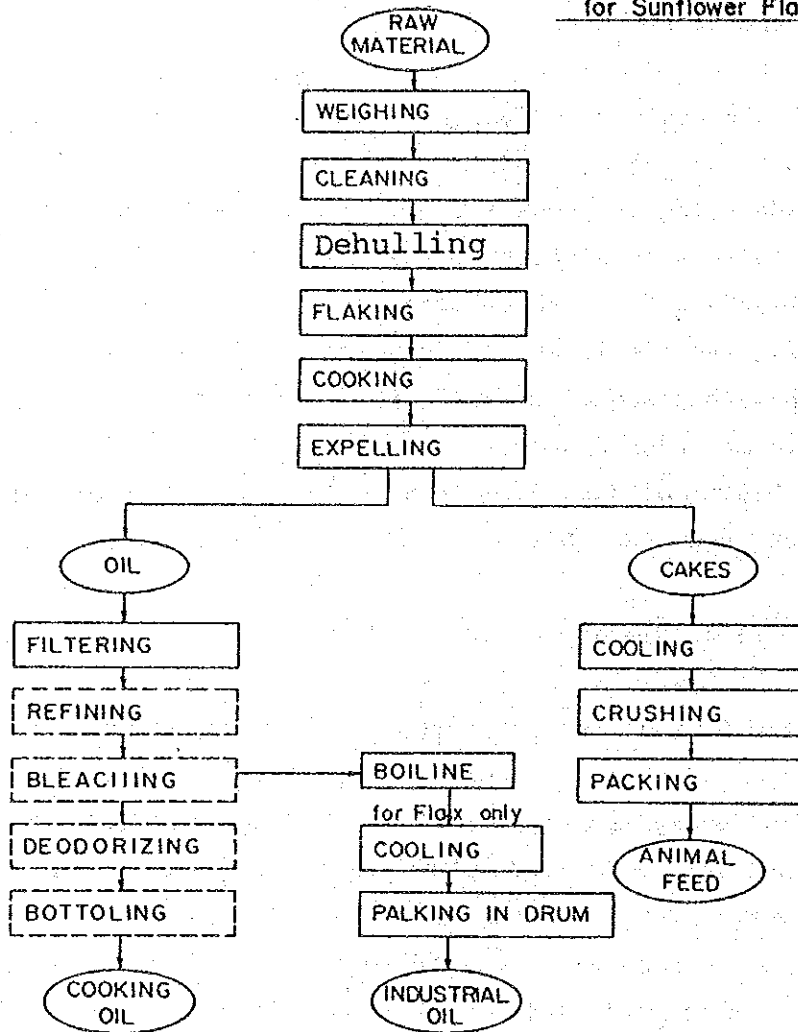


Figure 4.5-2 Slaughtering and Cut Meat Process

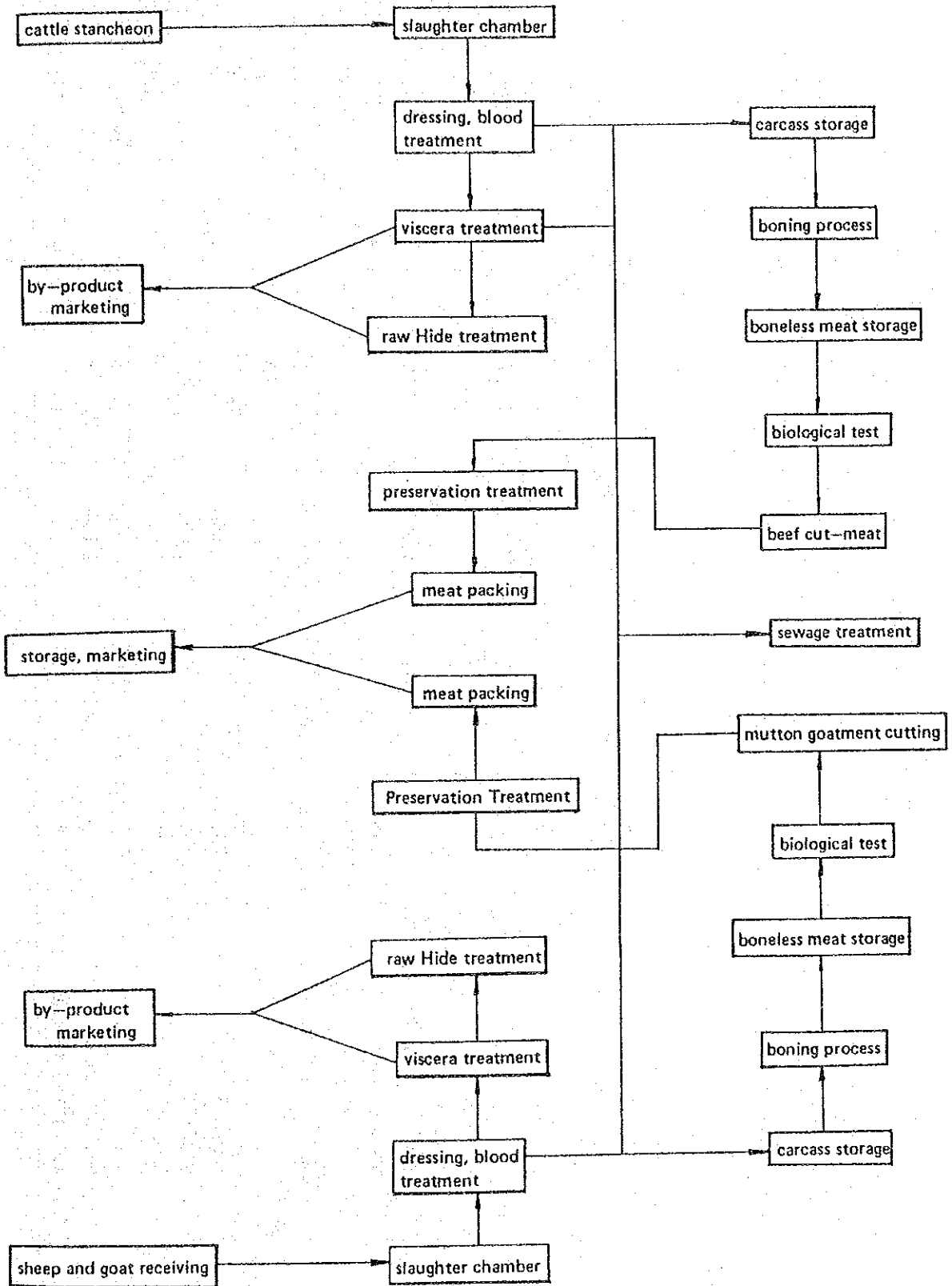


Table 4.5-1. Processing of Agricultural Products

(unit : ton)

Cropping Pattern	C. P-1	C. P-2	C. P-3	C. P-4	C. P-5	C. P-6	Total
<u>Material</u>							
Oil extraction / refinery							
flax	3,040	-	990	-	-	-	4,030
sunflower seed	5,460	-	5,350	12,010	-	-	22,820
safflower seed	3,040	-	990	-	-	-	4,030
oil olive	36,420	-	-	-	-	28,000	64,420
Total	47,960	-	7,330	12,010	-	28,000	95,300
Slaughtering / cut / meat							
cattle carcass	-	2,732	2,732	13,398	-	NA	18,867
sheep carcass	1,348	-	-	-	-	NA	1,348
goat carcass	7,679	-	-	-	-	NA	7,679
Total	9,027	2,732	2,732	13,398	-	NA	27,894
<u>Products</u>							
boiled oil	762	-	248	-	-	-	1,010
edible oil	2,741	-	2,071	3,969	-	-	8,775
olive oil	5,827	-	-	-	-	4,480	10,307
beef cut meat	-	2,190	2,186	10,718	-	NA	15,094
goat/sheep cut meat	7,222	-	-	-	-	NA	7,222

Table 4.5-2. Estimated Annual Budget of Agro-Industrial and Marketing Facilities

(unit: 1000 LE)

	<u>Oil Extraction Refinery</u>	<u>Slaughtering Outmeat Plant</u>	<u>Fruit Marketing Center</u>
<u>Facility construction cost</u>	<u>36,800</u>	<u>97,300</u>	<u>16,180</u>
building	14,400	18,500	5,280
processing lines	13,900	38,400	9,940
storage	3,800	8,300	960
refrigeration equipment	0	19,800	0
vehicles	0	4,000	0
tanks	4,100	0	0
tools, kits, spareparts	600	8,300	0
<u>Annual depreciation cost</u>	<u>1,660</u>	<u>4,380</u>	<u>730</u>
<u>Annual running cost</u>	<u>36,280</u>	<u>169,420</u>	<u>3,230</u>
wages, salaries	300	570	430
electricity	450	1,250	170
fuel, oil etc.	80	310	30
water	10	50	100
material purchase	32,830	162,850	0
packing, packaging material	1,980	1,170	2,330
maintenance/repairing	580	2,870	170
chemicals etc.	50	350	0
<u>Total annual cost</u>	<u>37,940</u>	<u>173,800</u>	<u>3,960</u>

vegetable producing area (see Table 4.5-3). On the other hand, marketing activities in Ismailia central wholesale market for perishable products show a significant decrease in handling quantities during Nily months (Oct. - Dec.) as supply from Delta regions and horticultural areas in Ismailia Governorate declines (Table 4.5-4).

The possible range of domestic outlets encompasses the eastern edge of the Nile Delta, i.e. Ismailia and Port Said, Greater Cairo and its satellite cities, Suez and South Sinai Governorate. Foreign markets for export are expected in Saudi Arabia, Jordan and the Gulf States.

Marketing is targeted, taking into account the current market share, population growth and local self-supply for Year 2000 (Figure 4.5-3). Within the demarcated outlet area, population in year 2000, annual per capita consumption of perishable products are estimated based on the current figures. By means of these results, the likely size of the annual demand in Year 2000 is projected, which implies the potential capacity to absorb supply from the Study Area.

2) Analysis of Agricultural Products Export

Exports of agricultural products from Egypt were studied, along with exporting destinations and value/quantity of produce based on the data (1984-87) from the Foreign Trade Computer Center of CAMPAS (Table 4.5-5).

Figure 4.5-4 indicates that the destinations of agricultural exports are east and west European countries and the Middle East countries. The reasons are that the produce for export is mainly fresh vegetables and fruits, and Near/Middle East countries should depend on Egypt to supply fresh agricultural products. Among the Near/Middle East countries, Saudi Arabia is the largest destination for Egyptian agricultural products in terms of both value and quantity.

Considering climatic conditions, annual population growth and range of commodities, European and Near/Middle East countries will be continued to be the principal exporting destinations for Egyptian agricultural produce. However, it is difficult to judge in detail from the limited data what crops and which countries are really promising for future exports. The following crops are selected as promising crops based on their export value and quantity in recent years.

Fresh produce - tomatoes, potatoes, onions, garlic, stringbeans, cucumbers, squash, okra, pepper, sweet potatoes, groundnuts.

Fruits - mangoes, guava, pomegranates, oranges, figs, lemons.

Proceeds products - white cheese, dried figs

For expanding exports in the future, further technical improvement regarding quality management and marketing/processing will be required. The probable competition for exports in the future will be Turkey, judging from her higher share of agricultural exports towards neighbouring countries. If the production constraint that Turkey is now facing (chilly winter) is taken into consideration, North Sinai that has mild winter climate is competitive as far as exports of winter vegetables and fruits. Another advantage is that transportation to the Near/Middle East countries from North Sinai by land is more favourable than from Turkey.

According to the recent analysis by FAO on the possibility of expanding export shares to Near/Middle East countries, there is potential for watermelon, citrus fruits and tomato exports. These commodities are mostly produced as winter crops and have less risk from export competition.

Export crops were selected to meet the following requirements;

- Production within the Study Area is technically and economically feasible during the season required by client countries
- Outgraded quantities are also utilizable to meet domestic demands

Eventually, frenchbeans, tomatoes and oranges are selected as export crops from North Sinai.

Export by air requires specific airport facilities, leading to higher marketing costs. Therefore, all the exports from the Study Area will be planned to use land transport, limiting destinations to Jordan, Saudi Arabia and the Gulf states.

3) Marketing Facility Plan

Marketing activity for agricultural products is not organized, therefore, no warehouse and cold storage for marketing use are observed. The produce is also sold retail, itinerantly or at the roadside, along highways. So there is little room for utilizing storage or chilled warehouses and produce is generally handled in baskets knitted with petioles of date palm leaves. This method of handling often causes a fair percentage damages or loss from withering.

Slaughterhouses are seldom found in large towns such as El Arish with a cold storage facilities for preserving meat attached so that carcasses must be hung a butcher's for sale by cut pieces. Ice-making plants are clustered in the eastern area including El Arish, which are reported to supply enough ice to preserve current levels of fresh catch and landed fish. In this connection, a new ice-making plant is scheduled for operation in Tulul through a cooperation project with the EC.

Under such circumstances, the following facilities will be required for storage, processing and marketing of agricultural, livestock and fishery products.

Marketing Centers for Perishable Products

It is desirable to establish a Center for grading, packaging and marketing/temporary storing of perishable products.

Pre-cooling and cooling facilities were not included because of heavy costs incurred for their construction and maintenance.

Cold Storage and Marketing Facilities for Fishery Product

Fishery ports and related facilities are planned at Tulul and Nigila.

Collecting and marketing facility for agricultural products will be managed in small-scale before completion of the Project, and it will be expanded according to increase in production.

Table 4.5-3. Projected Consumption/Demand for Major Project Products in Year 2000 within Target Marketing Areas

Planned Crop	Self-Sufficiency ratio	Estimated Annual Per Capita Consumption		Expected Demand in Target Domestic Outlet* (1,000 tons)	Projected Production in El Arish Sheikh Zuwayed and Rafah in year 2000 (1,000 tons)	Marketable Room for the Project Area (not including Exports) (1,000 tons)
		Present (kg/year)	Year 2000 (kg/year)			
Goat/sheep meat	0.90	0.5	1	4	0	4
Cattle meat	0.45	6.1	10	41	1	40
Vegetable oil	0.51	17	22	89	0	89
Rice	1.03	41	40	162	0	162
Wheat	0.28	180	150	608	2	606
Maize	0.96	66	80	324	1	323
(as feed also)						
Total Vegetable**	1.01	166	200	811	33	778
Tomato	1.01	81	100	405	5	400
Squash	-	9	11	45	2	43
Cantaloupe	-	2	5	20	8	12
Cucumber	-	1	2	8	1	7
Pepper etc.	-	5	6	24	0	24
Eggplant	-	8	10	41	1	40
Watermelon	1.01	17	20	81	5	46
Potato	1.08	29	25	101	0	101
Total Fruits	1.01	65	80	324	21	303
Apple	0.96	0.6	2	8	1	7
Orange	1.13	21.2	25	101	2	99
Grape	-	8.5	15	61	2	59
Fig	-	0.6	3	12	0	12
Guava	-	3.2	4	16	1	15

* Total Population

** Fruit vegetables + Tuber only

Figure 4.5-3 Possible Outlet for Projected Products

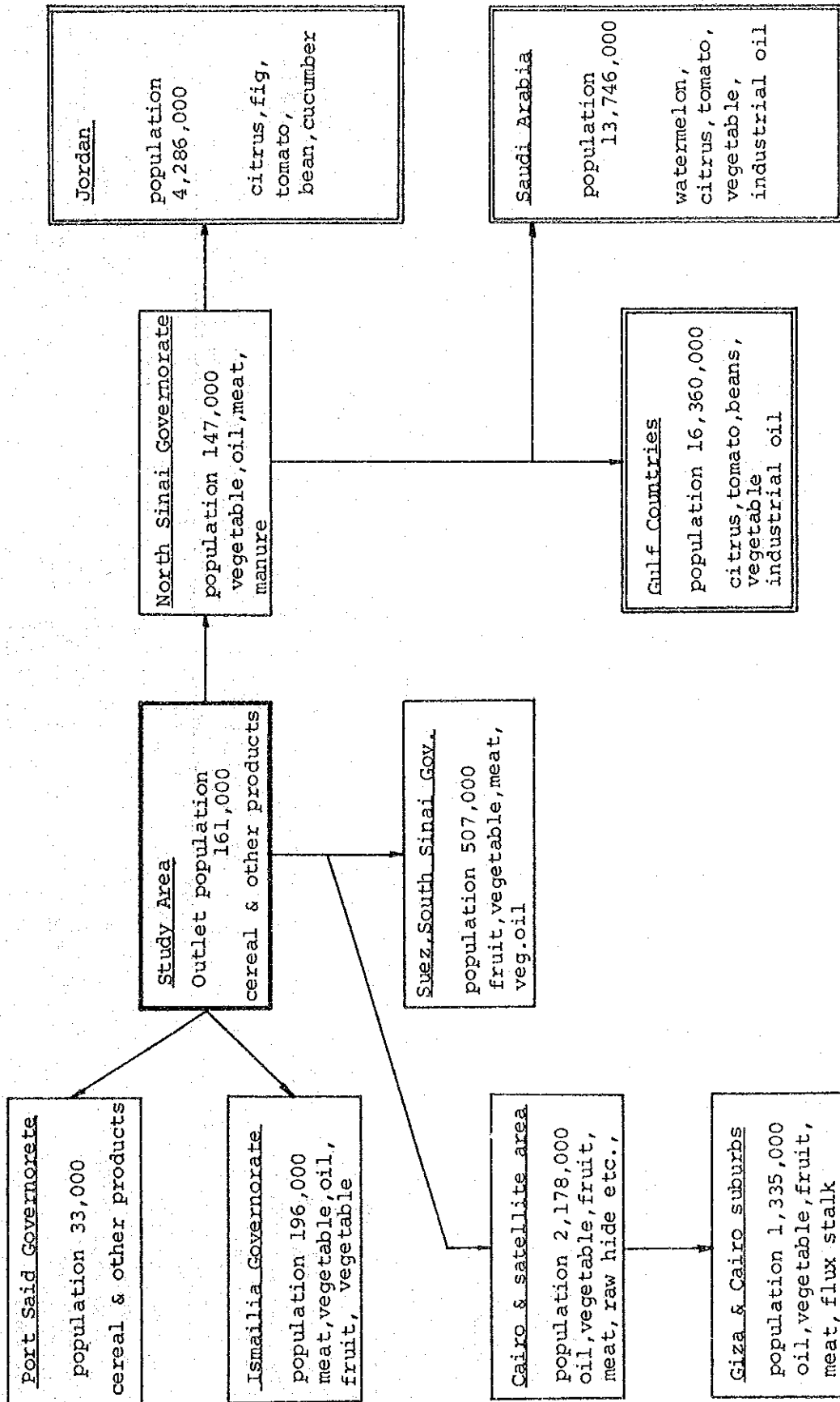
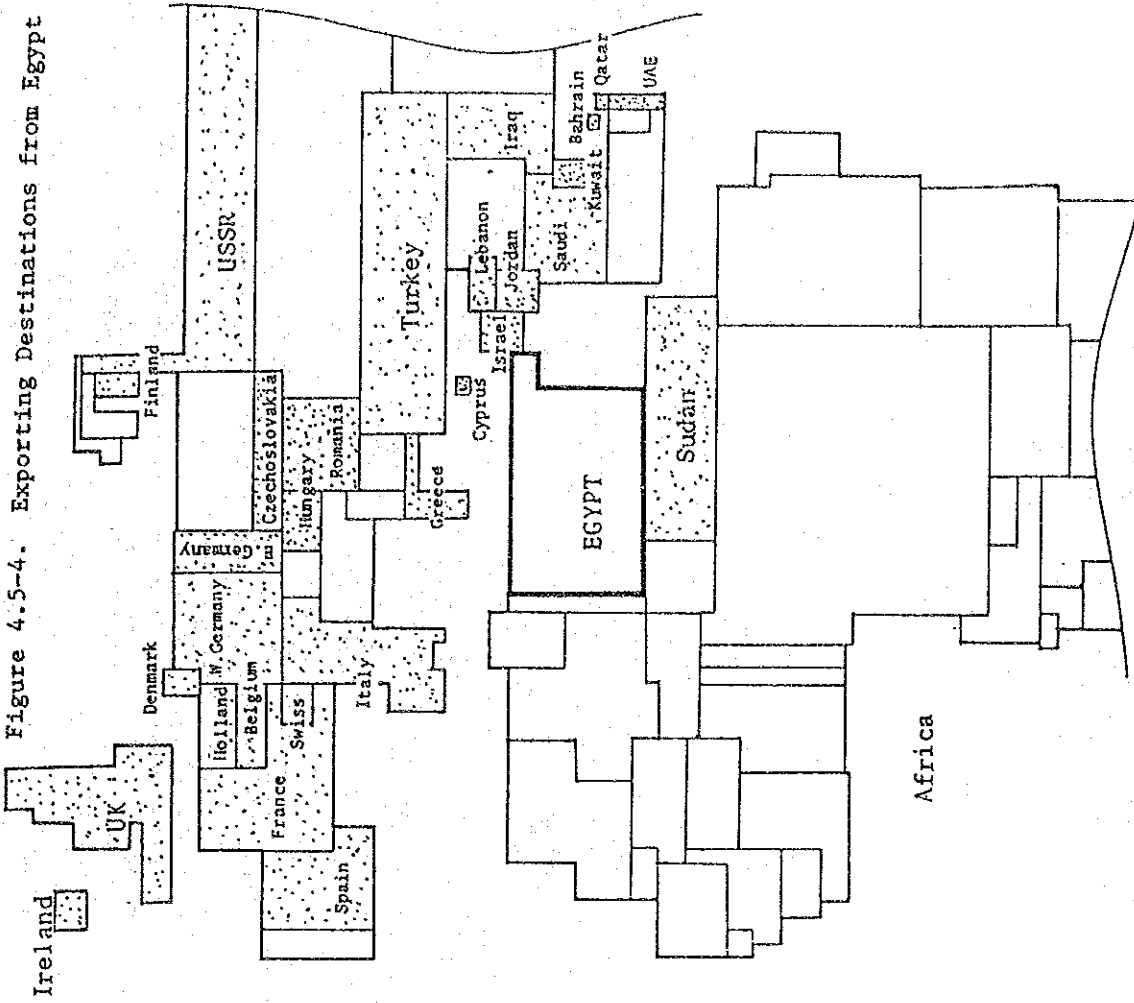


Table 4.5-4 Major Perishable Product Supply in Ismailia and Current
Extra-Governorate Export from North Sinai (1983)

(Unit: 1,000 ton)

Vegetables	D	J	F	M	A	M	J	J	A	S	O	N
Tomato		130				19						14
Cucumber		-				2						-
Greenbean		7				5						2
Peppers		-				9						-
Eggplant		-				10						-
Watermelon		-				118						-
Okra		-				3						-
Strawberry		4				-						-
Mango		-				22						-
Grape		-				-						0.5
Citrus		12				-						-
Guava		-				-						1
Total Tonnage		153				188						18
Handling in Ismailiya												
Central Market												
Total Vegetables (19.4)	0.5	1.8	1.25	2.85	3.5	2.2	1.1	1.5	1.7	1.2	1.15	0.65
Total Orchard Fruits (27.9)	0.8	3.2	1.35	0.65	0.8	1.2	4.5	5.0	3.5	2.6	1.8	0.8
Exported from												
North Sinai 1987												
Total vegetables	3.5	3.5	2.8	2.6	2.7	1.5	1.3	1.3	1.3	0.1	0.7	0.6
Total orchard fruits	0	0	0.2	0	0.5	3.3	3.3	0.1	0	0.5	0.6	1.0
Cucumber	3.5	3.5										
Cantalope				2.6	2.6						0.5	0.4
Watermelon						1.3	1.3				0.2	0.2
Peach					0.5	3.3	3.3					
Dates											0.5	0.5

Figure 4.5-4. Exporting Destinations from Egypt



Note. For volume and commodities, refer to Table 4.5-5.

Table 4.5-5. Exporting Destinations by Selected Crops

(Unit V: 1,000 LE,
Q: tons)

Crops	Year	1st		2nd		3rd		4th		5th						
		Country	V	Q	Country	V	Q	Country	V	Q	Country	V	Q			
Sheep	1984															
	85															
	86															
	87	Saudi	107	32												
Goat	1984	Saudi	5,502	1,874												
	85	"	3,974	1,629	USSR	21										
	86	"	2,804	1,080	UAE	37	190									
	87	"	3,379	866	"	458	122									
White Cheese	1984	Kuwait	42	15	Saudi	39	16	UAE	37	15	Qatar	14	6	FSS	8	4
	85	Saudi	380	252	UAE	74	32	Kuwait	63	35	"	35	21			
	86	"	1,154	550	Kuwait	330	147	UAE	85	45	"	53	29			
	87	"	1,375	463	"	337	114	"	244	74	"	38	11			
Fresh Tomato	1984	Saudi	1,379	6,270	Kuwait	455	2,132	Qatar	46	199	Bahrain	37	179	UAE	33	145
	85	"	1,971	11,659	"	310	1,368	UAE	104	444	Qatar	68	278	Bahrain	26	125
	86	"	3,021	15,937	"	433	1,932	Qatar	114	429	Bahrain	113	469	Bahrain	34	158
	87	"	5,707	17,957	"	1,080	3,576	"	200	647	UAE	104	332	Bahrain	104	346
Fresh Potato	1984	UK	15,276	74,087	Lebanon	4,209	22,969	Saudi	2,969	17,396	Jordan	780	4,664	Holland	724	4,662
	85	"	9,950	64,566	Saudi	4,156	28,096	Lebanon	2,176	16,567	Kuwait	1,281	9,707	UAE	408	3,244
	87	UK	22,208	64,336	Saudi	8,014	33,783	Lebanon	3,155	13,753	Kuwait	1,125	4,400	UAE	398	1,894
Fresh Onion	1984	USSR	2,105	9,244	Italy	724	3,389	France	517	1,932	Lebanon	391	1,909	Saudi	75	405
	85	"	3,650	12,765	"	557	3,278	Lebanon	463	2,129	France	415	2,439	"	203	1,010
	86	"	2,967	11,900	"	759	4,326	France	533	2,817	Holland	158	821	Lebanon	87	526
87	"	11,915	15,962	France	1,921	5,298	Saudi	1,719	4,453	Italy	1,288	3,073	Kuwait	282	872	
Fresh Haricot	1984	Holland	1,871	5,829	Saudi	707	2,675	UAE	235	945	Kuwait	146	587			
	85	"	936	3,402	"	784	3,249	"	229	934	"	97	392			
	86	"	2,851	8,494	"	1,106	3,152	"	458	1,302	"	185	486			
87	"	3,372	7,181	"	524	1,174	"	265	628	Swiss	161	299				
Fresh String Bean	1984	Kuwait	95	231	Saudi	86	229	UAE	27	71	Lebanon	12	34	Qatar	8	21
	85	Saudi	71	289	Kuwait	67	286	"	25	100	"	11	36	"	5	19
	86	Kuwait	60	224	Saudi	54	205	"	27	106	"	13	48	"	7	26
87	"	97	205	"	56	125	"	47	96	Qatar	10	21	UK	5	10	
Fresh Cucumber	1984	Kuwait	24	101	Bahrain	15	68	Saudi	13	68	UAE	11	51	Qatar	10	43
	85	Bahrain	7	33	Kuwait	7	26	"	7	28	"	3	16	UK	2	11
	86	Saudi	10	17	UK	5	18	Bahrain	5	14	"					
87	UK	16	20	W.Germany	14	22	"	5	6	Denmark	5	6				
Fresh Squash	1984	Saudi	43	191	Kuwait	16	78	UAE	13	52	UK	9	40	FSS	2	10
	85	Kuwait	23	93	UK	19	81	Saudi	13	59	UAE	6	25			
	86	UK	49	191	Kuwait	14	54	"	10	37	"	2	10	FSS	2	6
87	"	85	201	"	28	69	"	10	27	W.Germany	3	3	"	2	5	

(Unit V: 1,000 LE)
Q: tons

Crops	Year	1st		2nd		3rd		4th		5th			
		Country	V	Q	Country	V	Q	Country	V	Q	Country	V	Q
Fresh	1984	Saudi	40	157	Kuwait	19	70	UAE	4	12	Bahrain	3	16
	85	"	54	138	"	19	71	"	4	19	Qatar	3	14
	86	"	41	116	"	29	85	"	11	30	"	9	28
Eggplant	87	"	24	52	"	17	35	Qatar	5	10	UAE	5	11
	1984	Kuwait	29	80	UAE	7	6	Saudi	5	15	Qatar	5	10
Fresh Okra	85	"	15	43	Saudi	4	10	FSS	1	1			
	86	"	64	70	UK	16	20	Saudi					
	87	"	38	36	Saudi	24	14	UK	11	9			
Green Pepper	1984	Saudi	148	584	France	12	29	Italy	4	9	Bahrain	3	9
	85	"	109	467	"	11	40	Spain	11	16			
	86	"	146	359	Kuwait	5	16	UK	3	8	Swiss	2	8
Dried Onion	87	Kuwait	30	49	Saudi	28	45	USA	13	12	W.Germany	8	13
	1984	UK	3,576	3,318	W.Germany	793	767	Holland	633	591	Cyprus	181	168
	85	"	2,826	2,998	"	915	974	"	375	426	Cuba	236	247
Dried Garlic	86	"	2,379	2,271	"	1,487	1,411	"	666	825	Belgium	190	214
	87	W.Germany	3,697	1,620	UK	2,805	1,257	"	1,644	764	USSR	793	850
	1984	UK	36	34	Belgium	15	14	Holland	3	2	Swiss	3	3
Fresh Garlic	85	"	225	281	France	66	90	"	10	10	USA	4	5
	86	"	126	135	Italy	13	7	Saudi	8	5			
	87	"	206	118	UAE	14	16	Denmark	13	6	Italy	12	10
Dried Okra	1984	USSR	1,350	3,000	Saudi	464	1,069	Lebanon	111	278	Sudan	106	254
	85	"	297	772	Kuwait	73	187	Italy	67	180	"	58	140
	86	"	253	452	Italy	119	218	Lebanon	79	145	Kuwait	77	150
Dried	87	"	519	707	Lebanon	252	323	France	191	347	Italy	162	238
	1984	Swiss	8	8									
	85	"	8	5	Saudi	2	1						
Dried Haricot	86	Lebanon	21	50	FSS	1	1	Jordan	-	1			
	87	FSS	1	1									
	1984	Jordan	118	119	France	61	45	Saudi	17	18	Sudan	15	16
Guava	85	Saudi	404	1,255	Kuwait	120	387	UAE	33	105	Qatar	25	77
	86	"	448	1,440	"	82	343	"	44	161	"	16	53
	87	"	580	1,309	"	328	684	"	133	390	"	73	127
Orange	1984	USSR	32,898	102,627	Saudi	10,919	34,063	Czecho.	5,997	12,694	W.Germany	1,353	3,260
	85	"	34,200	95,043	"	12,073	37,644	E.Germany	8,987	16,341	Czecho.	2,709	11,459
	86	"	15,684	23,396	"	11,031	38,399	Czecho.	2,833	9,215	Romania	617	2,103
Dried	87	"	76,536	66,496	"	17,680	27,975	"	6,659	9,082	Canada	839	909
	1984	Belgium	513	919									
	85	"	513	919									

-Continued-

(Unit V: 1,000 LE,
Q: tons)

Crops	Year	1st		2nd		3rd		4th		5th			
		Country	V	Q	Country	V	Q	Country	V	Q	Country	V	Q
Mandarine	1984	Saudi	3	9	FSS	2	5	Kuwait	1	2			
	85	Kuwait	4	16	Sudan	4	47	Saudi	3	15	FSS	2	5
	86	Sudan	13	41	Saudi	7	31						
	87	USSR	43,301	43,883	E.Germany	10,239	12,027	Finland	60	180			
Fresh Fig	1984	Kuwait	0.06	0.05									
	85	"	1.10	1.70	Qatar	0.30	0.50						
	87	Saudi	0.50	0.60									
Fresh Apple	1984	UAE	0.06	0.02									
	85	Kuwait	0.20	0.08									
	87												
Pomegranate	1984	Saudi	210	583	Kuwait	78	209	Qatar	30	92	UAE	21	60
	85	"	191	680	"	41	140	"	16	47	"	15	51
	86	"	256	671	"	112	240	"	51	66	UK	19	44
	87	"	385	784	"	76	129	UK	27	40	Qatar	14	23
Water Melon	1984	Saudi	3,775	13,830	Kuwait	1,089	4,307	Lebanon	878	2,801	Qatar	176	780
	85	"	3,207	13,056	"	1,019	3,350	Qatar	208	783	Bahrain	52	186
	86	"	4,698	15,311	"	1,911	5,103	Swiss	420	381	Qatar	297	803
	87	"	4,192	8,138	"	1,288	2,453	Qatar	286	543	France	106	136
Hushed Rice	1984	E.Germany	3,147	15,970	Jordan	2,461	9,823	Czecho.	1,736	7,000	Sudan	1,232	6,400
	85	Czecho.	1,857	7,200	Saudi	588	2,500	E.Germany	464	2,000	UAE	233	677
	86	Sudan	5,471	15,979	Czecho.	2,796	12,015	Jordan	1,845	7,563	Saudi	428	1,650
	87	Italy	12,277	46,131	Jordan	4,929	19,284	Czecho.	4,462	16,275	Iraq	1,998	4,200
Groundnut in shell	1984	Italy	606	992	Holland	434	1,146	France	393	429	Saudi	318	512
	85	Saudi	386	725	Jordan	311	578	Hungary	79	135	Italy	41	84
	86	Holland	1,232	2,527	Italy	218	513	Saudi	214	294	Hungary	81	155
	87	Yugoslavia	353	226	Saudi	282	227	Italy	74	83	Hungary	73	10
Dates	1984	Lebanon	167	421	Saudi	28	82	Kuwait	27	75	UAE	12	38
	85	"	67	94	"	42	151	"	41	158	"	11	34
	86	Saudi	109	144	Kuwait	92	202	UAE	68	108	Lebanon	57	151
	87	USSR	943	699	Saudi	86	207	Kuwait	84	146	Finland	56	102
Fresh Strawberry	1984	Saudi	63	46	Kuwait	9	7	Qatar	6	4	France	2	2
	85	"	13	21	Qatar	6	9	Kuwait	3	4	UAE	3	5
	86	"	47	90	"	7	10	UAE	2	2	France	1	2
	87	Qatar	5	7	Saudi	3	4	Holland	3	2	UAE	2	2

Note: FSS: Foreign Ship Supply
V: Value (1,000 LE)
Q: Quantity (tons)

Source: Foreign Trade Computer Center, CAPMAS

4.6. Tourism Development Plan

4.6.1. General

1) Development Subject

The tourism development closely relates to the development of other sectors. Therefore, it is recommended that the tourism development in the Study Area should go along with the overall development of the region. The relationship between a site for tourism development and local communities is specially important in this Plan.

There are various types of tourism development possibilities in this Area, such as cultural, recreational, adventurous, etc., depending upon the development objectives. Considering the natural environmental conditions and the domestic demand for recreation and resort, it should be focused at first on seashore recreation and tourist resort development. Other types of tourism development would be considered according to future needs.

The specific characteristics for tourism development in the Study Area area summarized in Table 4.6-1.

The Eastern Division of the Study Area has a certain rainfall and good natural environment for tourism development. This area includes the city of El Arish and has great potential for recreation and tourist resort development. In addition, this area can also be developed as a cultural, convention-type of tourism because the area is a political, economic, and cultural center of the Peninsula.

Currently the Bardawil Lake area does not have many inhabitants. There still exists untouched nature. Consequently, the area would be suitable for quiet and/or resort-type tourist development. According to the accessibility matrix calculation (APPENDIX-G), the overall accessibility of the area to scattered

Table 4. 6-1. Characteristics of Area for Tourism Development

FACTOR	Tina Plain	Bardawil lake and Vicinities	Eastern Area
Natural Condition	<ul style="list-style-type: none"> - flat hinter land with wide seashore - monotonous land scape - tar lumps and scattered shells - occurrence of jellyfish 	<ul style="list-style-type: none"> - calm water surface separated by long sand lagoon - clean seashore without tar lumps - mud sediment in creek - scarce vegetation - flat land and sand dunes - bird sanctuary at El Zaranig lagoon. 	<ul style="list-style-type: none"> - annual rainfall more than 150mm - rich palm trees on seashore - white sand beaches - sand dunes on hinter land - tar lumps contaminate seashore - occurrence of jellyfish
Infrastructure Accessibility	<ul style="list-style-type: none"> - highway from El Qantara to El Arish - entrance from Nile Delta area - new road under construction on the middle of Tina plain - El Qantara to Port Said road beside Suez canal 	<ul style="list-style-type: none"> - middle point on El Qantara-El Arish highway - 115km from Ismailia to Bir El Abd - several approach roads from highway to Bardawil lake - hill road from Bir El Abd to Gifgafa 	<ul style="list-style-type: none"> - coastal and inland regional trunk roads from Ismailia to El Arish, Rafsh - 194km from Ismailia to El Arish - international boundary to Israel - access to El Arish by air - access to El Arish by sea
Social Condition	<ul style="list-style-type: none"> - existing facilities in El Qantara - under construction of new community of El Qantara East 	<ul style="list-style-type: none"> - no major facilities in this area 	<ul style="list-style-type: none"> - highest level of facilities in North Sinai - political, economic and cultural center of North Sinai Governorate - most densely populated area in North Sinai Governorate
Geographical Condition	<ul style="list-style-type: none"> - directly connect to Nile Delta cities by three ferries 	<ul style="list-style-type: none"> - geographical center of North Sinai coastal area 	<ul style="list-style-type: none"> - hill land with fairly rich vegetation compared to the others
Type of Development	<ul style="list-style-type: none"> - Recreation and Resort Tourism - Cultural Tourism 	<ul style="list-style-type: none"> - Recreational and Resort Tourism - Cultural Tourism 	<ul style="list-style-type: none"> - Recreational and Resort Tourism - Business Tour - Convention - Cultural Tourism

historical resources in the North Sinai is the highest compared to the others. Therefore, the area can be a base for cultural tourism.

The western part of Bardawil Lake is continuation of the flat lands of the Tina Plain. The landscape of the area is, therefore, monotonous. However, this area is adjacent to the Suez Canal and has the highest accessibility from various cities in the Nile Delta. The area can be a candidate for recreational and tourist resort development for the people from the Delta. This area also includes Tell El Ferma, the ancient Persian city, and cultural tourism can be developed.

2) Target Tourists

According to the current tourism statistics in North Sinai Governorate, tourists to the area centered on the El Arish beach resort consist of Egyptians, Arabs and other foreigners. The number of Egyptian visitors and total tourist nights are dominant compared to the others (APPENDIX-G). Even though foreign tourists to the North Sinai are gradually increasing, the majority of visitors to resort places here are from the Delta cities.

According to the past study, visitors to North Sinai tourist resorts can be categorized into four groups.

- 1st group: Egyptian holidaymakers, weekend or long stay
- 2nd group: Businessmen, business purposes
- 3rd group: Foreigners living in Egypt, vacation use
in addition to those groups
- 4th group: Rural residents, day trips or weekend use
should also be considered as potential users of
the area.

4.6.2. Development Components

In order to develop seashore recreation and tourist resort, the following components should be considered.

1) Major activities

According to the questionnaire survey, respondents spend their vacation in a relatively passive way. Most respondents tend to consider vacation as a time for rest. Active sports such as yachting, wind-surfing, diving etc. are not yet popular activities among respondents. Driving a car rarely becomes an object of a vacation. But it is perceived that foreign lifestyles gradually spread among young people. Therefore, it is presumed that more active sports will soon become popular as vacation activities. It will be desirable to prepare some facilities for those activities.

Swimming, sightseeing, beach games are popular activities on the seashore. Holidaymakers are interested in fishing, diving and scenery exploring. Fishing is a popular activity in Egypt. Boat-related activities are not popular among respondents. Despite lack of experience, many wish to try. It might be thought that boating will become more popular in future.

According to the land characteristics and the above analysis of respondents answers, the following tourist activities should be considered in the development site.

- relaxation on seashore
- swimming
- other sports such as tennis, racket ball, etc
- fishing
- boating

2) Length of Stay

There are three patterns of usage for tourist sites:

- one-day use : one-day use mainly by residents from the locality
- weekend use : weekend or short-term use by residents of North Sinai and Nile Delta area
- vacation use : long-term vacationer use by residents from North Sinai and especially visitors from Nile Delta

According to the respondents answers, length of vacation varies from 3 days to 85 days and average length is 13 days.

3) Accommodations

There are several types of accommodation for holidaymakers to stay at the resort such as bungalows, apartment houses, relatives house, etc. In Egypt all family members sometimes with relatives are tend to spend vacations together, apartment houses or bungalows are more convenient than hotels. More than 60 percent of questionnaire respondents firstly select apartment houses for their accommodations, second bungalows, then hotels.

4.6.3. Selection of Development Sites

1) Potential Development Sites

Several potential development sites are located in the Study Area. North Sinai Structural Plan and Tourism Study considered the following sites as development candidates (refer to APPENDIX-G).

- El Kals Bardawil Lake
- El Masaid Eastern Area
- El Raysa "
- El Massiada "
- El Fayrouz "

The study examined natural condition of the sites such as coast characteristics, climate, shore pollution, marine pollution, natural particulars, sand dunes and availability of adequate infrastructure, and then evaluate those sites.

It is important that selection of the development site fully considers integration with the development policy of North Sinai area. El Kals island in Bardawil Lake, though the site holds outstanding natural beauty, was considered unsuitable for tourism development in this study because the site is not connected by road. There are other candidates with good natural condition in both Bardawil Lake area and Malaha Lake and Tina Plain. Port Fouad-Balouza-Rumana and El Ruag-Maharet El Markab should be added to the candidates of development sites.

2) Selection Criteria

The development concept of the North Sinai coastal area should be carefully considered for the selection of tourism development site(s) in this study. Therefore socioeconomic features of the sites are very important aspects for site selection in addition to the natural environment of the site. The followings are selection criteria.

Balanced development of the area

- Contribution to the balanced development of the area

Relationship with existing communities

- Holding reasonable proximity to local communities to increase the convenience for vacationers.

Accessibility

- Good accessibility from/to various cities, especially Nile Delta cities for building up strong economic linkages.
- Good accessibility to historical and other tourist points to increase the attractiveness of the sites

Natural environment condition

- Good natural condition such as climate, water resources, beaches, winds, etc.
- Less pollution
- Good landscape such as trees, moderate gradients of the land.

3) Development Site

The evaluation chart for seven candidates is on Table 4.6-2. All candidate sites hold a certain level of natural environment conditions but socioeconomic conditions differ from one to another.

The selected site, El Ruag, is located at almost the center of the Study Area. Therefore, accessibility to/from various cities in the Study Area is the highest. The nearest city, Bir El Abd, is currently a small town but it is the center of Markaz and has great potential for future development. The development of the area around Bir El Abd would contribute enormously to the balanced development of the North Sinai coastal area as a whole. El Ruag is located 80 km east of Ismailia, 80 km west of El Arish. Connection of the area to the Nile Delta cities would, in a geographical sense, become stronger than El Arish. Extensive agricultural and fisheries development is planned at the hinterland of the site. Therefore, El Ruag would be very suitable for tourism development from an integrated North Sinai development point of view.

4.6.4. Tourism Facilities Plan

Necessary facilities for seashore recreation and tourist resort development are as follows.

Infrastructure:

- approach road, pedestrian footpath, electricity, water supply etc.

Lodging facilities

- apartment houses, bungalows and hotels

Recreation and sports facilities:

- rest facilities
- sports facilities (tennis, racket ball, etc.) and boating

Transportation facilities:

- transportation terminal, parking etc.

Table 4.6-2. Evaluation Chart of Tourism Development

Criteria	Port Fouad	Rumana	El Ruag	El Massaid	El Raysa	El Massiada	El Feirouz	Remarks
Accessibility from Nile Delta cities	A	A	A	B	C	C	D	air and sea transportation are not taken into account
Proximity to cities in North Sinai	B	A	B	B	C	C	D	cities in North Sinai coastal area only
Accessibility to tourism points in North Sinai	B	A	A	A	B	B	C	tourism points are on Appendix
Balanced development of the area	B	B	A	B	C	C	C	contribution to development balance of coastal area
Natural condition climate etc.	B	B	B	B	A	A	A	reference ** and site observation
Marine characteristics seabed topography jerryfish sediment	N/A D N/A	N/A * D N/A	A A C	B D A	B D B	A D A	A D A	reference and site observation
Shore pollution tar lumps pollution	C	C	A	C	C	C	C	reference and site observation
Landscape natural vegetation	C	D	D	D	B	A	A	
Coast characteristics beach width beach quality	B B	A B	A A	A B	B A	A A	A A	
Economic efficiency	C	D	B	A	A	B	A	cost minimization possibility
Points	46	47	57	51	49	52	50	evaluation example nominal to ratio scale
Evaluated Rank	7	6	1	3	5	2	4	

Index
A 5 most suitable
B 4 suitable
C 3 fair
D 2 unsuitable
E 1 most unsuitable

* fair grade (c) is used for N/A for calculation purposes

Supporting facilities:

- management building
- communication (post/telephone/telegraph)
- security (police/fire brigade)
- health/emergency (clinics)
- restaurant/coffee shop
- entertainment (casino/cinema/others)
- shopping/souvenirs
- parks

The facility plan of the site should be integrated with the development of Bir El Abd city. Lodging, sporting and resting, shopping, transportation and parks are major facilities to be prepared on-site. Apartment houses and bungalows are two major types of accommodation. Even though it is not necessary to be luxurious, a hotel is also better prepared for small groups or short-term holidaymakers.

According to the opinion of questionnaire respondents, "resting" is one of the important objectives of domestic holidaymakers. Apartment houses in resort areas, bungalows and hotels mean the basic resting facilities. Restaurants, coffee shops and seashore parks may be convenient resting facilities for one-day visitors as well as long-term holidaymakers.

The parks are connected with pedestrian passes and visitors can enjoy walking around the site. Vegetation is important at this site because it serves to prevent the movement of sand dunes and provides comfortable greenery shade. Agricultural garden for tourists such as orchard or flower gardens may be enjoyable for city dwellers and profitable for farmers. Fisheries for tourists also has the potential to be developed in this area by the fish resources of Bardawil Lake.

Swimming, beach games, fishing and other activities are the seashore recreation activities on this site. Even though boating, yachting and wind-surfing are not yet popular here, they may soon be popular among young people. Therefore, facilities for these

activities are recommended to be prepared. Consequently, the site can respond to the needs of both young and elder visitors.

Transportation facilities, management buildings and restaurants should be prepared on site. However, many other supporting facilities are not necessarily prepared on the site, as there is the possibility of using those of Bir El Abd. According to PPU/GARPAD report, Bir El Abd will have more than 30,000 inhabitants in the near future.

Layout of necessary facilities is based on the study of visitors' movements, management system and balance of the facilities. Topographical character of the site is also important. The site is considered for use by both long-term holidaymakers and one-day or weekend visitors, therefore, the distribution of facilities should be decided upon so as not to disturb the activities of both groups. Safeguard management is important at beach resorts. Swimming areas should be clearly separated from boating activities due to safety reasons. The relationship among facilities in the site is shown in Figure 4.6-1, and the El Ruag tourism development plan is illustrated in Figure 4.6-2.

Figure 4.6-1. Functional Diagram of Resort Area

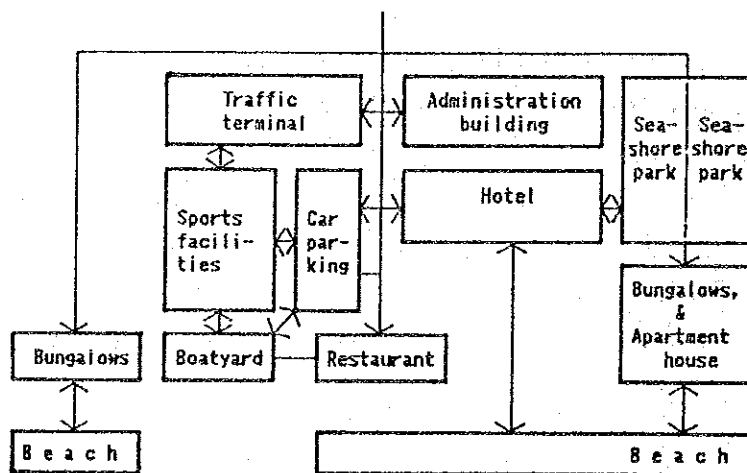
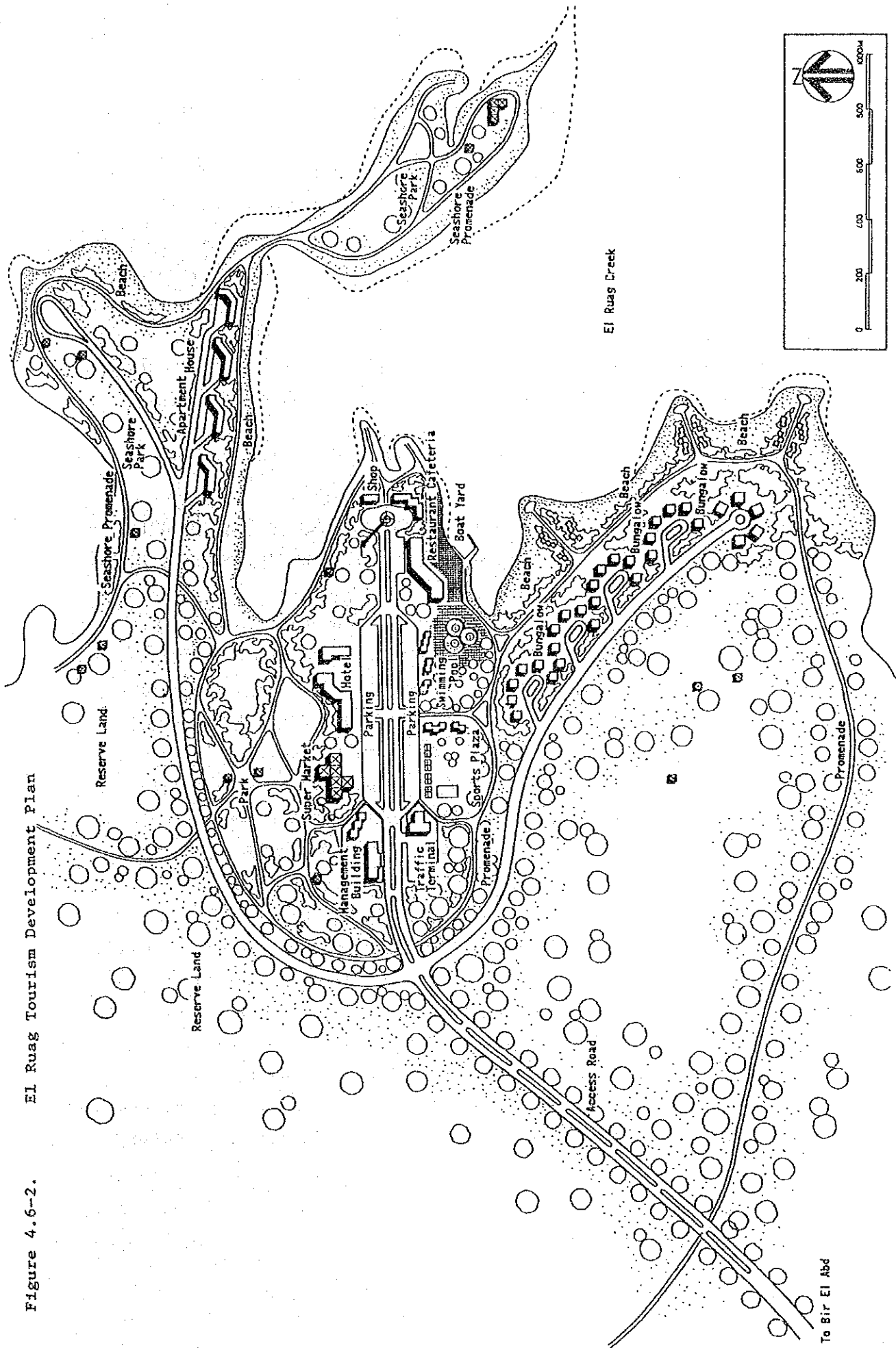


Figure 4.6-2. El Ruag Tourism Development Plan



4.7. New-Community Development Plan

4.7.1. Reconstruction Plan of Existing Communities

1) Regional Plan

In some of the existing communities in the Study Area, reconstruction, expansion or new construction plan has been proposed. The development plans of the major communities stipulate the following estimated population:

El Arish	142,000 - 172,000 (year 2010)
Bir El Abd	34,000 - 38,000 (year 2000)
Balouza	16,000 - 20,000 (year 2000)
Qantara East New Community	25,000 - 27,000 (year 2000)

El Arish city will be expanded as a growth pole of development of North Sinai region. Following it, Rafah (population 34,300 as of 1986), Bir El Abd (4,800) and Sheikh Zuwayid (24,000) will become growth points of development. Qantara East New Community will also be a growth point rather than the old El Qantara East, following Suez Canal expansion. This new community planned as a main base of agricultural, social services and industrial development in the Northwest Sinai region, with close relation with the development of Tina Plain from a geographical viewpoint.

A series of settlements alongside the highway, such as Balouza (population of 2,600 as of 1986), Rabaa (6,100 with Qatia), Nigila (2,500) and El Khirba (3,500) will play the role of service centers in the course of development of the adjacent areas. These small settlements will function as processing bases for agricultural and fisheries products as well as a supporting function within the area of newly developed agriculture, fisheries, and tourism activities.

2) Development Plan for Existing Communities

In the Study Area, the land reclamation plan is proposed by means of the El Salam Canal extension. In the Malaha Lake and Bardawil Lake, fisheries development is also planned. Furthermore, the processing and marketing facilities for agricultural and fisheries products are schemed mainly to be located in the existing communities along the highway as well as newly built complexes. In the El Ruag area of Bardawil Lake, the recreational and resort tourism development is planned. El Zaraniq lagoon in the east of Bardawil Lake is designated as a natural preservation area.

Population of the Study Area will increase in future owing to the various development plans. Such a rapid increase of population will require new communities for settlers. Specific conditions of these new-communities will depend on land ownership, farming pattern, scale or pattern of settlement, and availability of infrastructure and social services. Currently, in the area alongside the highway, such infrastructure as water supply, electricity and telecommunication has been well-established compared to other areas.

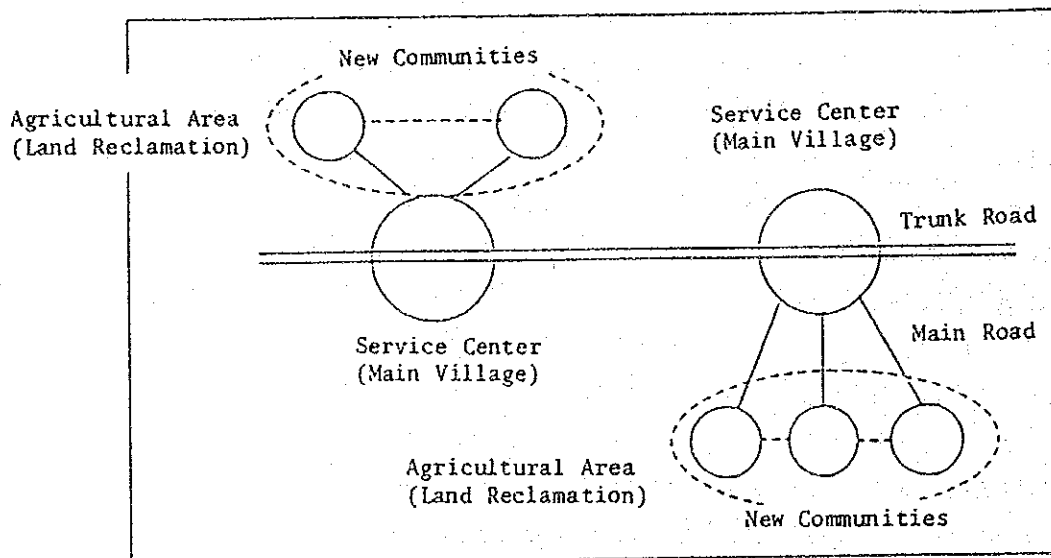
In view of regional development, at least the social service networks should be linked intentionally between the existing communities and the new-communities. In other words, the principal existing communities will act as service centers in the area. In view of the development balance of the North Sinai region and the distribution of agricultural development, service centers for the new communities should be located at Qantara East New Community, Balouza, Rabaa, Bir El Abd and El Rouda.

Qantara East New-Community will be the marketing point between the North Sinai region and the Nile delta region acting as the center of Northwest Sinai, having an important role to the agricultural development of Tina Plain. Balouza, located at the eastern end of the Tina Plain, is a diverging point of the El Tasa

road and Port Fouad road (under construction); therefore, it will be an important junction for transportation. Rabaa is the central point of the agricultural development. It also plays the role of marketing base for Bardawil Lake fishery development. Bir El Abd is a center of Markaz of which area shares nearly half of the North Sinai region, and the new-community is currently under construction. It is also a diverging point for the Maghara coal mine road. In the adjacent area there is agricultural development. Fisheries development in Bardawil Lake, and tourism development in the El Ruag area are planned. It will have an important role of processing and marketing base for agricultural and fisheries products.

For the existing communities to function as service centers of the new-communities, it will be required that infrastructure should be improved voluntarily and that the level of social services be advanced.

Figure 4.7-1 Service Village and New-Communities
(Settlement Village)



3) Improvement Plan for Educational Service

The only higher education services in North Sinai region are available in El Qantara East and El Arish. Secondary schools and vocational schools are situated in Rabaa, Bir El Abd, Sheikh Zuwayid and Rafah.

In the new communities planned in connection with land reclamation, primary schools and preparatory schools will be established in the settlement villages. New secondary schools and vocational school will be constructed or existing ones will be improved in the central villages.

In particular, agricultural education should be seriously considered. Secondary schools and vocational schools will be linked to the Agricultural Development Center which are planned as supporting services of agricultural development.

4) Improvement Plan for Health and Medical Service

Facilities for health and medical treatment in the North Sinai region are limited. Hospitals exist in El Qantara East, Bir El Abd, El Arish, Sheikh Zuwayid and Rafah, but their equipment is insufficient.

Health units will be established in new communities planned along with land reclamation. The units will be fitted with emergency equipment for treatment on an outpatient basis. While in the central villages, new hospitals will be constructed or existing ones will be rehabilitated. In Qantara East New Community, the facility for health treatment is not included in the construction plan, therefore, a hospital should be newly constructed. The hospital provides integral treatment including obstetrics or pediatrics, facilitating simple surgery or treatment bed. Design standards for these facilities will follow those of the Land Master Plan. Hospital and health units link systematically and provide a health treatment to the inhabitants.

4.7.2. New-Community Development Plan

1) General

Recent population increase in Egypt has become a serious problem. The Second Five-Year Plan places the population problem as the first priority for the nation and suggests the redistribution of the population to new areas. In other words, people in the Nile Delta region will be relocated to new areas where more expanded agriculture, industry and tourism development are possible. New community plan in general, depends upon the location and the scale of the implementation of various development plans which will absorb the population. A strategy of the new community plan is based on the following:

- To promote social infrastructure in the new areas to create an attractive living environment that will absorb more population.
- To lower the population density of the area where the density is excessive through redistribution of the population.
- To absorb some part of national population increase.
- To create expanded employment opportunities.

New community plan aims at to establish communities rationally where inhabitants can lead full and attractive lives, including tourism, recreation, education and public activities.

2) Scale of Settlement

The Land Master Plan stated that the land reclamation for small-holders would require 1-1.5 persons/feddan including the personnel of processing and supporting services for agricultural products.

When the agricultural development is completed, a total of 254,700 feddan agricultural land will be reclaimed, and some 200,000 inhabitants will be settled. The total population of the area will be about 400,000 by the Year 2000.

The Land Master Plan indicates that settlements should be divided into three levels:

- Satellite or settlement village; cultivated area 1,500 - 3,000 feddan, inhabitants 1,500 - 3,000, availability of basic daily services.
- Service or main village; contain 4-6 satellite villages, service area 8,000 - 12,000 feddan, inhabitants 1,500 - 3,000, availability of intermediate services.
- Central or rural town; contain 4-8 service villages, service area 25,000 - 30,000 feddan, inhabitants 9,000 - 15,000, availability of comprehensive services.

In Egypt, the service village has been acknowledged, in the hierarchical principle of settlement, for the basis of settlement planning of the new area. In other words, the situation of the new area is entirely different from the Nile Delta region, where the development of such desert and semi-desert areas requires the adoption of a strategy which meets the actual conditions of the area.

Scale of principal settlement in the Study Area, based on the existing medium-scale service village, is planned to be from 4,000 to 6,000 people, and be able to provide mid-level facilities and services. Minimum scale village always has problems of infrastructure and public services. In view of the investment for social infrastructure and public services, it will be economical to concentrate the population.

3) Pattern of Settlement

The productive and living activities in rural community are carried out by three aspects, namely, home, farm and service facilities. The relationship of these three activities divides the settlements into concentrated types and disparate types. Advantages and disadvantages of both types of settlements depend upon the standard of management scale, mechanization, transport method and service facilities. However, so far as the development of the new

area is concerned, the concentrated type will be generally supported. Advantages of the concentrated type of settlement are as follows:

- Regional and agricultural development depends strongly upon the cooperative and community activities of the inhabitants.
- Guidance of agricultural extension is more effective in the concentrated type.
- Facilities of schools, health units and shops are used more frequently in the concentrated type, even with the same population scale.
- Future improvement of agricultural mechanization and transportation methods will gradually reduce the travel time to and from the farm.
- Regional and agricultural development may cause a change in farm distribution for farmers or an occupational change from the farming to other activities. In this case, the concentrated type will be clearly more advantageous.
- Construction costs of such social infrastructure as water supply, electricity etc., in the concentrated type, are more economical.

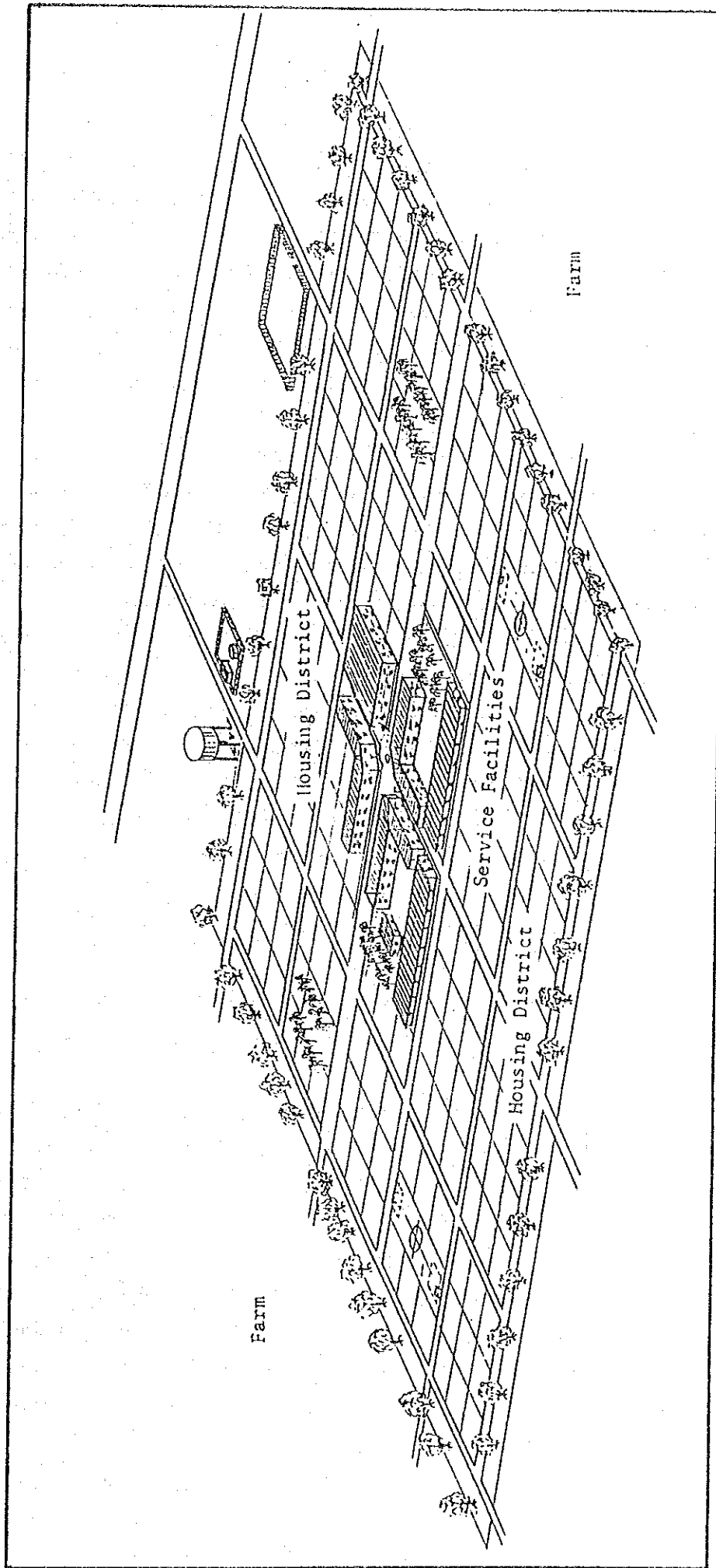
4) Village Model

In the central areas of the village, such public and private service facilities as mosques, governmental offices, schools, health units, post office, cooperative associations, shops, bus terminals and service workshops will be located. The location of the public facility should be convenient for the people, and particularly facilities used by children and old people should be close to residences and have safe access. Simultaneously, location and combination of facilities which are useful for the community, such as cooperative association activities, are fully taken into consideration (refer to Figure 4.7-2).

5) Settler

Settlers in the new communities will be inhabitants from the region including Bedouin as a first priority, from a regional development viewpoint. They should be the unemployed persons from

Figure 4.7-2. Model of Settlement Village



small villages between El Qantara East and El Arish. But most of the settlers are from the Delta region of the west bank of Suez Canal. A study by the PPU/GARPAD showed that the main settlers from the west bank of the Canal were hopefully those from the Delta governorates such as Gharbiya, Dakhalia, and Sharkia. In addition, settlers who recently moved to the small settlement from rural areas or the second generation of settlers in older settlement schemes as Ibis, El Tahady were also expected.

For the selection of settlers, merging of different class farmers is taken into consideration to form the balanced communities with agricultural supporting services including agricultural extension and promotion of agricultural cooperatives.

In addition, new communities necessitate people who provide non-agricultural services such as administrative, educational, health and commerce. Non-agricultural population will be about 15 percent of the total. Settlers will reside in the residential area of the village. Those areas are divided into a few sections to be given to the respective class of the farmers.

6) Infrastructure and Social Services

The major infrastructure of the new communities are water supply, sewerage, electricity, telecommunications and roads.

Potable water will be provided to all villages by means of a network of water supply pipelines and elevated tanks. Average consumption per one person is 150 lit./day. Namely, that of the village holding about 4,000 population is 600 cu.m/day. Electricity will be supplied to all villages, not only to the domicile but also for street lamps and light industry facilities. Average capacity per household corresponds to about 1.6 kw. Thus, in a village of about 800 households, total capacity will be about 1,200 kw. The installation standard of telephone is 60 lines in the service villages as mentioned in the LMP.

For the transportation of agricultural products and production materials, roads will be constructed to link the villages and farms. Main roads will be paved to link with, and closely connect with, the major existing settlements that are located alongside the highway.

7) Forestation Plan by Use of Treated Sewage Water

The sewerage system in the Study Area is insufficient except for some parts of the major settlements. After potable water supply is completed in the community, the sewerage volume will increase rapidly. It will cause serious problems due to the pollution of groundwater in future from a sanitary and contamination aspect. In consequence, the sewage treatment system in the new communities will be designed simultaneously with the planned water supply system.

Sewage is produced from the flush toilets and kitchens, public facilities, light industrial plants etc. The new community plan does not involve industries, which use large amounts of water, therefore, most sewage comes from the domicile. If the average sewage volume per one person is assumed as about 120 lit./day, the estimated total sewage volume will be about 500 m³/day. The Land Master Plan recommended the oxidation pond method or package plant method. The recent study has proposed the oxidation ditch method (Recommendation of National Organization for Potable Water and Sanitary Drainage).

Treated water will be utilized for the irrigation of trees to be planted in the surroundings of the villages as well as street trees along the main road and those of parks. These trees have the function of windbreaks, sand prevention barriers and living environment reservation. Types of trees are anticipated to be casuarina, acacia or eucalyptus.

8) Public Services

The new communities will provide public services to allow residents to enjoy the amenities of rural life besides the productive facility and fundamental living basis facility. The Land Master Plan suggested the necessity of the following facilities in the service village with respect to public services;

- Fundamental education facilities (primary and preparatory schools, 6 to 16 ages)
- Health unit
- Mosque
- Post office
- Police station
- Fire station
- Village assembly administration building
- Youth center
- Cooperative association
- Shops/Market
- Cemetery

4.7.3. Development of Infrastructure and Social Services

1) Plan of Potable Water Supply

The installation of a 700 mm diameter water supply pipeline between El Qantara East and El Arish has almost been completed and actual water supply has been partially provided. Main service area is El Arish city and discharge capacity of the pipeline reportedly will satisfy the demand up to the Year 2020 (according to Structure Plan for El Arish City). On the other hand, the settlements on the way to Bir El Abd have not received sufficient water supply.

The construction of a 1,100 mm diameter water supply pipeline between El Qantara East and Rafah was proposed but its implementation plan and the detail plan have not yet been defined. The new-community plan necessitates the supply of potable water, therefore, water supply plan to the new communities and existing settlements where potable water is insufficient is included. A water purification plant will be established in El Qantara East on the east bank of the Suez Canal. The area to be supplied limits

up to El Midan area where the land reclamation is proposed. If estimated population is assumed to be approximately 400,000, supply volume will be 60,000 cu.m/day (150 litres per capita per day.

2) Electricity Plan

The main power supply system is planned to be extended its capacity from 22 to 66 kv. The agricultural development plan will require large amounts of power for the pumping stations of the El Salam Canal and irrigation facilities. New-communities, pumping station of potable water, and development of processing plants of agricultural and fisheries products also require stable power supply. To cope with this increase in demand, as a long-term development strategy, the installation of a power plant within the Area is planned.

Power of 60 MW is required for operating all pumping stations along the El Salam Canal including irrigation facilities. In addition, another power of 140 MW is estimated to be required for usages of agricultural processing plants, fishing ports and new communities. Those require the new power resource for 200 MW in total. The present power line for the North Sinai area is supplied from the west of the Suez Canal and its capacity is limited for the present use.

The current power for North Sinai is not involved in the national power grid so that it is necessary to establish a power supply scheme for the estimated new demand, to enhance development progress in the Study Area.

The proposed schemes for the North Sinai are listed as follows:

- To develop new power lines of high voltages from Cairo to the Area.
- To supply power individually to each place of demand by the use of diesel generator.
- To construct a thermal power station operated by the use of oil or coal.

For those schemes, the present circumstances are also summarized as follows;

- It is difficult, both technically and economically, to install new power lines of more than 200 km length with submerging the high voltage cable line under the Suez Canal. This is estimated to cost around 100 million LE.
- It requires oil refinery and conveyance pipeline installed from South Sinai, although to utilize the oil produced in South Sinai is most desirable from the viewpoint of the development of potential power resources in the region.
- Coal-fired power plants have a geographical advantage in having access to the coal mine at Maghara located 60 km southeast of Bir El Abd. It is promised to get the 300,000 tons/year of high quality coal at the Maghara mine.

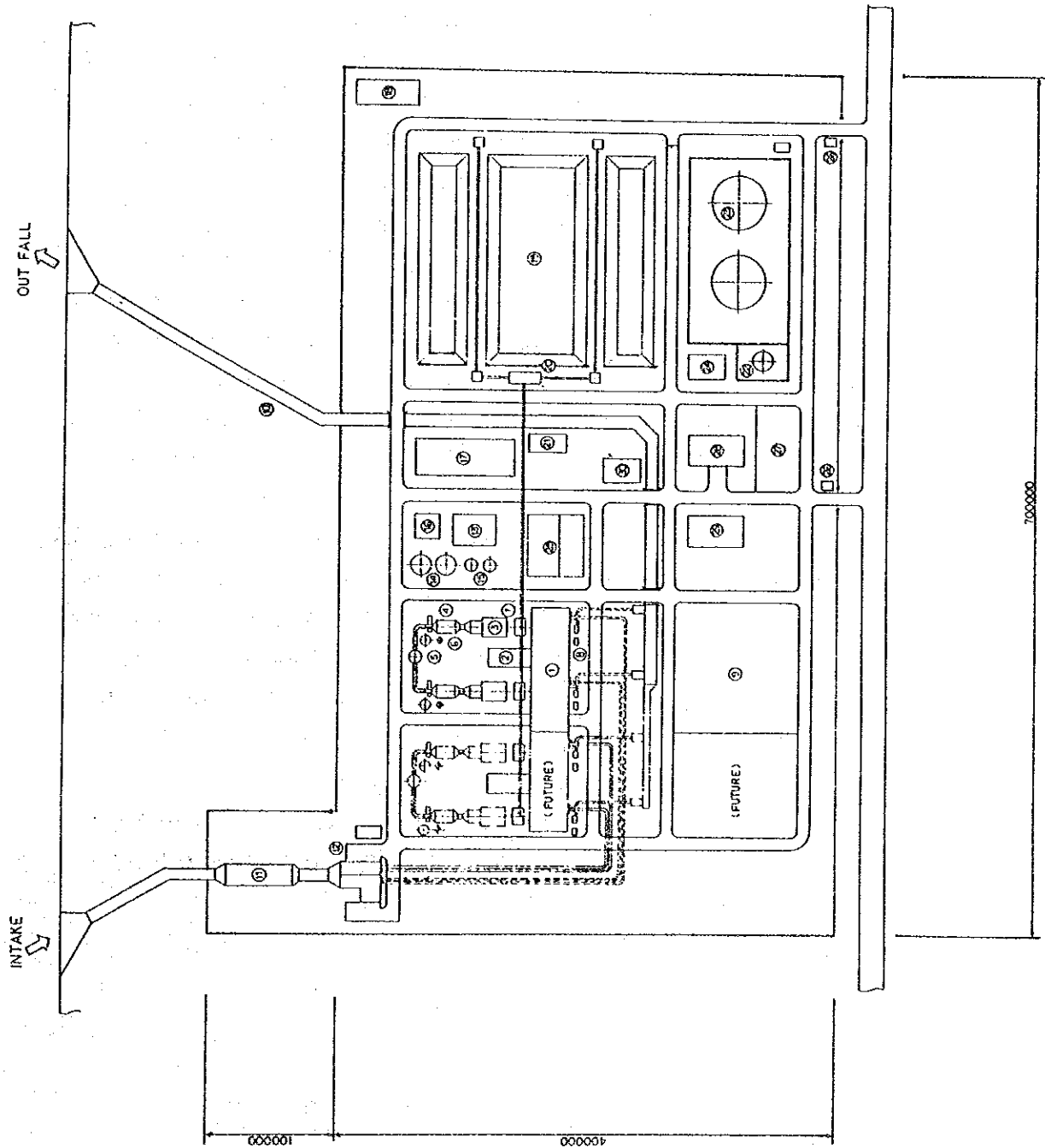
Referring to the case of the Delta area, electricity fee for irrigation purpose is 25 LE/KW and that for agricultural processing and new-communities is 50 LE/KW. On the other hand, the construction costs for the thermal power plant of 100 MW capacity is estimated at around 250 million LE. To develop a coal-fired power plant in North Sinai has significance from a national energy security viewpoint due to the development and usage of regional resources (Figure 4.7-3). The power plant is to be placed near the Balouza pumping station where seawater for cooling the generating facilities can be obtained.

The appurtenant effects of the power station are to produce fly ash cement using coal ash and to promote shrimp aquaculture using the warm water from the power plant.

3) Road Network Improvement Plan

The highway between El Qantara East and El Arish has a sufficient capacity compared to the current traffic volume. Owing to the construction of new communities, the population will double and the transport volume of produce and materials will greatly expand. In the long-term development plan, the expansion and complete separation of carriage ways of the highway will be proposed. And the road network will be improved facilitating the

Figure 4.7-3. Coal Fired Power Station



1	TURBINE HOUSE
2	CONTROL BUILDING
3	BOILER
4	ELECTROSTATIC PRECIPITATOR
5	STACK
6	ASH SILOS
7	COAL BUNKER
8	TRANSFORMER
9	SUB STATION
10	DISCHARGE CANAL
11	SAND EXTRACTOR
12	CIRCULATING WATER PUMP STATION
13	DEMINERALIZATION PLANT
14	RAW WATER STORAGE TANK
15	SEMINEURALIZED WATER STORAGE TANK
16	NEUTRALIZATION PIT
17	WEST WATER TREATMENT PLANT
18	WEST WATER SETTLING PIT
19	COAL STORAGE YARD
20	COAL CRUSHER HOUSE
21	COAL CONTROL BUILDING
22	LIGHT FUEL OIL TANK
23	FUEL OIL STORAGE TANK
24	FUEL OIL PUMP STATION
25	WORKSHOP & WAREHOUSE
26	GUARD HOUSE
27	PARKING
28	ADMINISTRATION BUILDING
29	CARTEEN
30	FIRE SERVICE BUILDING

distribution of agricultural and fisheries products.

Future increases of trade between the North Sinai and Delta region will reach the limit of transport by the Suez Canal ferries and need a new method. To replace ferry transport, an underground tunnel is desired. In the long-term development plan, the trans-Suez Canal tunnel accompanied by an improvement in road network will be proposed.

The present paved highway in the North Sinai runs between El Qantara and Rafah and branches out in a north-south direction where fishery and farm products as well as daily necessities are transported. These products are forwarded to the trunk road and then distributed to other villages in the region.

Plans for expansion of road network to cope with the future development have recently been discussed due to the ever-increasing volume of transportation on the highway without any bypass in the region and also to the branch roads made unusable because of sand blown from the dunes which accumulates on the roads, partly constraining regional development.

Without any major road in an east-west direction other than the present highway, development activities are concentrated along the highway. Construction of a new road, parallel with the highway and fully integrated with improved branch roads, is a necessary for accelerated development in the North Sinai. Construction of roads is under way in the Tina Plain, Rabaa and Bir El Abd.

Planning of a new road network must take into account not only the distribution of farm products but fisheries, tourism and other development plans proposed in the region.

The following two roads are proposed in the Study Area.

- (1) Extension of the road, currently under construction across the Tina Plain, for 40 km eastward parallel with the existing highway along the Mediterranean Sea.
- (2) On the southern side of the highway, extension of the El Salam Canal is planned in the vicinity of the irrigation area. At present, a new road is under construction for 25 km between Rabaa and Bir El Abd, further South.

Construction of a new road is proposed, to connect the embankment road of the El Salam Canal and the above road currently constructed and is to be located to the south of, and in parallel with, the existing highway surrounding the land reclamation area.

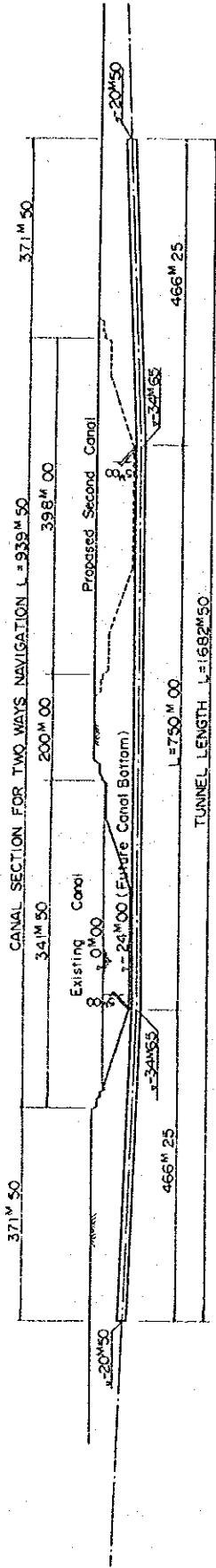
These new roads will serve as bypasses in the east-west direction on both the north and the south sides of the highway surrounding the land reclamation area and connecting the proposed tourist and fisheries development areas.

There are three alternative sites for construction of the road tunnel which connects the North Sinai and the Cairo-Delta area and crossing the Suez Canal, i.e., i) Ismailia or Ferdan, ii) El Qantara, iii) as an extension of the new road across the Tina Plain.

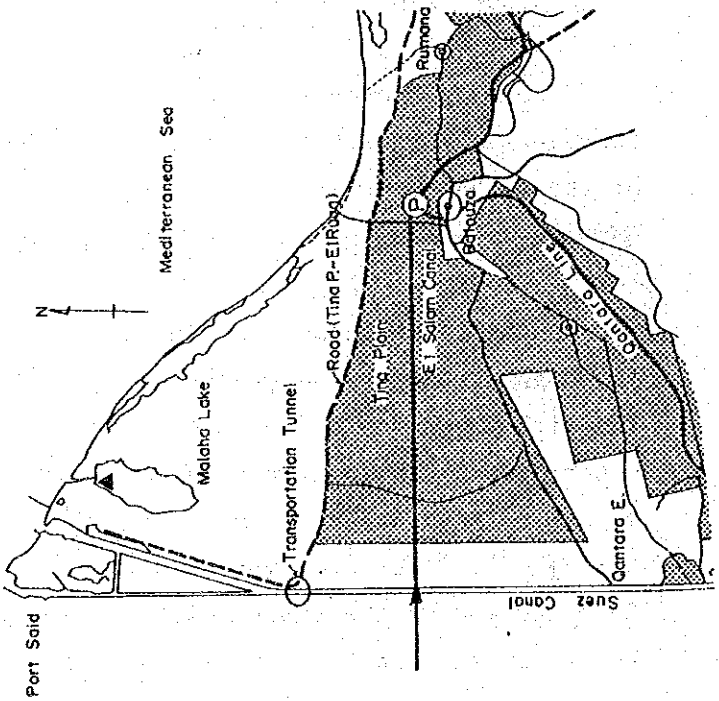
Among these three possible sites, the third alternative is proposed as the most appropriate considering transportation of farm and fishery products from the North Sinai, proximity to tourist sites of the Bardawil Lake (Figure 4.7-4). The third alternative site can be extended as far as the ports of Damietta and Alexandria through the Port Said bypass, presently under construction. Construction of the tunnel will provide the Area with direct access to the Delta, and farm and fishery products from the Area could be exported to the European market through Port Said and Damietta international ports.

Figure 4.7-4. TRANSPORTATION TUNNEL

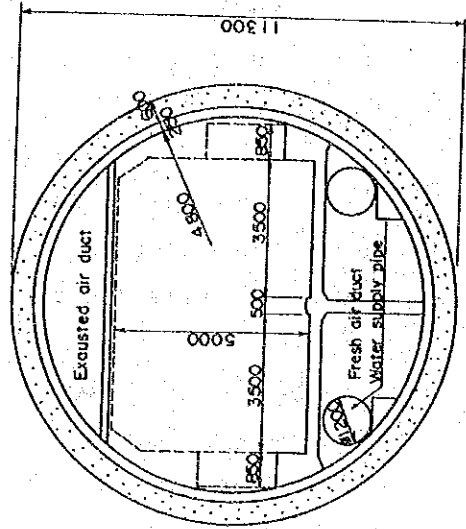
PROFILE OF TRANSPORTATION TUNNEL



Location of Transportation Tunnel



Typical Cross Section of Transportation Tunnel



4) El Arish Airport Improvement Plan

The El Arish Airport currently provides a passenger service from Cairo during only the summer season. The implementation of agricultural development and realization of high quality vegetables, medical crops, flowers production will bring a growth in economic prospects for El Arish Airport as an export point to Europe and the Middle East. The long term development plan includes the installation of storage and refrigeration facilities at El Arish Airport.

4.8. Supporting Service Plan

4.8.1. Agro-Supporting Service Plan

1) General

The agricultural production in the Study Area will be carried out by settlers from the Delta and Bedouins, owing to the water from El Salam Canal. It is not an exaggeration, however, to say that the determinant for whether the plan will be successful or not is fully dependent on appropriate extension services. In new settlement farming, soil improvement and effective use of limited water sources will be key to the success of profitable and stable production. Under these conditions, it is indispensable to make a variety of research for application of the irrigated farming technology. Its extension shall be efficiently disseminated to the settlers.

2) Agricultural Development Center

The Center shall be established in Rabaa/Qatia area for successful extension of the irrigation farming technology in the Study Area. The application study and training of irrigation farming technology shall be carried out as shown below.

(1) Training of agricultural technology

The training shall be given to settlers and existing farmers, including their successors.

(2) Application study of irrigation farming technology

An application study shall be carried out by experts of the Center. The fields covered by the experts are as follows;

- Vegetables
- Tree-crops
- Cereals/oil crops
- Livestock breeding & fodder crops
- Soils & fertilizers
- Irrigation and drainage
- Farm management

Major subjects to be studied in the Center are as follows;

- Selection of crops most suited to the Area
- Irrigation methods
- Fertilization for crops
- Cultivation guidelines (including fodder crops)
- Rotational cropping patterns
- Farm management
- Processing of farm products
- Sand dune fixation method

(3) Systematization of application studies by the center

The cooperative studies by the experts of the Center and extension workers shall permit the results to be readily available to farmers for application in their own fields.

(4) Training of applicable technology to farmers' fields

The Center's experts, with their study results, shall give lectures and training to extension workers, farmers and their successors both in lecture rooms and experimental farms at the Center.

(5) Demonstration of the results of application studies

The experts and extension workers shall give guidance and training to farmers on the model farms for upgrading

farming techniques so that the traditional agriculture can be successfully transformed into irrigated agriculture (modernized and intensive agriculture).

The model farms shall be located near the new communities and it is desirable to select those farmers who are enthusiastic to improve their farming and play an important role as local leader.

3) Extension Activities

To increase agricultural productivity and realize target yields, various techniques established by the Agricultural Development Center shall be disseminated to local farmers.

For this purpose, the extension services should be rendered in placing emphasis on the following matter;

- (1) At least one extension worker in such field as vegetables, tree crops, livestock, soil and pest control should be distributed in the extension office to provide appropriate guidance to the farmers.
- (2) Adequate guidances should be given on:
 - Field irrigation techniques
 - Irrigation standards for various crops
 - Selection of suitable varieties of crops
 - Farming methods for various crops (planting, seeding and protection method)
 - Fertilization method (soils analysis and fertilizer application)
 - Livestock breeding methods (feeding, artificial insemination, diagnosis and cure of diseases)
 - Farm management (farm management checking and organization of marketing activities)

- Processing of farm products (vegetables, fruits and dairy, etc.)
- Sand dune fixation method (forestation and windbreaks)

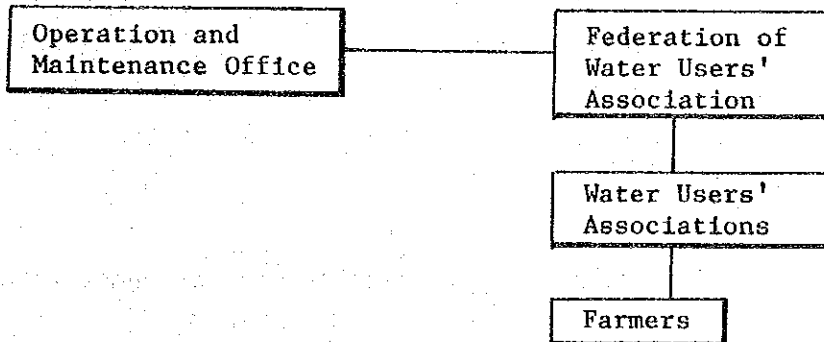
(3) The farmers should gain knowledge and techniques by lectures and seminars, and recommendations and advices by training and guidance given at the Agricultural Development Center.

4.8.2. Farmers' Organization Plan

1) General

Well arranged irrigation facilities are indispensable for performing timely irrigation with appropriate quantity of water to meet the crop requirements at each growing stage, however, an even water distribution at on-farm level cannot be realized unless the farmers themselves are well-organized.

Consequently, it is considered most effective that the beneficiary farmers shall be organized into a water user's association which will unite the farmers, with water as common property. The organization is illustrated as follows.



2) Establishment of Water Users' Association

(1) Purpose and tasks of Water Users' Association (WUA)

Purpose : Securing fair distribution of irrigation water to the farmers' fields.

Tasks : - Adjusting irrigation area at on-farm level
- Water distribution planning
- Operation and maintenance of on-farm irrigation facilities
- Collecting irrigation fee

Organization: - Managing director
- Secretary general
- Permanent staff (staff for general affairs, operation and maintenance, farm management, water distribution, etc.)

(2) Procedures for establishment of Water Users' Association

- i) Obtaining beneficiaries' consent
- ii) Preparation members' list
- iii) Organizing of water users' association
- iv) Election of managing director and employment of permanent staff
- v) Preparation of association rules

(3) Support for establishment of water users' association

The following adjustment should be made among the agencies concerned such as MOA, MPWWR and GARPAD to promote the organizing of Water User's Associations before the commencement of construction work.

- to confirm the numbers of beneficiary villages, total households and farmers,
- to prepare the programme for organizing the associations,
- to prepare regulations and rules for the association activities,

- to study the amounts of O & M charges to be paid by farmers,
- to employ the staff of the Governorates in order to provide training and guidance in organizing the associations.

3) Strengthening of Agricultural Cooperatives

Commonly, many producers grow wide variety of crops, while a limited number of middlemen or retailers deal the farm products with the farmers. In such dealing of farm products and input materials, farmers are apt to take much disadvantage. The farm products, however, have been dealt with many farmers to a few merchants (middlemen/retailers) and the imbalance in numbers of buyers and sellers has resulted in uneven distribution.

When selling the products and buying input materials are not made by individual farmers but by collective farmers like cooperative organization, on the other hand, the products will be traded at reasonable prices. Therefore, individual farmers should be organized into cooperative organizations in this point. For the purpose, existing cooperatives should be strengthened for more profitable bargaining of products and inputs for farmers.

Followings are major tasks of the agricultural cooperative;

(1) Operation of Joint Use of Equipment and Machinery

- Wheat milling
- Nursing seedling
- Collecting & marketing of vegetables and fruits
- Crop sorting
- Storage of crops
- Cold storage of crops
- Collecting & marketing of livestock products
- Collecting & marketing of milk
- Cold storage of livestock products
- Milk processing
- Services for farm machinery
- Gas station

(2) Education/Extension Operation

- Foster for Cooperative Groups of agricultural production (in cooperation with Agricultural Development Center & extension offices)
- Training the successors
- Survey and analysis about agricultural production cost
- Official reporting (Information about crop prices etc.)

(3) Sales Operation

- Joint sales for vegetables & fruits
- Joint sales for livestock products
- Joint sales for dairy products

(4) Procurement Operation

- Joint procurement of fertilizers and pesticides
- Joint procurement of feeds
- Joint procurement of farm machinery and tools
- Joint procurement of personal necessities

(5) Credit Operation

- Obtain loans for procurement of joint use equipment & machinery
- Loans for farm management
- Saving

4.8.3. Fisheries-Supporting Services

The fishing activities are performed mainly in the Bardawil Lake. Because the fishery in the lake is in a critical situation due not only to the depleted fish stocks but also to the rapid increase in numbers of fishermen and fishing boats, the time has come to develop the fishing grounds in the Bardawil Lake and the

Mediterranean Sea and to introduce the new technology for aquaculture. For the development of the Mediterranean fishing resource, a marine fisheries development center shall be established in future at El Arish, while the Malaha Lake aquaculture experimental center shall be established to ensure the maintenance of fishing resources.

Fishermen concerned shall be organized into the Fishermen's Cooperative Associations, furthermore, the related Governorate should render technical supporting services.

(1) Extension of fishing technology

- Study and extension of fishing methods and technology including aquaculture
- Survey on fishing resources in the Mediterranean Sea

(2) Establishment of Fishermen's Cooperative Associations

- Fishermen's Cooperative Association shall be made up by cooperative capital investment and deal with collective work such as purchase of fishing equipment/gear and marketing of catch, processing of catch, fishermen's credit, and information services for fish marketing.

4.8.4. Supporting for Processing, Commerce and Tourism Sectors

Processing industries relating to the local products such as agricultural, livestock and fisheries shall be vigorously introduced to the Study Area. These industries will serve to increase the value added of local produce and raise the income of the inhabitants with more employment opportunities, resulting in improvement of the regional economy.

In other respects, commercial and tourism development, in making better use of the local landscape, will also result in a

creation of employment opportunities. The supporting services for these sectors can be itemized as follows.

- Consolidation of industrial infrastructure such as roads, water and electricity supply, etc.
- Invitation for enterprises such as processing factories for agricultural and fishing, or tourism facilities etc.

4.8.5. New-Community Development Supporting Plan

The settlers will be the members of rural new-communities which will act as the core of the local society. The new-communities will provide amenities so as to attract additional settlers to farming.

The following supporting plans can be considered:

(1) Education, Culture and Welfare

- Scholarships to improve school attendance rates
- Cultural activities such as surveying of historical remains, collecting historical information for tourism, and providing recreational/sports facilities.
- Services for the welfare of the inhabitants.

(2) Health and Sanitation

- Arrangement of comprehensive medical service system for general medicare and emergency medicare.
- Arrangement of health and sanitation system for providing knowledge for health-maintenance, nutrition control, etc.

4.9. Environmental Impact

The proposed Project envisages integrated rural development of the North Sinai region on the basis of introduction of Nile water, which would be realized by the extension of El Salam Canal. The Study Area of about 3,200 sq.km involves Bardawil and Malaha lake areas, and proposed component of the Project includes agricultural development in terms of land reclamation and settlement, consolidation of new communities for settlers and existing inhabitant inclusive of Bedouin, promotion of agro-industry, improvement of marketing systems, fishery development in the above two lake areas, and the development of tourist resorts along the Mediterranean coastal area and lake sites.

The implementation of the proposed Project would significantly alter the existing natural and socio-economic environment in the area and its vicinity. Under this section, major environmental impacts to be accompanied with the Project are discussed qualitatively, based on the present environmental constraints observed in the area and on the analysis of available data/information at hand. In this connection, it is notified that more detailed assessment of environmental impact is to be done during pre-construction and even during construction stages of the Project, and that proper and suitable countermeasures are to be established in advance in order to expect sound development with natural and social environment and to prevent environmental destruction.

4.9.1. Existing Environmental Constraints

The Study Area involves the Bardawil Lake, the only lake in Egypt which has not been polluted yet. A large expansion of desert and waste inclusive of mobile sand dune prevails inland and ecosystem is quite delicate. In addition, many structures and facilities which had been destroyed by a series of the Middle East War are left.

1) Bardawil Lake

Bardawil lake is a clear saline lake with its water surface area of about 650 sq.km and shallow water depth varying from one to two meter, bordering on the open sea by a narrow sand bar. Due to extremely small amount of annual rainfall which causes almost no runoff inflow from the catchment and on the contrary large amount of basin evaporation, the lake water will easily dry up, salinity increase and lake ecology will rapidly be destroyed if the inflow of sea water is stopped. At the beginning of this century two openings are artificially excavated to link the lake and open sea, and since then fisheries have been carried out on introducing sea water and fish fry. Regarding the existing status of the ecosystem in the lake, investigations were made on fishes, plankton and algae through samplings at 19 sites by Al Azhar University in association with GAFRD in 1986. According to the investigations, useful sea fishes such as gray mullet, seabass and gilthead seabream grow in the lake. The openings to the sea are easily closed by the deposit of sand, hence the GAFRD has been dredging them annually with considerable expenses. Moreover, in view of fishery resource preservation, fisheries are being regulated with the close season from January to April.

The wet Sabkha, characterized by accumulated salts, is widely distributed stretching from south to western edge of the coastal area. Migratory birds represented by flamingo come flying annually to El Zaranig lagoon located at the northeast end of the lake.

2) Malaha Lake and Tina Plain

Malaha lake was formerly a large lake having the water surface area of about 110 sq.km, however, in early 1980's it was destroyed by residual soils dumped out during the construction of the by-pass at the north gate of Suez Canal. At present, the lake is divided into two parts; namely, the North and South lakes, with the total water surface area of 24 sq.km. Water levels in the lake are commonly high during

winter with expanded water surface area. Sea water is also introduced into these lakes through artificial openings. Water depths are shallow and salinity are high. Salinity will be raised rapidly and finally the lake will dry up if free exchange of water between the sea and lake is not allowed. The lake is being managed currently by the Egyptian Fishery Company for Fishing and Fishing Equipments which also undertakes maintenance of the openings and conservation of fishery resources.

The Tina Plain adjoins at its northern part to Malaha lake, and in winter the lower portion of the plain is covered with the lake water raised by strong northwest wind waves. The plain is characterized by a flat topography and shallow groundwater basin where saline loam and clay soils prevail and plant growth is hardly seen. The east edge of the area is covered with thick salt crusts and partially utilized as salt pan. A greater part of the Plain is left unused, except that hawking is practised by the inhabitants living in the vicinity. Wreckage of tanks used by the Middle East War has been left indicating some probable existence of unexploded mines.

3) Desert Area

Mobile sand dune of various scale is widely distributed in the Study Area. The direction of movement changes from season to season causing serious damage to communities and infrastructures including roads and communication facilities. On the other hand, in the stable sand terrain, Bedouin pastures sheeps, goats and camels utilizing the desert shrub grown in the wild, however, due to the rapid expansion of farmland and settlement accompanied with settlement of Bedouin, such grazing land tends to decrease recently. Shallow groundwater aquifer formed by rain water exists at depressions between sand dunes and at coastal dune zone located near Rafah, and date palms or salt tolerant crops are irrigated by the water pumped up from shallow wells. This groundwater shows high salinity, therefore, it is not usable to irrigate other crops. In the lower reach of Wadi El Arish, wells are dug by

REGWA and water pumped up from wells is utilized for horticulture. On the plateaus made of limestone and sandstone, which are situated between Sheikh Zawayid and Rafah, horticulture is also being practised using rain water and groundwater. In such places, soils are being gradually improved by croppings, however, salinity tends to increase and quality of groundwater becomes worse due to excessive pumping.

4) Social Environment

Infrastructures in the Study Area were once destroyed by the Middle East War, however, every possible effort to restore the area is being made by the governmental agencies concerned led by SDA. It is estimated that population in the area are about 160,000, and most are concentrated in the Eastern Division between El Arish and Sheikh Zuwayid/Rafah. El Arish is the capital of the North Sinai governorate and is administrative and commercial center of the area. In the suburbs many villas are built and resort tourists are collected from the Delta area especially in summer. Towns and villages on the west of El Arish concentrate mostly along the highway to connect El Qantara and El Arish. This is because the infrastructure such as water supply pipeline is installed only along the highway, and the remote area is scarcely populated. Educational and medical services stand at a low level in this area.

4.9.2. Environmental Impact Accompanied with Project Implementation

Environmental impact to be accompanied with the implementation of the Project involves not only negative factors that need careful countermeasures but also positive factors which would contribute to a great extent to increase in income of inhabitants and employment opportunity, improvement of living standard and promotion of national economic activities in terms of restoration of the area which had once destroyed by a series of war.

Qualitative prospect of environmental impact to be accompanied with the implementation of the Project is summarized as shown in Table 4.9-1.

1) Impact of El Salam Canal Extension

Through the extended El Salam Canal, Nile water mixed with drainage from the both Bahr Hadous and El Sirw drains are planned to be introduced into the Study Area. Mixing drainage water would make worse the quality of water in the canal, especially in terms of BOD, DO and salinity, however, this effect is estimated small as far as heavy metal and/or toxic chemical compounds are not included, and when it is considered that the drainage from the above two drains is actually being used in the lower end of the Delta area and since such waters are still more diluted by the Nile water.

In this connection, improper maintenance of the canal would cause suspension of water in the canal which will result a wide spread of malaria and schistosomiasis. Moreover, imperfect construction works of the canal would cause leakage of water which will flow through groundwater basin into the Bardawil Lake. However, this effect would be negligible since the major part of the canal is lined and the canal water is controlled with the upper limit of salinity at 800 ppm.

Impact on scarce animals and historical treasures during the construction work should be discussed. El Salam Canal is planned to be extended passing through the Tina Plain at a 500 m distance south of Tel El Ferma, therefore, necessary countermeasure should be taken to prevent the area from pollution during the construction period.

On the contrary, construction of El Salam Canal and other main irrigation and drainage canals, farm roads and the Tina Plain circulation road would contribute to a great extent to the protection of the area from inundation caused wind wave and also from soil erosion. In addition to the expansion of farmland to be irrigated by the extended El Salam Canal, positive impact to be brought about from the implementation of the Project such as the consolidation of infrastructure would greatly contribute to the social and economic environment of the area.

2) Impact of Land Reclamation

Execution of farmland reclamation will first remove unexploded mines in the area and then irrigated agriculture will add value of waste desert where at present only grazing is being practised. Farmland surrounded by windbreaks will be covered with crops, and microclimate will be moderated. Crop coverage would also control movement of sand dune. Sandy soils will be improved in both water holding capacity and fertility through accumulation of crop residue as well as compost produced from livestock.

Pastureland currently managed by Bedouin will further decrease as time passes. It is therefore important to enroll fodder crops into cropping pattern in order to expect stable supply of forage. Moreover, preparedness of preventive medicine and veterinary services to prevent spread of diseases is inevitably required under the intensified stock farming. Farmland owned by the settled Bedouin is also included in the reclaimed area, however, their traditional land ownership should be guaranteed even after the implementation of the Project.

Extension of intensive irrigated agriculture would alter ecosystem in the area. Irrigated farmland would provide preferable growing environment to harmful insects, weed and other wild lives that would in turn promote breeding of them. Agricultural chemicals may necessarily be used to exterminate or control harmful insects and wild lives and hence to achieve the target yield so that farmers can earn self-supporting incomes. Organic chloric and phosphorated chemical has a strong residual toxicity, remains easily in soil, drains into canal and groundwater aquifer, and causes damages to both land and water-borne lives. Use of chemical should therefore be minimized and a comprehensive system of pest and disease control should be established employing improvement of cropping method, use of a natural enemy and repellent, and other useful measures.

Residual irrigation water, not consumed by crops, infiltrates underground dissolving salt in soil, and forms saline groundwater. A part of this groundwater flows into Sabkha and deposits salt there. Such salt accumulation is seen a little in sandy soil, where sprinkler or drip irrigation is usually employed. In the Tina Plain, desalinization through leaching is to be made during the construction period, and salt-tolerant crops are then planted with surface irrigation. If drainage is insufficient, salts dissolved by leaching would be concentrated into groundwater and again accumulated on the ground surface by capillary action resulting the secondary salinization. To prevent the above secondary injury, stable and proper supply of irrigation water and at the same time efficient drainage are inevitably necessary.

3) Impact of Settlement and New-Community Establishment

The smallholders and graduates from other regions are settled in newly created farmland, and population will rapidly increase. The resident Bedouin is also unavoidable to remove their land and houses, however, if they wish, houses are provided in the new-community under the Project and social services are distributed similar to them. The settlers gathered from various places are classified according to their classes or origins, into groups so that enmity among groups is avoidable to the utmost at the organizational set-up of settlers.

Although new diseases are possibly carried in by settlers from the Delta area, it is planned to consolidate social infrastructure, and health and medical services are upgraded in the community. Patients who need first aid are easily carried to hospitals in either El Arish, Ismailia or Cairo through road networks consolidated. Water supply and sewerage systems and electricity are also distributed to each house, as a result, sanitary conditions are much improved. Sewage and litter produced by expanded population are treated within the community in order not to contaminate the Bardawil Lake and surrounding area. Parks and sports/amusement facilities installed in the community result a great improvement of living conditions of inhabitants. Development of

resort areas along El Ruag Bay, the Bardawil Lake and the Mediterranean Sea coast would contribute to some extent to recreation of the community residents.

In addition to this, agro-industries such as an oil extraction and refinery plant and a slaughterhouse are introduced in the area. Liquid and solid waste would be the source of pollution, therefore, plants are to be collectively installed in a place, if possible, and centralized system of waste management including collection, storage and disposal facilities is recommendable to be facilitated.

4.9.3. Necessary Countermeasure on Environmental Protection

As discussed in the previous section, various types of environmental impact are prospected as accompanied with the proposed development in each component. During pre-construction and construction stages of the Project, detailed investigation is to be made to establish necessary countermeasures. This section summarized four major countermeasures as briefly discussed in the following.

1) Preservation of Natural Environment of Bardawil Lake

The Bardawil lake is appointed as the nature preserve area by the Prime Minister's Order No.1429 in 1985 that was based on Egyptian Act No.102 issued in 1983. Most important is El Zaraniq lagoon situated at eastern end of the lake, known as the place where migrant birds represented by flamingo come flying, and is at present managed strictly by the inshore defence military. However, it is recommended to establish the method and organization for natural environment preservation including educational services to get consensus of inhabitant to avoid indiscriminate hunting, in cooperation with other functional organizations or agencies related with wild animal preservation.

Construction of permanent structure to prevent the openings from closure is required since it would contribute to better circulation of sea water in the lake, to stabilizing salinity and to protecting growing environment of water-borne lives such as algae, plankton, shellfish and fish. Clean lake water without suspension means that water is poor in nutrition for fish breeding, therefore, rapid growth of fishery is not expected. To prevent the lake from excessive fish catch and to maintain fishery resources, strong regulation and firm organization should be established in association with GAFRD.

In the western edge of the lake, the master plan aims at increasing of fishery resources positively by introducing organic matter in the lake. Since this area is far apart and separated from the other part of the lake, eutrophicated water is expected not to flow out from the area. In this connection, since residual chemical is always involved, even if it is negligibly little, in drainage from agricultural land, it is necessary either to use such a chemical harmless to fish or to establish a comprehensive plan of pest and disease control.

In El Ruag Bay located at the center of the lake, recreation and resort area development is proposed. It is recommended here to install waste and sewage disposal plants in addition to afforestation planting date palms and eucalyptuses.

2) Control of Schistosomiasis

The Study Area is not infected by schistosomiasis at present owing to no stagnant surface water where snails (vector of schistosomiasis) grow with aquatic weeds such as water hyacinth. When the Nile water mixing with the drainage water is introduced, however, it is predicted that schistosomiasis is also introduced together with the water from the Delta. The stagnant water provide a suitable environment to grow weeds and snails accordingly, therefore, the careful water management under proper maintenance of the canals to control the snails which propagate

under the shallow water and low water velocity of about less than 30 cm/sec is essential to prevent the new land, particularly in the Tina Plain from schistosomiasis infection.

In addition, proper medicine as well as chemicals to control the snails should be stocked in the health unit built in the proposed new-communities in order to distribute to the inhabitants. Furthermore, medical checks, medical prescriptions, education, and campaign of sanitary treatment should be undertaken as social services.

3) Excavation and Preservation of Ruins

The ancient commercial road known as "Horus Road" had been pierced in the Study Area and various historical treasures had remained in various places. Excavation works were conducted during the course of field survey at Tel El Ferma in the Tina Plain. Fortress ruins have also remained in many places, however, excavations have not satisfactorily been made, therefore, many of their values have not yet been confirmed. It is planned to route the extension of El Salam Canal at about 500 meter from Tel El Ferma, therefore, prior to implementation of the Project, detailed investigation along the canal alignment is recommended to be done in close cooperation with Department of Antiquity, Ministry of Culture.

4) Fixation of Mobile Sand Dune

Mobile sand dunes in the southern edge of the Study Area as well as around Bir El Abd have been causing damages to infrastructures, especially to roads. Currently fixation of dune by means of plantation of acacia and castor bean is being studied by MOA and DRI at Sheikh Zuwayid and other places, however, until now large-scale actualization of the researches has not yet been achieved. Although a large extension of mobile sand dune zone near Bir El Abd is excluded from the land reclamation area, the Project envisages to contribute to the fixation of mobile sand dune by extending crop coverage with farmland reclamation

and irrigated agriculture, by making researches in effective wind and sand control in the Agricultural Development Center to be established in the area, and by positive application of studies and researches readily available. In addition, it is inevitably necessary that the community and agro-industrial facilities are to be equipped with windbreaks and sand control measures.

Table 4.9-1. Impact Identification for Development Subprojects

Environmental Parameters	El Salam Canal Extension	Agricultural Dev.	New-Community Dev.	Agro-Industry Dev.	Fishery Dev.	Tourism Dev.
A. Physical and Chemical Effects:						
1. Land						
a) Landforms	++	++	+	x	x	+
b) Soils	x	+++	x	x	x	x
c) Sand dunes	++	+++	+	x	x	++
d) Mineral resources	x	x	x	x	x	x
2. Water						
a) Lake water quality	-	-	-	-	-	-
b) Lake water quantity	+	+	x	x	+	x
c) Groundwater quality & recharge	x	-	-	-	x	x
3. Climate and Natural Calamities						
a) Floods in Wadi	x	++	x	x	x	x
b) Submerge by seawater	x	+	+	x	x	x
c) Micro-climate	++	+++	+++	++	x	x
d) Sandstorm	+	+	+	+	x	-
B. Ecological Effects:						
1. Terrestrial species						
a) Vegetation	+	+++	-	x	x	++
b) Wildlife	-	--	--	x	x	x
2. Aquatic species and Habitat						
a) Fish	x	x	x	x	+++	-
b) Bird	x	-	-	-	--	-
c) Plankton & benthos	x	x	+	+	+++	-
C. Socio-economic Effects:						
1. Demography						
a) Population (Bedouin)	x	--	--	-	-	-
b) Employment	++	+++	+++	+++	++	+++
c) Life style	++	+++	+++	++	++	+++
d) Health & sanitary	--	x	+++	-	x	++
2. Land Use						
a) Cropping	+++	+++	-	+++	x	x
b) Grazing	-	--	--	x	x	x
c) Residential	x	x	+	-	x	x
d) Industry & commercial	++	+++	+	+++	+	+
e) Wetland (Sabkha)	-	++	+	x	+	+

(Table 4.9-1 - continued)

Environmental Parameters	El Salam Canal Extension	Agricultural Dev.	New-Community Dev.	Agro-Industry Dev.	Fishery Dev.	Tourism Dev.
3. Infrastructure						
a) Major structure	++	x	+++	+++	x	++
b) Utility networks	++	x	+++	+++	x	++
c) Transportation networks	++	++	+++	+++	x	++
4. Aesthetic Effects and Human Interests						
a) Scenic view & vistas	-	++	--	--	-	+++
b) Parks & reserves	-	--	++	--	-	+++
c) Resort and sporting	x	x	++	--	-	+++
d) Rare and unique	--	--	--	--	-	--
e) Historical & archaeological sites.	-	x	-	x	x	-

+ : Positive Impact - : Negative Impact x : No Impact
 +++ & --- : High Impact
 ++ & -- : Moderate Impact
 + & - : Negligible Impact

**CHAPTER 5. IMPLEMENTATION PROGRAMME
AND PRIORITY SUBPROJECT**

5.1. Development Subprojects

The development subprojects having a high potential are listed in Table 5.1-1. The proposed development plans in the respective components mentioned in Chapter 4 are combined based on the specific characteristics of the area. In the Western Division, the horizontal expansion; namely, land reclamation and settlement through the El Salam Canal extension is proposed. In the Eastern Division, on the other hand, the vertical expansion of the existing farmland; namely, increase in productivity through enhancement of supporting services and marketing is proposed.

The development subprojects in the respective area are summarized as follows:

- 1) Western Division (Tina Plain, Southwest of Bardawil Lake, East of Bardawil Lake)

Land reclamation of 254,700 feddan through the extension of the El Salam Canal is proposed. On the reclaimed land, the farm management combined cropping and livestock will be practised. The diversified crops, viz., i) food crops, ii) fodder crops, iii) oil crops, and iv) vegetables and fruits will be produced. Oil extracting and refinery plants and slaughterhouse and cut meat plants will be established in the area allocated to investors and/or near the existing communities.

The clayey area in the Tina Plain will be provided with surface irrigation facilities while the sandy area with sprinkler and drip irrigation facilities. In particular, the clayey area will be drained with proper facilities and leaching of salinity will also be conducted.

A total of 30,000 farm households (160,000 residents) are proposed for settlement on newly developed farmland. For those who will be settled in the sandy areas other than in the Tina Plain where the

farming practice is different from the Delta area, technical support and guidance will be provided for settlers owing to the Agricultural Development Center and water user's association will also be established. Existing agricultural cooperatives shall be strengthened. The settlement area will comprise 40 new communities (settlement villages), where communication will be maintained with the existing communities through newly developed marketing and road networks. The new communities will be provided with the basic infrastructure such as water supply and electricity while the existing communities (El Qantara East, Balouza, Rabaa, Bir El Abd, etc.) will be provided with marketing facilities for collection/distribution and storage purposes. Education, public health, and medical facilities will also be improved.

In order to improve the openings of the Bardawil Lake, construction of a breakwater and embankment in front of openings is required for which hydrologic and oceanographic engineering surveys will be conducted. Improvement in fish landing port facilities in Tulul is currently underway including ice-making, cold storage, and refuelling facilities. Similar facilities are also planned for fish landing sites such as Nigila. In an effort to improve the west end of Bardawil Lake, construction of aquaculture facilities is proposed at Nigila. Fishing ground improvement plan is proposed in the Malaha Lake while fish pond and an aquaculture experimental center will be established in the north of the Tina Plain which is unsuited for development of farmland.

Tourism development survey will be started on the west coast of El Ruag Bay for identification of resort/recreation sites for the local residents which are accessible by the north connection road from Bir El Abd. Historical locations in the Tina Plain will definitely be excluded from farmland development and appropriately preserved. The stopover sites for migratory birds in El Zaraniq lagoon at the east end of Bardawil Lake will be designated as a wildlife sanctuary.

Furthermore, new road network for marketing, a Suez Canal tunnel and a thermal power plant near Balouza will be constructed in future.

2) Eastern Division (Wadi El Arish Basin and Sheikh Zuwayid/Rafah Area)

According to the survey made by RIWR, groundwater resources in El Arish are being excessively pumped out at present, therefore, effective control measures need to be instituted. On the other hand, Sheikh Zuwayid/Rafah area has an annual precipitation of 200 to 300 mm and there is expansive farmland which depends on the rainfall and/or groundwater. It was reported that there is a development potential of groundwater resources in this area.

There are many existing farms in this area where improvements are proposed in fruits, vegetables, cattle, sheep, goats, and rabbits. For this purpose, technological development and extension such as artificial insemination, embryo transplanting and fruits quality improvement through top-grafting at livestock center, seed center, and horticulture demonstration farm are all considered important. In Sheikh-Zuwayid/Rafah areas where there is moderate rainfall, extension service for livestock production using rainfall and promotion of rain water storage (Harabat) are encouraged. For this purpose, construction of a slaughterhouse, cut meat processing and marketing facilities is proposed. Construction of storage and marketing facilities for fruit and vegetables is also planned.

The fish landing port at El Arish is now being improved; furthermore, the center for supporting marine fisheries will be established in future. Tourism development planned by MOD along the Mediterranean Sea coast will also be promoted from now on.

Table 5.1-1. Development Sub-Projects

Development Sector	Sub-Project	Remarks	Executing Body
Agriculture	AW-1 El Salam Canal Extension Project	Including Siphon under Suez Canal	MPWWR
	AW-2 South Tina Plain Land Reclamation Project	Including land reclamation; settlement; agro-industry, marketing; and supporting service facilities	GARPAD/MOA
	AW-3 South Qantara-East Land Reclamation Project		
	AW-4 North Tina Plain Land Reclamation Project		
	AW-5 Rabaa/Qatia Area Land Reclamation Project		
	AW-6 Bir El Abd Area Land Reclamation Project		
	AW-7 Kathib El Agramia Land Reclamation Project		
	AW-8 Hod Abu Samara Land Reclamation Project		
	AW-9 El Mazar Land Reclamation Project		
	AW-10 El Midan Land Reclamation Project		
	AW-11 Wadi El Arish Agriculture Improvement Project		
	AW-12 Sheikh Zuwayid/Rafah Area Agric. Improvement Project		
	AW-13 Agricultural Development Center	At Rabaa/Qatia Area	MOA
Fishery	F-1 Bardawil Lake Opening Improvement Project	Bugaz No.1 and No.2	GFRD
	F-2 Malaha Lake Opening Project		
	F-3 West Bardawil Lake Aquaculture Development Project		
	F-4 Nigila Fishery Center Project		
	F-5 Malaha Lake Aquaculture Development Project		
	F-6 Malaha Lake Fishery Center Project		
Tourism	T-1 El Ruag Recreation and Resort Development Project		MOD/MOT
	T-2 El Zaranig Wildlife Sanctuary Project		Egyptian Wildlife Service
	T-3 Historical Resources Reservation Project		Dept. of Antiquities, Ministry of Culture
Community	C-1 New Communities Development Project (Settlement Villages)		MOD
	C-2 Existing Communities Improvement Projects for Qantara-East, Bir El Abd, El Arish, Sheikh Zuwayid, Rafah	Including medical care, education, social infrastructure, etc.	

5.2. Implementing Agency

As the development subprojects formulated in this master plan have covered several sectors, all sectoral agencies concerned must be essentially involved in the implementation of the Project. On the other hand, it is also strongly required that certain organization shall be appointed as the main coordinating body in order to contribute to smooth and on-schedule implementation and to attain overall development target. Particularly, such key agency shall have practical functions to act efficiently on the field of the project management and coordination among the sectoral line agencies.

Under the above consideration, it is recommended that the key coordination agency of the development plan would be the Sinai Development Authority (SDA) under MOD, which has sufficient experiences about ten years on the project coordination. On this basis, technical and close assistance to SDA/MOD shall be provided by all line agencies concerned.

Namely, MPWWR is responsible to construction of El Salam Canal and main canals and GARPAD to land reclamation including on-farm facilities, new-community and agro-industry. And MOA has responsibility to agricultural supporting services, etc.

Meanwhile, fishery development is implemented by GAFRD and tourism development is planned by MOD and operated by MOT (refer to Table 5.1-1).

5.3. Implementation Programme

5.3.1. Staged Development Implementation Plan

As mentioned in Chapter 3, the Master Plan covers an extensive area and comprises a wide range of development components. Therefore, the development plans are proposed for all sectors in the whole area to be implemented districtwise, sector by sector, under a staged development manner.

In Egypt, the Second Five-Year Plan is now undertaken and the ultimate target of this M/P is expected to be completed by Year 2005; namely, the midst of the Fifth Five-Year. For this target, the subprojects which can be and/or must be commenced immediately should be started as early as possible. The subprojects will be implemented with keeping balance between other components as the following target year:

Short-term Plan (Third Five-Year Plan)	:	1997
Medium-term Plan (Fourth Five-Year Plan)	:	2002
Long-term Plan (Fifth Five-Year Plan)	:	2005

Furthermore, the subprojects having urgency are selected as the priority subprojects and feasibility study on them is carried out immediately.

5.3.2. Implementation Schedule by Components

1) Agricultural Development

The introduction of Nile water for irrigation through the extension of El Salam Canal is essential for the agricultural development in North Sinai. The land reclamation works will be implemented keeping pace with the extension of El Salam Canal.

During the Short-term Plan up to 1997, widening of El Salam Canal and installation of pumping station in the west bank of Suez Canal will be undertaken as well as a siphon under Suez Canal and extension up to El Khirba. In parallel with the construction of El Salam Canal, the land reclamation of 113,400 feddan in total in South Tina Plain and Rabaa/Qatia area will be carried out (horizontal expansion). Also, preparatory procedures of settlement, i.e., application and determination of settlers will be started. In addition, the Agricultural Development Center will be established to support technically for settlers.

In the Eastern Division, on the other hand, diversification of farm management, improvement of productivity and enhancement of supporting services will be undertaken in order to increase the agricultural productivity (vertical expansion).

During the Medium-term Plan, El Salam Canal will be subsequently extended up to Misfaq area and its branches towards south will be constructed. Accompanying with the Canal extension, land reclamation of 124,600 feddans in total in South Qantara, Bir El Abd (Bir El Abd, Tofaha, North and South Salmana, Misfaq) and Hod Abu Samara will be carried out.

Furthermore, the extension of El Salam Canal up to El Midan and the land reclamation of 16,700 feddan in El Mazar and El Midan areas will be started during the Long-term Plan after reconsideration based on the results of development during the Short- and Medium-Term Plans.

2) Inland Fishery Development

Improvement of openings (Bughaz I and II) is important in fishery development of the Bardawil Lake. Existing data is still insufficient for designing the permanent protection structures, therefore, the study on the oceanology and current simulation should be immediately started. Meanwhile, improvement of fish landing port being undertaken should be promoted during the Short-term Plan.

During the Medium-term plan when the cropping is performed on the reclaimed lands in Rabaa/Qatia area, reconstruction works of the western part of Bardawil Lake introducing the agricultural drainage water will be commenced. In parallel with the renovation of fish landing port, fishery center for breeding and restocking will be established at Nigila fish landing port. Meanwhile, in the Malaha Lake, construction of fishponds for aquaculture utilizing agricultural drainage water to increase in nutrients will be started in some portion where land reclamation has been carried out in the adjoining Tina Plain. In addition, aquaculture experimental center will be established to give technical support.

During the Long-term Plan, fishpond area will be expanded to the remaining portion of the Malaha Lake. In El Arish, on the other hand, the center for supporting marine fishery development will be established (refer to APPENDIX-E.2).

3) Agro-Industry and Marketing Development

Construction of agro-industry and marketing facilities should be implemented keeping pace with land reclamation and cropping schedule.

In the Eastern Division, rehabilitation and improvement of processing, storage and marketing facilities for agricultural products will be undertaken during the Short-term Plan. In the Western Division, on the other hand, no intensive cropping has been performed during the Short-term Plan. During the Medium-term Plan, cropping has been started on the reclaimed land, and oil crops, fodder crops, and vegetables will be harvested, except fruits which take a long period of time to be matured. Accordingly, construction of oil extracting and refinery plants, slaughterhouse and cut-meat plants as well as marketing facilities for vegetables will be started in the Medium-term Plan.

During the Long-term Plan, the agro-industry and marketing facilities will be expanded to meet the increase in agricultural production owing to the progress of land reclamation in the Western Division.

4) New-Community Development

Accompanying with the land reclamation and settlement, new-communities for settlers should be constructed. For the new communities (settlement villages), infrastructure and social services to meet the basic human needs should be provided. The construction of basic rural infrastructure such as housing and potable water supply facilities will be started with the land reclamation works, simultaneously during the Short-term Plan in order to be in time for settlement schedule. Then, service facilities such as health and education will be gradually provided.

Infrastructure of the existing communities in the Eastern Division will be rehabilitated in addition to the continuous construction of new communities in the Western Division during the Medium-term Plan.

In the Long-term Plan, improvement of marketing road networks inclusive of construction of a tunnel under Suez Canal as well as construction of a thermal power plant will be undertaken in addition to the consolidation of the existing infrastructure in whole North Sinai region.

5) Tourism Development

Tourism development along the Mediterranean Sea coast which has been prepared by MOD in the Eastern Division will be promoted in the Short-term Plan.

In the Medium-term Plan, the recreational and resort tourism development in El Ruag will be started for the local people including settlement farmers to the Tina Plain and Rabaa/Qatia area where land reclamation has been completed during the Short-term Plan.

Improvement of such infrastructures as road networks and medical facilities in the existing communities will attract tourists from outside of the Study Area, therefore, further expansion of tourism facilities will be continued in the Long-term Plan.

Meanwhile, natural environment related to tourism will be preserved. Monitoring of natural environment and survey of historical monument will be started in the Short-term Plan. In the Medium-term Plan, facilities for natural environment preservation will be constructed at El Zaraniq lagoon in the Bardawil Lake. Furthermore, facilities for conservation of discovered historical monument such as museum will be constructed in the Long-term Plan.

Fixation of sand dune is very important, therefore, the trial on sand dune fixation by forestation will be carried out at the Agricultural Development Center which is established during the Short-term Plan. Subsequently, the large-scale sand dune fixation will be started in the Medium-term plan when land reclamation area expands to Bir El Abd area adjoining mobile sand dune area.

5.3.3. Comprehensive Development Schedule

In the Western Division, the horizontal expansion by land reclamation from Suez Canal towards east will be undertaken keeping pace with El Salam Canal extension. In the Eastern Division, on the other hand, the vertical expansion at the existing farmland will be promoted surrounding El Arish, Sheikh Zuwayid and Rafah as nucleus.

For respective area, the productive sector, viz., agriculture and fishery together with agro-industry and marketing, will be first established. Subsequently, tourism facilities will be developed in parallel with the improvement or rehabilitation of the social infrastructure for new-communities and existing communities. The comprehensive implementation schedule is shown in Figure 5.3-1.

Figure 5.3-1 Implementation Schedule of Priority Subprojects

Works	1988-1992	1993-1997	1998-2002	2002-2007
<u>Agricultural Development</u>				
El Salam Canal Extension		to Rabaa	to Bir El Abd	to El Midan
Land Reclamation (feddan)		113,400	124,600	16,700
Land Improvement (feddan)		59,500		
Land Settlement				
<u>Fishery Development</u>				
Bardawil Lake Opening Improve.				
Fish Landing Port Improvement				
Nigila Fishery Center				
Malaha Lake Aquaculture				
<u>Agro-Industry & Marketing</u>				
Oil Extraction Plant				
Slaughterhouse / Cut Meat Plant				
Agric. Product Marketing				
Fish Storage & Marketing				
Market Road Network				
<u>Community Development</u>				
Existing Community Improvement				
New-Community Construction				
Infrastructure				
<u>Tourism Development</u>				
El Ruag Recreation/Resort				
El Zaraniq wildlife Reservation				
Historical Monum. Conservation				
<u>Supporting Service</u>				
Agric. Extension Facilities				
Agricultural Development Center				
Aquaculture Exptl. Center				
Natural Environ. Monitoring				
Sand Dune Fixation				

----- Preparatory Works ■ Construction Works (Qantara East - El Arish)
 □ Construction Works (El Arish - Rafah)

5.4. Project Cost Estimate

Based on the cost estimate for the F/S, overall project costs were estimated by the development stage as shown below:

(Unit: Million LE)

	Development Plans			Total
	Short-term	Medium-term	Long-term	
Agricultural Development	1,373	1,163	258	2,794
Fishery Development	26	22	2	50
Agro-industries	30	49	-	79
Total	1,429	1,234	260	2,923

Note: For details, refer to Table 5.4-1.

Tourism development will be implemented by private sectors. On the other hand, at the stage of completion of M/P, transportation tunnel under the Suez Canal and more road networks will be necessary for increased traffic. A thermal power generation plant will also be necessary to meet the increasing demand of electricity.

Costs necessary for the above-items are as follows:

Road networks	500 million LE
Tunnel under the Suez Canal	800 "
Power station	250 "
Excavation of ruins and preservation of bird sanctuary	50 "
Communication networks	30 "
Others	30 "
Total	1,700 million LE

Table 5.4 - 1 Estimated Project Cost

(Unit: 1,000 LE)

<u>Description</u>	<u>Short Term</u>	<u>Medium term</u>	<u>Long Term</u>
Agricultural Development			
El Salam Canal ^{1/}			
Siphon	175,690	—	—
Pump Stations ^{2/}	54,620	27,200	33,100
Canal ^{3/}	76,360	36,090	82,690
In the west bank ^{4/}	86,850	39,600	—
<u>Sub - Total</u>	<u>393,520</u>	<u>102,890</u>	<u>115,790</u>
Irrigation and Drainage ^{5/}	474,670	951,940	127,590
New-Communities	395,350	108,400	14,530
Agric. Support / Marketing	43,120	—	—
Agric. Development Center	20,000	—	—
Engineering Fee ^{6/}	46,500	—	—
Total	1,373,160	1,163,230	257,910
Fishery Development			
Bardawil Lake			
Openings Protection	20,000	—	—
Western Part Reconstruct	3,000	—	—
Nigila Fishery Center	—	2,000	—
Fish Landing Port	3,000	1,000	—
Malaha Lake			
Openings Protection	—	16,000	—
Aquaculture Center	—	2,000	—
Fish Landing Port	—	1,000	—
Cage Fish Farming	500	—	—
Fish Pond	—	—	2,400
Total	26,500	22,000	2,400
Agro - Industry Development			
Oil Extraction Plant	11,150	11,150	—
Slaughterhouse / Cut Meat Plant	18,810	37,610	—
Total	29,960	48,760	—
Grand Total	1,429,620	1,233,990	260,310

Notes: 1/ Including 10% contingency

2/ " civil works and equipment

3/ " control system

4/ " canal widening and pump facilities

5/ " branch canals, drainage canals, land reclamation and on - farm facilities

6/ Included in the cost of New - Communities in the Medium - Term and Long - Term Plans

(unit: L.E.1000)

Table 5.4-2 Breakdown of Project Cost

Description	Short Term Development Plan			Medium Term Development Plan			Long Term Development Plan		
	Total	F.C	L.C	Total	F.C	L.C	Total	F.C	L.C
A. Agriculture Development									
1. El Salam Canal									
1-1 Siphon under Suez Canal	159,720	125,360	34,360						
1-2 Tina Pump Station (Civil)	6,180	2,270	3,900						
-ditto- (Equipment)	14,580	13,550	1,030	14,580	13,550	1,030	14,580	13,550	1,030
1-3 Balouza Pump Station (Civil)	7,060	2,850	4,210						
(Equipment)									
1-4 Control System	21,850	19,170	2,660	10,150	8,900	1,250	11,160	8,370	2,790
1-5 Canal	5,720	5,460	260	4,000	3,000	1,000	4,350	3,800	550
1-6 Branch Canal	65,700	34,850	28,850	28,810	15,560	13,250	74,170	42,770	31,400
Contingency	30,040	15,960	14,080	69,990	37,190	32,800	9,390	4,990	4,400
Sub-Total	30,880	21,950	8,940	12,750	7,820	4,930	11,460	7,450	4,010
(Rabaa/Qatia Area ; 53,400F)	339,710	241,420	98,290	140,280	86,020	54,260	126,110	81,930	44,180
2. Drainage Facilities	6,800	3,660	3,140						
3. Land Reclamation	54,820	32,640	22,180						
4. On-Farm Facilities	118,360	88,790	29,590	874,950	340,360	534,590	117,270	45,620	71,650
5. Social Facilities	195,000	20,800	174,200						
6. Agriculture Support, Market	45,120	27,025	16,095						
7. Agriculture Center	20,000	8,580	11,420						
8. Engineering Fee	46,500	24,500	22,000						
Sub-total	484,600	205,980	278,620	983,350	402,660	580,690	131,800	53,970	77,830
Total	824,310	447,400	376,910	1,123,630	488,680	634,950	257,910	135,900	122,010
(South Tina Plain; 60,000F)									
9. Irrigation, Drainage Facilities	217,650	106,540	111,110						
10. Social Facilities	200,350	79,260	121,090						
11. Pump Equipment	44,000	40,000	4,000						
Total	462,000	225,800	236,200						
12. El Salam Canal in West Bank	47,250	-	47,250						
12-1 Expansion Canal for West Bank	39,600	34,430	5,170	39,600	34,430	5,170			
12-2 Expansion for Pump Facilities	86,850	34,430	52,420	39,600	34,430	5,170			
Total	1,373,160	707,630	665,530	1,163,230	523,110	640,120	257,910	135,900	122,010
Total of Agriculture									

(unit L.E.1000)

Estimated Project Cost

Discription	Short Term Development Plan		Medium Term Development Plan		Long Term Development Plan	
	Total	F.C	L.C	Total	F.C	L.C
B. Fishery Development						
1. Opening excavation for Bardawil Protection Bank for Bardawil	12,000	5,000	7,000			
	8,000	3,200	4,800			
2. Opening excavation for Malaha Protection Bank for Malaha	-	-	-	8,000	3,200	4,800
	-	-	-	8,000	3,200	4,800
3. West Bardawil Lake Aquaculture	3,000	1,000	2,000			
4. Nigila Fishery Center				2,000	1,500	500
5. Malaha Lake Aquaculture Center				2,000	1,000	1,000
6. Malaha Fishery Port Facilities				1,000	700	300
7. Fishery Port Facilities (Bardawil)	3,000	2,000	1,000	1,000	700	300
8. Cage Aquaculture	500	400	100			
9. Fish Pond construction						
Total of Fishery	26,500	11,600	14,900	22,000	10,300	11,700
					2,400	1,920
					480	1,920
C. Agro-Industry						
1. Oil Processing Plant	11,150	5,345	5,805	11,150	5,345	5,805
2. Slaughter & Cut Meat Center	18,806	13,492	5,314	37,612	26,984	10,628
Total of Agro-Industry	29,956	18,837	11,119	48,762	32,329	16,433
Grand Total	1,429,616	738,067	691,549	1,233,992	565,739	668,253
					260,310	136,380
						123,930

5.5. Selection of Priority Subprojects

The objectives of the North Sinai integrated rural development project following the national development policies of the Second Five-Year Plan are: i) to increase in productivity, ii) to create employment opportunities, iii) to improve the living standard of inhabitants, and iv) to redistribute the dense population in the Delta to new lands.

Among the development subprojects proposed for the Short-term Plan, priority subprojects were selected in accordance with the urgency, importance and effect on other components. In this Plan, extension of El Salam Canal, land reclamation and settlement, construction of new-communities, construction of Agricultural Development Center as well as improvement of openings in the Bardawil Lake are included for the Western Division. For the Eastern Division, on the other hand, improvement of agro-industry and marketing facilities and enhancement of agricultural supporting services are proposed.

In the selection of priority subproject, tourism development would be excluded from the viewpoint of the increase in productivity. From the aspects of levelling the regional gap and redistributing the population, the development projects in the Eastern Division where the population density is comparatively high, would be excluded. Meanwhile, fishery development is inferior to agricultural development (land reclamation and settlement) in terms of absorbing population. Moreover, designing of permanent protective structures for openings in the Bardawil Lake could not be started immediately due to lack of basic data on oceanology for the designing.

Accordingly, from the current Egyptian socio-economic situation and the development potential in the North Sinai in particular, development priority should be given to agriculture and its related components in the Western Division.

Consequently, agricultural development through extension of the El Salam Canal will have a tremendous significance on national development with anticipated effects to be brought about by increased agricultural production such as increase in food self-sufficiency, expansion of processing and marketing industries, creation of employment opportunities, and expansion of the habitable area.

5.6. Implementation of Priority Subprojects

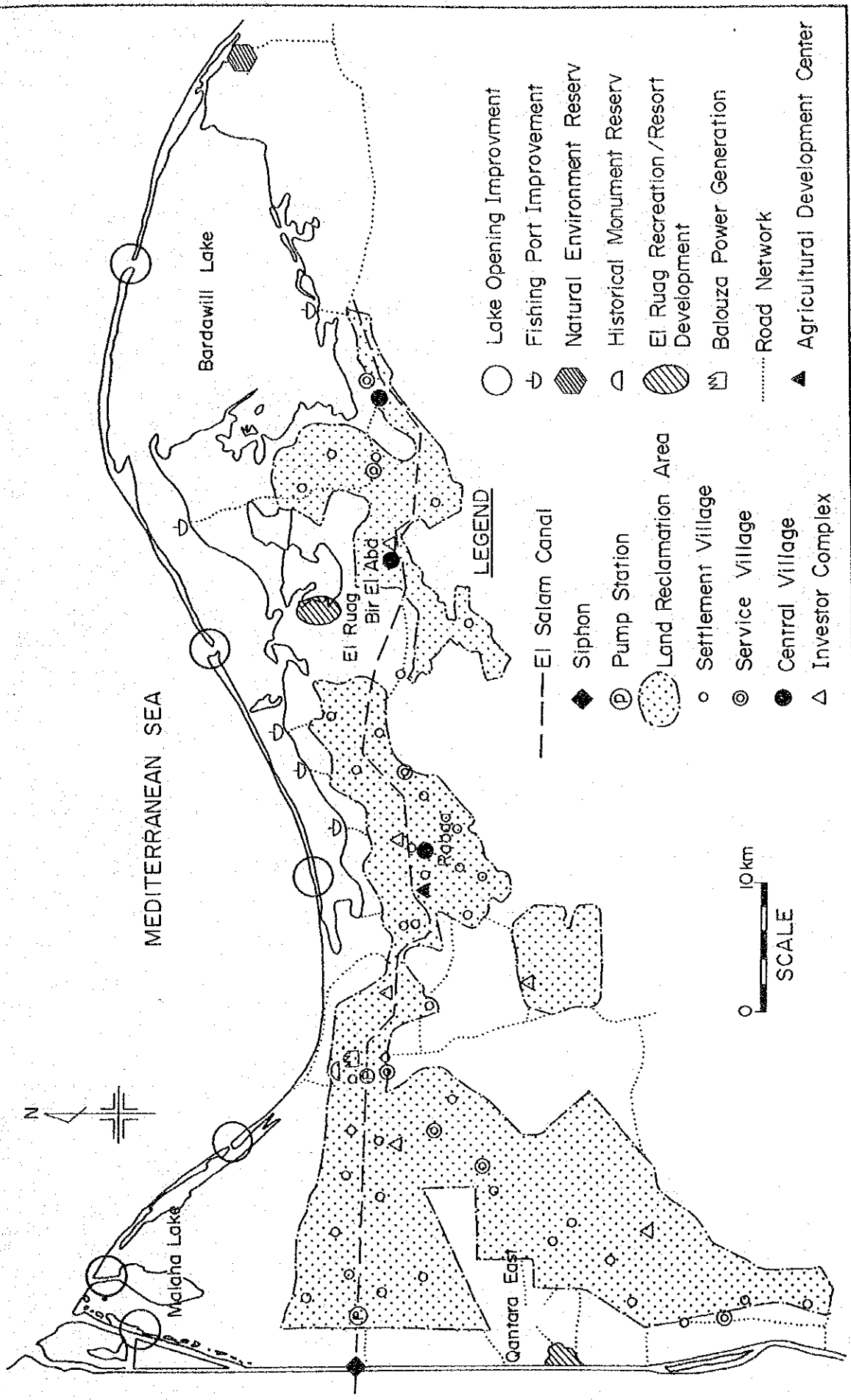
As a result of the selection of priority subprojects, agricultural development in the Western Division is accorded high priority.

The area to be developed in the Short-term plan which includes the expansion of El Salam Canal, land reclamation and settlement, is 113,400 feddan of Rabaa/Qatia area and Tina Plain. The feasibility study for the South Tina Plain area of 60,000 feddan has been completed by PPU/GARPAD.

Therefore, priority subprojects for which the feasibility study will be conducted are the El Salam Canal Extension (including siphon crossing the Suez Canal) and total land reclamation of 53,400 feddan in Rabaa/Qatia area. Proposed also are plans for new community development, agro-industries and marketing facilities necessary for integrated agricultural development (Figure 5.6-1). All these plans will be subjected to investigation for technical and economic viability.

As part of integrated agricultural development, establishment of Agricultural Development Center is proposed for provision of technical assistance in irrigation methods, production techniques, etc., to those settled farmers who migrate from the Delta area with different natural, social and economic backgrounds.

Figure 5.6-1. Development Plan Targeted in 2002



- LEGEND**
- Lake Opening Improvement
 - ↪ Fishing Port Improvement
 - ▨ Natural Environment Reserv
 - ◡ Historical Monument Reserv
 - ▨ El Ruag Recreation/Resort Development
 - ⚡ Balouza Power Generation
 - ⋯ Road Network
 - ▲ Agricultural Development Center

- El Salam Canal
- ◆ Siphon
- Ⓟ Pump Station
- ⊙ Land Reclamation Area
- Settlement Village
- ⊙ Service Village
- Central Village
- △ Investor Complex

0 10 km
SCALE

